NUREG-1130

Environmental Assessment

for renewal and consolidation of Materials License Nos. SNM-362, SMB-405, 08-00566-05, 08-00566-10, and 08-00566-12

Docket No. 70-398

U.S. Department of Commerce
National Bureau of Standards

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

March 1985

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ABBREVIATIONS AND ACRONYMS

ALARA	As Low As Reasonably Achievable
AQCR	Air Quality Control Region
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FR	Federal Register
HEPA	High Efficiency Particulate Absolute
MPC	Maximum Permissible Concentration
MSL	Mean Sea Level
NBS	National Bureau of Standards
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
SNM	Special Nuclear Materials
TLD	Thermoluminescent Dosimeter

LIST OF FACTORS FOR CONVERSION OF ENGLISH TO INTERNATIONAL SYSTEM OF UNITS (SI)

The following table gives the factors used in this document for the conversion of conventional English units to the equivalent International System of Units (SI) now being adopted worldwide or conventional metric units. The conversion factors have been obtained from the ASTM publication Standard for Metric Practice[a] and are used to four-digit accuracy, since most of the values in this document are not known to any more exactness. After conversion, the SI values have been rounded to reflect an accuracy sufficient for the requirements of this document. Most of the values will be presented in SI units with the equivalent English unit following within parentheses.

Conversion of English to SI Units

To Convert From	To	Multiply By
acre	hectare (ha)	0.4047
feet (ft)	meters (m)	0.3048
cubic feet (ft^3)	cubic meters (m^3)	0.02832
gallon (gal)	cubic meters (m^3)	0.003785
gallon (gal)	liters (L)	3.79
gal/min	liters/s (L/s)	0.06309
inch (in.)	centimeters (cm)	2.54
inch (in.)	meter (m)	0.0254
mile (statute)	kilometer (km)	1.609
square mile ($mile^2$)	square kilometer (km^2)	2.590
pound (lb)	kilograms (kg)	0.4536

[a]American Society for Testing and Materials, Standard E-380, Standard for Metric Practice, February 1980.

1. PURPOSE AND NEED FOR ACTION

1.1 Introduction

By letter dated November 15, 1983,[1] the National Bureau of Standards (NBS) of the U.S. Department of Commerce submitted an application for renewal and consolidation of five nuclear materials licenses covering operations at the NBS site at Gaithersburg, Maryland (Sect. 1.2). The applicant submitted supporting environmental information on February 29, 1984.[2] The staff of the U.S. Nuclear Regulatory Commission (NRC) and its contractor, Oak Ridge National Laboratory (ORNL), visited the site for observations and discussions with the applicant on April 26, 1984, and a response to the staff's questions was submitted in June 1984.[3]

To evaluate the licensee's proposed action, NRC, with the technical assistance of ORNL, prepared this environmental assessment (EA) pursuant to Council of Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and NRC regulations (10 CFR Part 51), which require an environmental assessment (EA) implementing requirements of the National Environmental Policy Act (NEPA) of 1969 (PL 91-190). Paragraph 1508.9 of the CEQ regulations defines "environmental assessment" as follows:

1. An environmental assessment is a concise public document, for which a federal agency is responsible, that serves to

   - briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact,

   - aid an agency's compliance with the act when no EIS is necessary, and

   - facilitate preparation of an EIS when one is necessary.

2. An environmental assessment shall include brief discussions of the need for the proposal, of alternatives as required by Sect. 102(2)(E) of NEPA, of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted.

1.2 Summary of Proposed Action

The proposed action for which this EA is prepared is the renewal and consolidation of five nuclear materials licenses (Table 1.1) for radiological activities at the NBS site. These licenses cover most uses of radioactive material at NBS except that controlled by the license for operation of the NBS reactor.[4] The reactor license is not associated with and will not be affected by the currently proposed licensing action.

Table 1.1 Current radioactive materials licenses for National Bureau of Standards

License number	Previous renewal date	Expiration date
SNM-362	07/12/79	07/31/84
SMB-405	09/29/78	09/30/83
08-00566-05	12/20/77	12/31/82
08-00566-10	06/22/81	05/31/86
08-00566-12	08/28/78	08/31/83

Radiological activities are conducted principally in 4 of the 29 buildings at the 233-ha (576-acre) NBS site, and include the following:

1. irradiation of materials and equipment;

2. research on the chemistry of radioactive materials;

3. calibration of instruments for measurement of radioactivity;

4. preparation of calibrated, contained (sealed) sources of low-level radioactivity, and the distribution of these sources to licensed customers;

5. determination of emission rates and dose rates from sealed sources;

6. determination of the responses of radioactivity monitors to radiation beams; and

7. miscellaneous research and development projects (e.g., conducting assays and preparing radioactive samples during participation in various environmental and medical test programs).

Radioactive materials or sources are (1) maintained long term, (2) distributed to outside customers, and (3) received for characterization or use prior to reshipment or redistribution. Maintained sources are usually kept in sealed containers and range from the very small activities of most sources to several tens of kilocuries of irradiator units. Some unsealed materials are maintained for historical purposes or for feedstock for sample preparation. Materials that are distributed include radioactive counting samples, standard reference materials of well-characterized elemental and isotopic content, and samples for medical testing. Materials received by NBS are usually from customers who want the emissions and dose rates of the materials characterized against standard reference sources.

1.3 Need for Action

Activities under the nuclear materials licenses at NBS serve a wide variety of federal, state, commercial, and research needs, both nationwide and international. For example, nuclear power plants use sources and instruments calibrated at NBS. Industrial users of radioactive materials depend on certifications by the NBS, and the establishment of international standards involves interaction with the NBS.

The licensing action addressed in this document is the consolidation and renewal of five nuclear materials licenses. Consolidation of the licenses is needed to increase the efficiency of the applicant's preparation of license applications and the NRC staff's reviews of these applications. The current system, with staggered expiration dates of licenses, requires that license reviews occur at several different times. This results in unnecessary duplication of effort over the complete cycle of renewals for all licenses. Consolidation can eliminate this redundancy in the licensing procedures for NBS.

1.4 Scoping Process

The NBS facilities at the Gaithersburg site have been in operation since the 1960s. Documentation of the lack of impacts of NBS operations has been obtained from the applicant and is based on material control and accountability and on monitoring required by various state and federal permitting agencies. The principal possible impacts of operation are associated with routine and accidental releases of radioactive gases and particulates to the atmosphere. Waste liquids are stored temporarily and sampled before release to sanitary sewers leading to local sewage treatment facilities. Solid wastes are deposited at approved commercial landfill sites. Because of the controls applied to routine releases, the low level of radioactivity of most materials used, and the small amounts of radioactive materials handled, potential impacts of routine operation and accidents are insignificant. The proposed consolidation of licenses does not involve an increased level of operations with radioactive materials, and no increase in environmental impacts is expected. Because of the lack of potential impacts of the current operations (Sect. 4), the staff did not find it necessary to provide a formal public scoping process to adequately determine the scope of impacts of the proposed action.

REFERENCES FOR SECTION 1

1. National Bureau of Standards, Materials License Document (Application for Renewal and Consolidation of License Numbers 08-00566-05, 08-00566-10, 08-00566-11G, 08-00566-012, 08-0566-13E, SMB-405, and SNM-362; Docket Nos. 30-3918, 30-6894, 30-3919, 30-9796, 30-1167, 40-4348, and 70-398), November 1983.

2. National Bureau of Standards, Environmental Information in Support of the Application for U.S. NRC Materials License Consolidation, Docket No. 70-398, Feb. 29, 1984.

3. National Bureau of Standards, "Response to NRC Site Visit Questions," Docket No. 70-398, June 30, 1984.

4. U.S. Nuclear Regulatory Commission, Final Environmental Statement Related to License Renewal and Power Increase for the National Bureau of Standards Reactor, Docket No. 50-184, August 1982.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Alternative of No License Consolidation and Renewal

This alternative includes two options: (1) nonrenewal, and (2) renewal without consolidation. The option of nonrenewal precludes the continuation of the respective licensed operations by the NBS. A denial of the license renewals would occur only if issues of adverse public health and safety impacts could not be resolved or mitigated. However, as discussed in Sects. 2 and 4, the environmental impacts associated with the current license renewal action are small and acceptable, and denial of license renewal would result in little benefit to the environment.

Renewal of the licenses without consolidation would maintain the status quo. Nonconsolidation would result in the need for more frequent NRC reviews of NBS operations than if licenses were consolidated. Because of the lack of potential impacts of the NBS radiological operations, frequent NRC reviews will not provide significantly greater benefits in the form of higher standards of control of materials and associated operations.

2.2 The Alternative of License Renewal

2.2.1 Description of the Current Operation

2.2.1.1 General Discussion of Site

The National Bureau of Standards (NBS) site is a 233-ha (576-acre) tract of land in upper Montgomery County, Maryland, about 1.6 km (1 mile) southwest of Gaithersburg. The site is bounded on the east by Interstate 270 and Muddy Branch Road and on the north and west by Maryland Route 124 (Fig. 2.1).

Principal operations covered by the nuclear materials licenses are summarized in Sect. 1.2 and are conducted in 4 of the 29 buildings on the site (Fig. 2.2) as described in Table 2.1. The 29 buildings include an 11-story administration building, 7 general-purpose laboratories with similar floor plans, 11 buildings designed for specific purposes, and several buildings providing support services for NBS operations.[1] A nuclear research reactor is also located on the site, and its operation and environmental impact is addressed by NRC under a separate license action.[2] Although the operation of the research reactor is not discussed in this document, the impact of its operation is included in the effluent and environmental effects monitoring (Sect. 4.1) at the site.

2.2.1.2 Building 221, Physics Building

The portion of this building involved with radioactive material consists of a laboratory complex housing six mass spectrometers with two hoods, and has services including gas, air, vacuum, and electricity. The complex is the size of seven individual laboratory modules (one module is about 7.3 m long, 3 m wide, and 3.4 m high). Two of the spectrometers are usually reserved for radiological work using filaments with a maximum deposition of one microgram

Fig. 2.1 Map of the National Bureau of Standards site and surrounding area, showing the principal roadways leading to the site and surface drainage streams.

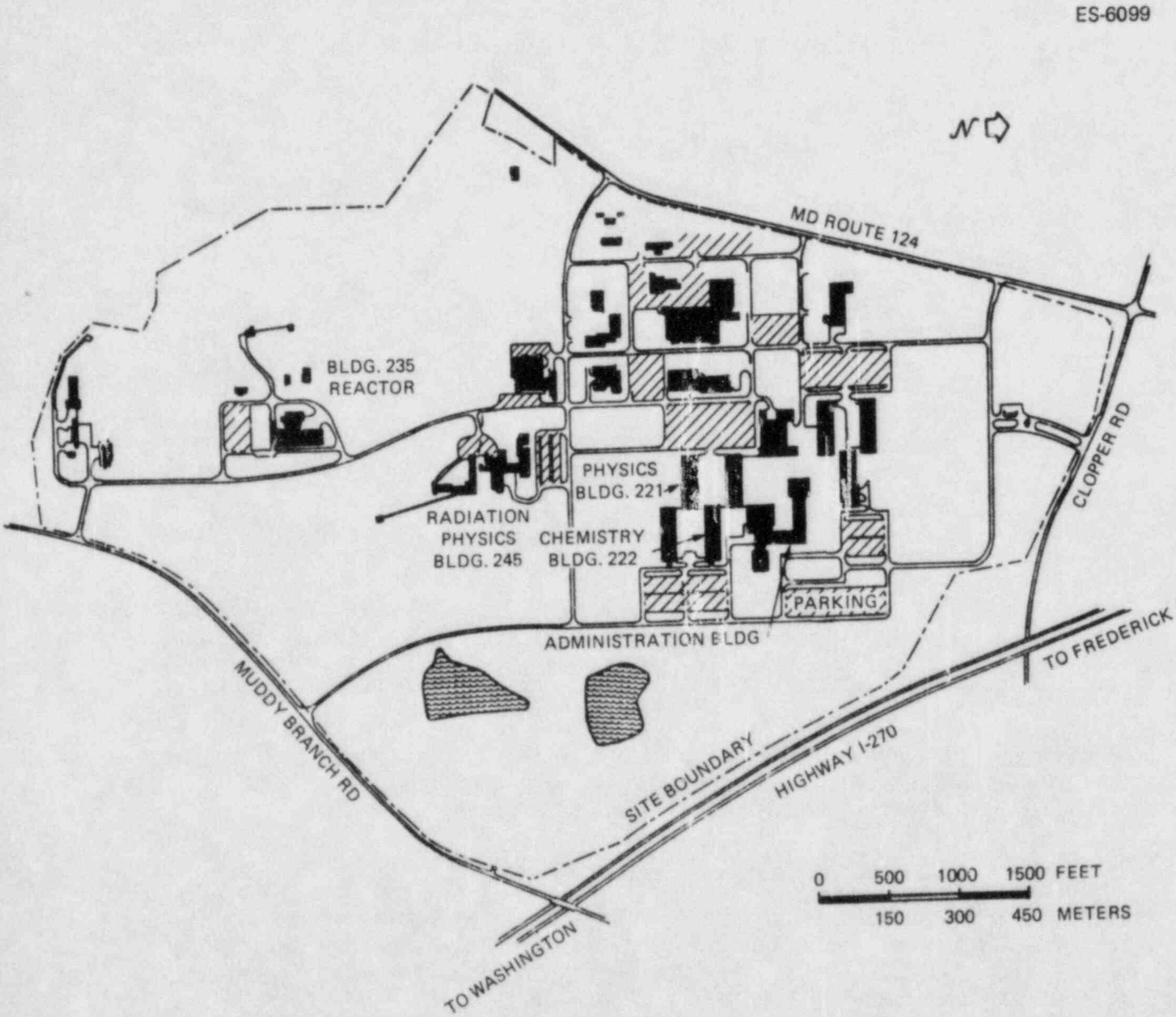

Fig. 2.2 Location of buildings on the National Bureau of Standards site in which radiological materials are stored or used

Table 2.1. Facilities for nuclear materials at the National Bureau of Standards, Gaithersburg, Maryland

Building number and name			
221 Physics building	222 Chemistry building	235 Reactor building	245 Radiation physics building
One mass spectrometry laboratory complex (rooms A30, B25, and B33)	Vault-type storage room (room B118)	Radiochemistry rooms (36 rooms, B119 through B154)	Source receiving and storage (3 rooms, B131-B133)
	Alpha chemistry laboratory (room A344)	Waste handling facility	Sealed source calibration (5 rooms, B141-B145)
	Several general purpose laboratories		Sealed source operations (52 rooms, B05-B-25, B013-B043)
			Radiochemistry rooms (28 rooms, B44-B53, B146-B157, C11, C13, C15, E103, E105, E106)
			Water-well irradiator (room F101)
			Dry irradiators (several specially designed or approved rooms)

of activity, e.g., about 30 nCi of Pu-239. Hoods associated with all licensed activities in all buildings have both roughing and high efficiency particulate absolute (HEPA) filters, and a ventilation rate of 30 lin m/min.

2.2.1.3 Building 222, Chemistry Building

Room B118 in this building is used for the storage of contained radioactive materials. The room is smaller than individual module size and has a single entrance with a double-hung vault-type door. Services include electricity, fire and intrusion sensors, and air exchange ducts.

Room A344 is an alpha chemistry laboratory containing one vertical-door hood, two horizontal-door hoods, and four glove boxes. The room is used for normal chemistry operations with high-toxicity alpha-active radionuclides in quantities no more than 1 mCi or 0.01 g, whichever is less. The glove boxes exhaust through absolute filters into the hood duct. The room is the size of one module. Services include water, electricity, air, gas, and vacuum.

Tracer and labeling operations and other processes using similar very small quantities of activities and nuclides are conducted in other laboratories in this building.

2.2.1.4 Building 235, Reactor Building

Building 235 contains about 36 rooms of various sizes used for radiochemistry activities. Each laboratory has standard laboratory services and at least one hood. The hoods vent into the exhaust stack of the reactor, which is also located in this building but not covered by this proposed licensing action.

2.2.1.5 Building 245, Radiation Physics

Various rooms and laboratory complexes serve a variety of purposes in this building.

Receiving, storage, and calibration

Nuclear source materials are received, stored, and calibrated in one complex of adjacent rooms and laboratories (B131-B133, B141-B145). Room B133 is the radioisotope receiving laboratory and is a special-purpose radiochemistry facility. Room B141 has a manganese sulfate bath facility used for neutron source calibration. Transfers of sources are accomplished with remote handling tools, nominally about 1 to 4 m long, to minimize exposure of personnel to radioactivity.

Sealed-source operations

Sealed-source operations are performed in two complexes of rooms and laboratories, one (B05-B25) in the basement level of the building and the other (B013-B043) in the subbasement level. A water-well irradiator in room F101, an extension of the first floor level, is also used. Sealed-source operations primarily involve sample irradiation using either gamma or neutron sources. Gamma irradiation is performed with the one water-well irradiator and with several dry irradiators. The water-well irradiator consists of a nominal 11 kCi of cobalt-60 in a sunken water pool about 2.8 m in diameter and 3.4 m deep. The irradiator is maintained in a fixed location and provides for wet, self-contained storage and irradiation conditions. Each dry irradiator consists of sealed sources totaling 250 Ci or more and is maintained in a fixed location in a dry container constructed of solid materials. These dry sources are shielded at all times when not in use. Human access to these sources is effectively eliminated by the design of the storage facility and the interlocks with the operation control system. Walls of concrete at least 0.6 m (2 ft) thick separate the irradiator rooms from the control room and other occupied areas. Both wet and dry irradiators and their facilities are provided with appropriate monitors, automatic interlocks on the irradiation room access doors, and postings and warnings according to potential radiation-level intensity categories as specified in 10 CFR Pt. 20. Neutron operations include calibration of neutron sources and production of neutrons by particle accelerators. Various isotopic neutron sources, including Pu-Be, Am-Be, Ra-Be, and Cf-252, are located at NBS. Some belong to NBS whereas others are received from customers for calibration in the manganese sulfate bath facility. Neutron sources are stored in concrete wells or water tanks in several areas and can be temporarily stored in the calibration bath. Several accelerators located in Building 245 are occasionally operated with targets of both stable and radioactive nuclides to study the properties of the particular nuclide in use or to produce radionuclides. Tritium in up to curie activities is used for neutron production by the accelerators.

Radiochemistry

Radiochemistry is conducted primarily in two complexes, one (rooms B146-B157) on the first floor and the other (rooms B44-B50) in the basement level. Rooms E105 and E106 are also devoted to radiochemistry. The laboratories have the customary facilities and are also equipped with hoods or glove boxes.

2.2.1.6 General Description of Operations

Although a wide variety of miscellaneous research and development projects are conducted with nuclear materials at NBS, radiochemistry and source calibration are the principal activities. All operations conducted at NBS are batch type with finite end-points or goals to be achieved. Although some of these operations are repeated at regular intervals, none involve continuous, ongoing activities. NBS maintains radioactive sources on the site, prepares sources for distribution to customers, and receives from customers sources to be characterized (calibrated) and returned.

Radiochemistry

Chemistry operations include preparation of unsealed samples of radioactive materials for distribution to customers, preparation of samples for assay purposes, and many different types of research and development projects conducted in cooperation with private and government institutions. Preparation of samples is typically accomplished by depositing known activities on a substrate and then using a fixing technique such as heat treatment or electrolysis.

Most projects involve materials of low-level radioactivity. The unsealed feedstock of the radioactive material kept in the process laboratory may have ten times the radioactivity of the samples actually prepared.

Source and instrument calibrations

NBS receives from customers low-level radioactive sources for characterization. These sources are assayed and calibrated using measurement techniques based on standard sources maintained by NBS. Similarly, inaccurate or noncalibrated instruments for measuring radioactivity are calibrated by exposing them to radiation fields of known strength and are then returned to the customer. An example of these activities is the research and development of particle and photon dosimetry, including the interlaboratory testing and calibration of neutron personnel dosimeters.

2.2.2 Waste Confinement and Effluent Controls

This section considers the controls employed at NBS to limit the releases of hazardous and radioactive materials to the ambient environment external to the facilities.

Releases of radioactive materials may occur during three types of activities: (1) the use of noble gases for production of standard samples, (2) operations involving high-toxicity, alpha-emitting nuclides, and (3) the discharge of low activity liquids from waste retention tanks. Releases of nonradioactive gases and particulates at NBS are so small that they are of no environmental concern. Concentrations of organics, hydrocarbons, and heavy metals in the releases are very low and cannot be measured.[3] The release points[4] for any gaseous releases are indicated in Table 2.2.

Table 2.2 Potential release point characteristics

Release point	Height above ground	Distance (m) to nearest	
		Boundary	Resident
Building 221	Four stories (20 m)	600	760
Building 222	Four stories (20 m)	600	1000
Building 235	30-meter stack	400	670
Building 245	Two stories (10 m)	560	670

2.2.2.1 Radioactive Gaseous Emissions

No radioactive gases are routinely released, although small releases may occur during the batch-type operations characteristic of NBS activities. These gases are noble gases infrequently used in Building 245 for standard sample production. Quality control procedures are followed to minimize releases of these gases. The quantity of noble gas produced during any batch-type activity is so small that, even if the entire amount were released to the atmosphere, the potential impacts would be inconsequential (Sect. 4.2.5).

2.2.2.2 Radioactive Particulate Emissions

Particulate emissions to the atmosphere are controlled by the use of hoods with roughing and HEPA filters.[4] All chemical operations requiring special precautions are conducted in hoods, or in glove boxes that vent into the hoods. During operation, the hoods maintain a ventilation velocity at the hood opening of 30 m/min. Alpha chemistry activities, which may result in the release of radioactive particulates, are controlled as shown in Table 2.3. The HEPA filters are tested upon installation and annually thereafter for air leaks that would allow excessive particulates to be emitted. Other tests of hoods and glove boxes are conducted to ensure occupational health and safety. Work requiring HEPA filters is not permitted if air leakage through the filter is demonstrated or if filter loading is four times the loading of freshly installed filters.[1]

Table 2.3 Limits and rules for radiological materials at the NBS Alpha Chemistry Laboratory

Type of operation	Limit, lesser of	Conditions
Simple storage	100 mCi or 10 g	In closed containers
Simple wet chemistry (e.g., aliquot preparation)	10 mCi or 1 g	Within hoods
Normal chemistry (e.g., analysis)	1 mCi or 0.1 g	In HEPA-filtered hoods
Complex wet chemistry (e.g., complex apparatus)	0.1 mCi or 0.01 g	in HEPA-filtered hoods
Simple dry operations	0.1 mCi or 0.01 g	In HEPA-filtered hoods
Dry and dusty operations (e.g., grinding)	0.01 mCi or 0.001 g	In glove boxes

2.2.2.3 Liquid Effluents

All radiological liquid wastes at NBS are assayed for radioactivity and then either released to the sanitary sewer for treatment at the public sewage plant or are collected for special handling. No liquid wastes are released to surface waters or groundwaters.[4]

All radiochemistry laboratories in Building 235 and most of them in Building 245 drain directly to holding tanks. Building 235 has one 19,000-L tank and Building 245 has two such tanks. When full or near full, the contents of these tanks are assayed and, if the activity concentration is low enough, the contents are dumped into the sanitary sewer. To date, all tank contents have been of such low activity that small fractions of maximum permissible levels have been achieved. In Building 235 almost all liquids, including air conditioning condensate, drain to the tank, and dumps of the tank are necessary about twice each month[3] (Table 2.4). Usually only one dump in several years is necessary for the tanks in Building 245.

In other laboratories in Building 245 and in Buildings 221 and 222, liquid wastes expected to have significant concentrations of radioactivity are collected in polyethylene bottles or equivalent containers. These bottles, with appropriate information regarding their contents, are transferred to the radioactive waste handling facility in Building 235. The liquids are either solidified for disposal as solid radioactive waste or are routed to the 19,000-L liquid waste tank.[1]

Table 2.4 Discharges of liquids from holdup tanks to the municipal sanitary sewer system

Year	Source (building)	Volume (L)	Radioactivity	
			(Ci of tritium)	(Ci, beta-gamma)
1981	234	362,000	0.735	0.00039
	245	8,500	(<10^{-5})	(<0.5 Bq)
1982	235	397,000	0.849	0.06
	245	0	0	0
1983	235	447,000	3.349	0.14
	245	0	0	0

2.2.2.4 Solid Wastes

Solid wastes produced in association with radiological operations at NBS include paper, glassware, process residues, spent particulate filters, radioactive sealed sources, and other solids.[1,2] All solid wastes are collected by NBS for offsite disposal.

Nonradioactive wastes collected during radiological operations are combined with other nonradioactive, nonhazardous trash from other NBS operations and are deposited at a local municipal waste disposal facility.

Radioactive wastes are collected in polyethylene bags or equivalent containers at the workplace and transported to the radioactive waste facility in Building 235, which is equipped with a compactor. Radioactive sealed sources and other high-activity materials are treated separately from low-level wastes. Radioactive wastes are usually compacted and packaged in 208 m^3 (55-gal) metal drums for offsite burial at a licensed disposal facility. The compactor facility includes a filtered ventilation system to minimize releases of radioactive particulates to the atmosphere. Exhaust air from the compactor is sampled regularly to detect releases. The annual volume of solid waste, including both compacted wastes and wastes that could not be compacted, has been less than 8 m^3 (283 ft^3), and has had an activity of less than 1 Ci.[3]

2.2.2.5 Direct Radiation

Direct radiation from Buildings 221, 222, and 235 is of no potential significance. Building 245, however, produces more radiation, which emanates from the californium-252 facility.[4] The possible effects of this radiation are discussed in Sect. 4.2.5.1.

2.3 Decommissioning

Whenever activities related to nuclear materials licenses at the NBS site cease, the affected buildings and facilities will be decontaminated and released to unrestricted use. A significant level of work activity at this site is not under auspices of NRC licenses. This site would continue to be used by the applicant, and the decontaminated areas of the affected buildings would be used for activities not requiring an NRC license.

Decontamination of the affected areas for continued use without radioactive material should be accomplished using the following major guidelines:

1. All areas are to be cleaned to levels established for unrestricted use.

2. Current radiological limits and decontamination technology are to be used.

3. All process and ancillary equipment in controlled areas is to be cleaned to the extent practicable, packaged, and transported to a licensed disposal facility for burial.

4. Any contaminated underground piping is to be removed, cleaned to the extent practicable, packaged, and transported to a licensed disposal facility for burial. The ground surrounding such piping is also to be surveyed and removed for disposal if contaminated beyond established limits.

If NBS ever decides to terminate all activities at the site, a decommissioning plan for future action or final decommissioning report of past action will be submitted to allow NRC to determine the effectiveness of the decommissioning activities.

2.4 Safeguards

Current safeguards are set forth in 10 CFR Parts 70 and 73. The regulations in Part 70 provide for material accounting and control (MC&A) requirements for special nuclear material (SNM) with respect to facility organization, material control arrangements, accountability measurements, statistical controls, inventory methods, shipping and receiving procedures, material storage practices, records and reports, and management control. For licensees authorized to possess and use a maximum of one effective kilogram of SNM, the basic MC&A requirements include specific records and reports, and an annual physical inventory of the SNM. A detailed MC&A plan is not required when possession and use is limited to one effective kilogram.

NRC's current regulations in 10 CFR Part 73 provide requirements for the physical security and protection of fixed sites and for nuclear material in transit. Physical protection requirements for SNM of low strategic significance (including low-enriched uranium) include provisions for establishing controlled access areas, monitoring these areas to detect unauthorized penetration, providing a response capability for unauthorized penetrations and activities, and establishing procedures for response to theft and threats of theft.

NRC's regulations in 10 CFR Parts 70 and 73, described briefly above, are applied in the reviews of individual license applications. Appropriate license conditions are then developed and imposed which (1) require the licensee to follow the NRC approved safeguards plans, (2) may allow for site-specific alternatives to safeguards requirements, and (3) may augment the approved plan to assure the licensee's capability to meet the intent of the regulations.

The licensee has an approved physical security plan which meets the current requirements for any SNM possessed at the site.

It is concluded, therefore, that the safeguards-related environmental impact of the proposed action is insignificant.

2.5 Staff Evaluation of the Proposed Action and Alternatives

The staff has concluded that denial of license renewal would provide very little in the way of environmental benefits. The staff believes that the NBS operations, methods of waste confinement, and effluent controls meet all applicable state and federal standards, and that the monitoring program for waste releases and environmental impacts is adequate to detect adverse effects of plant operation. The staff recommends that the licenses be renewed.

REFERENCES FOR SECTION 2

1. National Bureau of Standards, Materials License Document (Application for Renewal and Consolidation of License Numbers 08-00566-05, 08-00566-10, 08-00566-11G, 08-00566-012, 08-0566-13E, SMB-405, and SNM-362; Docket Nos. 30-3918, 30-6894, 30-3919, 30-9796, 30-1167, 40-4348, and 70-398), November 1983.

2. National Bureau of Standards, Environmental Information in Support of the Application for U.S. NRC Materials License Consolidation, Docket No. 70-398, Feb. 29, 1984.

3. National Bureau of Standards, "Response to NRC Site Visit Questions," Docket No. 70-398, June 30, 1984.

3. THE AFFECTED ENVIRONMENT

3.1 Site Description

The NBS facilities are located on a 233-ha (576-acre) tract of upland Maryland Piedmont (Fig. 3.1) in upper Montgomery County, Maryland, approximately 1.6 km (1 mile) southwest of Gaithersburg. The site is bounded by Clopper Road to the north, Muddy Branch Road and Washington National Pike (I-270) to the east, Maryland Route 124 to the west, and private lands in the watershed of Muddy Branch to the south and southwest (Fig. 2.1). Major radiological activities subject to NRC licenses occur in only 4 of the 29 buildings on the site. The site lies on level to gently sloping uplands separating the watersheds of Muddy Branch to the south and Long Draught Branch of Seneca Creek to the north. Both streams flow west to the Potomac River. The site vicinity has a combination of residential, commercial, and rural land uses. The nearest population centers are Rockville, 8 km (5 miles) southeast of the site, and Gaithersburg. The site is approximately 32 km (20 miles) northwest of the center of the District of Columbia. Elevations on the site range from 111 to 142 m (365 to 465 ft) above mean sea level (MSL).

3.2 Climatology and Meteorology

3.2.1 Climatology

The climate of the region in which NBS is located is continental, modified somewhat by the Appalachian Mountains to the west and the Atlantic Ocean to the east. Spring and fall weather changes rapidly because of a rapid succession of warm and cold fronts that generally move from west to east. Prevailing winds are from the northwest quadrant from October through June and from the southwest quadrant from July through September. Mean wind speeds at the surface range from 14 to 16 km/h (9 to 10 mph) in summer and increase to 16 to 19 km/h (10 to 12 mph) in winter and early spring. Winds from the east generally bring rain, while those from the west are usually associated with dry, fair weather.[1] The mean annual temperature in the area is about 13°C, ranging from about 0°C in January to about 25°C in July. Extreme temperatures of -26°C and 41°C have been reported in the area. Annual precipitation is about 102 cm (40 in.) and is well distributed throughout the year. The lowest monthly precipitation usually occurs in February and October [about 6.3 cm (2.5 in.)]; July and August are usually the wettest months [between 10.2 and 11.4 cm (4.0 and 4.5 in.) of precipitation]. A maximum monthly precipitation of 46 cm (18 in.) was reported at Dulles International Airport in June 1972. The maximum 24-h rainfall of 30 cm (12 in.) was also reported at Dulles in June 1972 during the passage of Hurricane Agnes. Annual snowfall at the NBS site is about 51 cm (20 in.), with the maximum monthly snowfall [13 to 18 cm (5 to 7 in.)] expected in February. The maximum one-month snowfall in the area was reported to be 90 cm (35 in.) in February 1899; the maximum 24-h snowfall was reported to be 63 cm (25 in.) in January 1922.

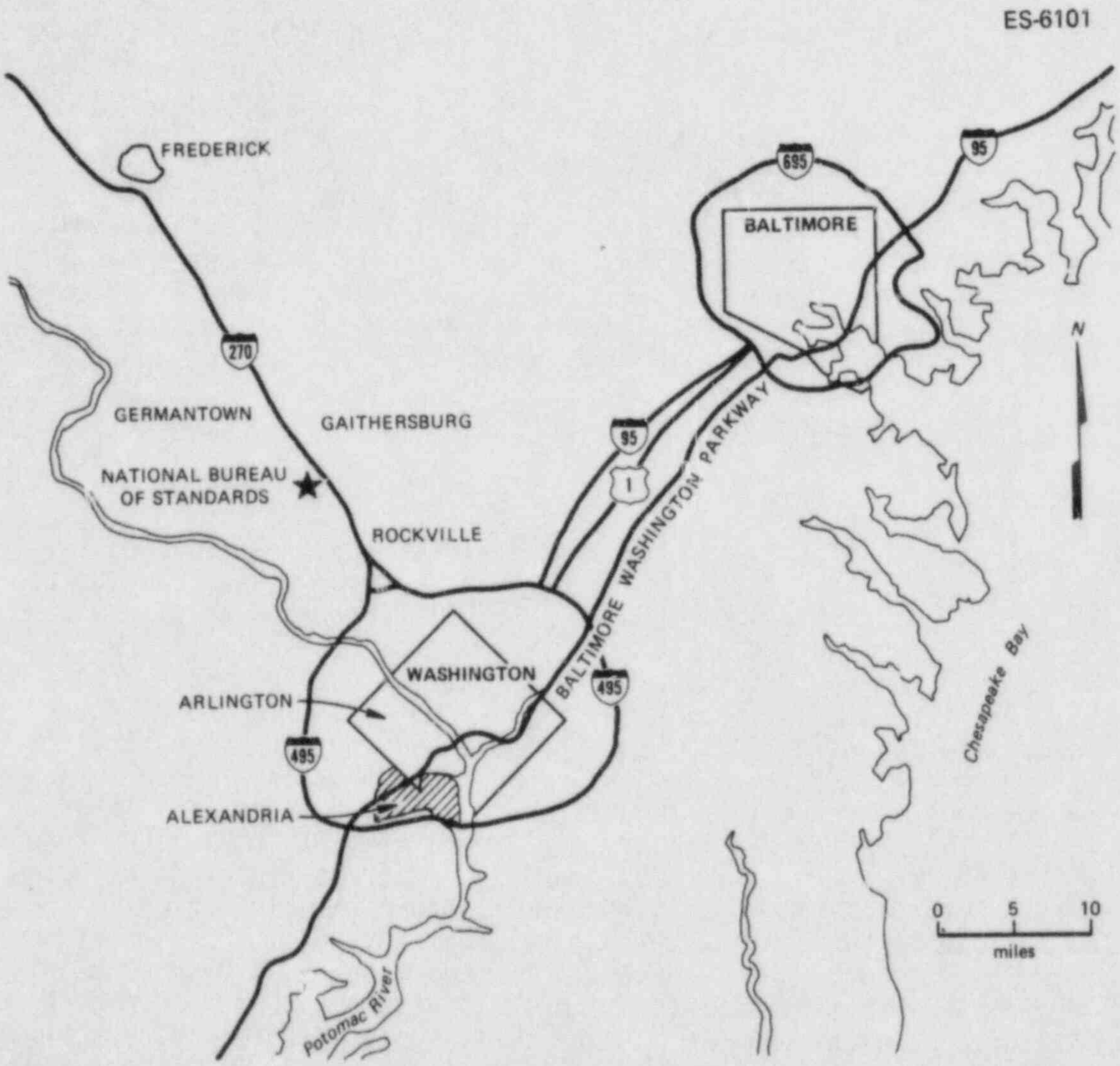

Fig. 3.1 Regional site map

3.2.2 Winds, Tornadoes, and Storms

Storms originating to the south and moving into Maryland often bring strong easterly to northeasterly winds, thunderstorms, and heavy rains. About 40 thunderstorms can be expected at the NBS site each year, most frequently from May through August. Hail sometimes accompanies severe thunderstorms, with July being the month of peak activity. Hail with diameter 1.9 cm (0.75 in.) or larger occurs about once each year.

During the period 1955-1967, 28 tornadoes were reported in a 2° latitude-longitude square containing the site. The computed recurrence interval for a tornado at the NBS site is about 2000 years, which is comparable to that calculated using reports of tornadoes for the period 1950-1976. July is the month with the highest frequency of tornadoes. In the period 1871-1978, about 20 tropical cyclones, storms, and hurricanes passed within 160 km (100 miles) of the NBS site. The "fastest mile" wind speed reported at Washington National Airport was 122 km/h (76 mph) and was associated with the passage of Hurricane Hazel in October 1954.

3.2.3 Meteorology

The average wind speed in the area is about 13 km/h (8 mph). Figure 3.2 gives representative wind rose data for the NBS site. Winds from the northwest quadrant (west-northwest, northwest, and north-northwest) occur about 30% of the time, and winds from the south and south-southwest occur about 20% of the time.

Some meteorological measurements have been made at the NBS site. Wind speed and direction are currently measured at the top of a small tower located on the southwest corner of the roof of Building 235, about 4.6 m (15 ft) above the top of the building. Comparison of wind data at the NBS site with data collected at Washington National Airport shows reasonable agreement. There appear to be no unusual atmospheric dispersion characteristics at the NBS site.

3.2.4 Air Quality

The NBS site is located in the National Capitol Interstate Air Quality Control Region (AQCR). In this region, concentrations of particulates and SO_2 are better than national primary standards.

3.3 Demography and Socioeconomics

The 1980 population for the surrounding area [80 km (50 miles)] is shown in Table 3.1. The data are divided into 16 sectors of 22.5 each, with the center of the first sector due north. The population is shown as a function of distance from the NBS reactor.

The NBS site is shown in relation to the surrounding urban area in Fig. 3.3. Households within the 8-km (5-mile) radius of the site include many federal employees and support or contracted staff for the numerous federal agencies in the Washington, D.C., metropolitan area. The daytime population of the NBS site is about 3000 persons, all of whom are under the control of NBS. The NBS

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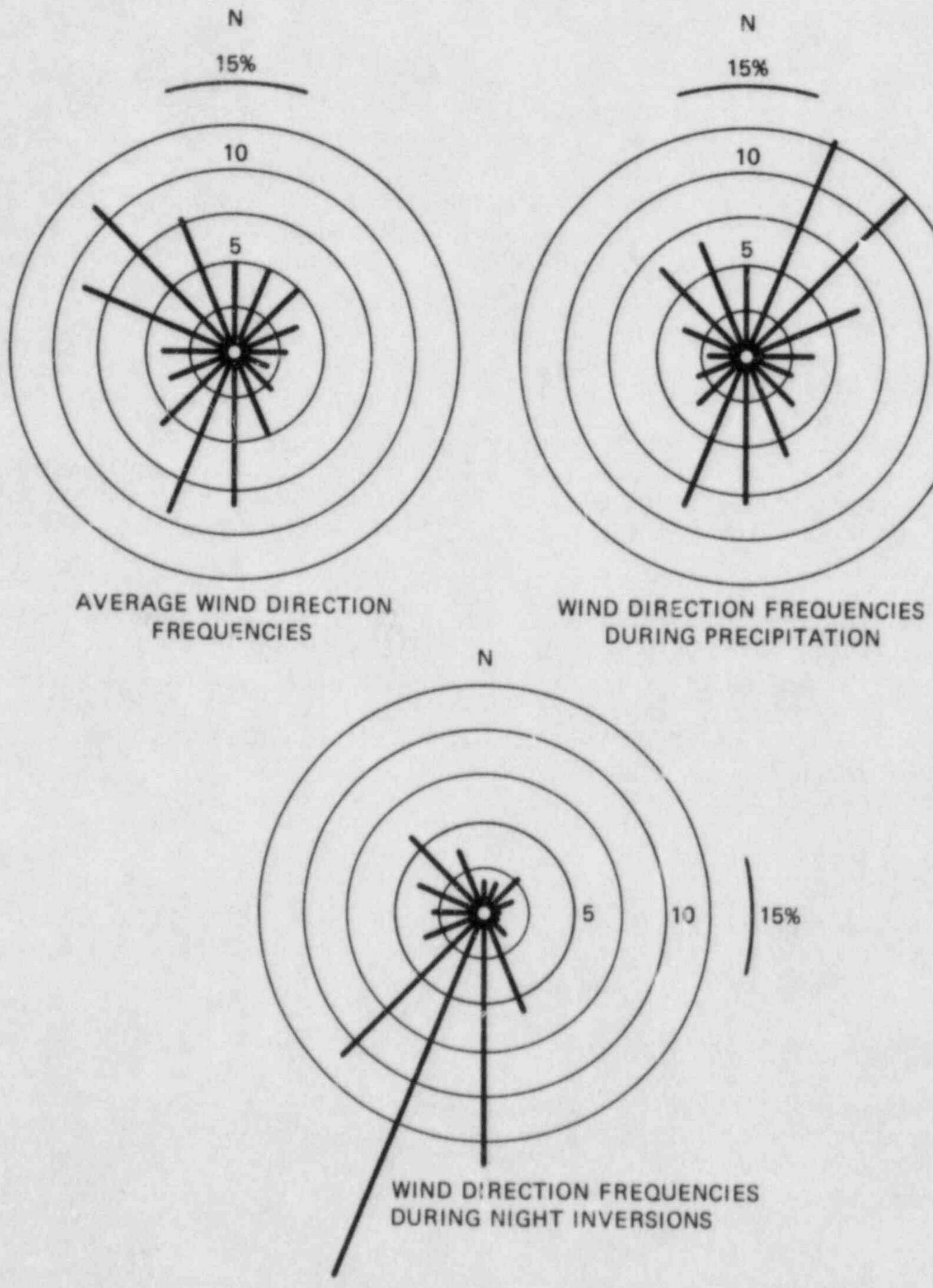

Fig. 3.2 Annual wind rose showing wind direction frequency (%) for 16 radial directions

Table 3.1. Incremental 1980 population data for 8-km (5-mile) radial segments and for the total 80-km (50-mile) radius in each of 16 directions from the National Bureau of Standards site

Direction	Population distribution at distances given in miles										
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	0-50
N	18,800	2,200	3,792	5,335	2,760	5,329	7,534	8,382	6,882	19,122	80,136
NNE	12,800	2,700	3,073	6,614	6,067	8,973	25,750	10,053	7,731	40,164	123,925
NE	6,500	2,700	3,591	6,461	12,949	26,842	36,140	23,070	5,361	11,189	134,803
ENE	10,200	10,000	6,446	23,656	35,457	148,454	568,076	355,858	76,507	32,196	1,246,850
E	6,400	8,500	7,023	38,877	45,896	36,887	141,963	83,700	19,191	0	388,437
ESE	6,900	46,500	64,979	62,927	41,988	38,466	10,230	32,275	24,481	0	328,746
SE	16,400	44,400	176,441	356,955	239,098	70,506	17,604	6,674	7,092	9,176	944,346
SSE	8,200	20,600	103,775	261,538	287,029	96,620	[illegible]	17,008	9,166	9,807	834,567
S	3,100	25,700	43,020	166,658	158,452	42,871	60,467	18,906	16,758	5,359	540,291
SSW	2,400	1,800	15,754	35,344	25,760	34,691	12,072	3,183	2,818	8,749	142,571
SW	1,900	1,700	17,325	7,081	6,899	6,574	5,890	7,243	6,704	4.555	65,871
WSW	1,500	1,100	3,132	2,053	2,011	2,794	4,384	2,512	1,763	2,673	23,922
W	1,900	1,000	1,452	8,178	5,529	6,510	3,526	2,840	3,632	12,543	47,110
WNW	2,500	1,400	1,462	1,674	3,467	6,226	8,597	14,045	8,725	25,937	73,493
NW	5,600	2,200	1,552	3,079	7,755	7,037	6,315	[illegible]	[illegible]	19,985	100,955
NNW	4,600	2,700	2,587	5,741	31,230	7,752	7,725	7,624	10,603	23,158	103,720
Total	109,700	175,200	455,404	992,171	912,347	546,532	937,097	582,670	244,549	244,073	5,179,743

staff contributes only a small share to the dynamics of the local economy and minor changes in NBS operation as a result of possible adverse action of the NRC staff would have an insignificant impact on the local economy.

3.4 Land Use

3.4.1 Site Land Use

The plot plan of the 233-ha (576-acre) NBS site is shown in Fig. 2.2, and the site boundaries and the general location of facilities are as described in Sect. 3.1. About half of the site is vacant and is maintained in mowed grass. Two large ponds on the site (Fig. 2.1), which lie in the upper end of the Muddy Branch watershed, are not used for activities associated with the proposed action. Of the 29 buildings on the site, major activities with nuclear materials will be conducted in only 4 buildings-221 (physics), 222 (chemistry), 235 (reactor), and 245 (radiation physics)-as identified in Fig. 2.2. The reactor building contains the NBS research reactor, which is licensed separately by NRC (Sect. 1.2).

3.4.2 Adjacent Area

The NBS site vicinity has a mix of light industry, commercial, residential, and rural land uses. The eastern site boundary, I-270, is a major commuter highway for Washington, D.C. The area on the opposite side of I-270 has seen rapid commercial and residential growth during the last decade. The area east and west of the site is currently undergoing rapid residential growth, including multifamily development. Much of the area immediately south of the NBS property is owned by the National Geographic Society and is controlled as a wildlife preserve, thus assuring its natural state for some time into the future.

3.4.3 Historic Significance

The National Register of Historic Places[2] lists many historic sites in Montgomery County. None is located in the immediate vicinity of the site; the closest is in Rockville. No natural landmarks are located in Montgomery County, according to the National Register of Natural Landmarks [48 FR (Mar. 1, 1983)].

3.4.4 Floodplains and Wetlands

No permanent streams and no floodplains are located on or in the immediate vicinity of the NBS site. The only wetlands located on the site are two large manmade ponds lying in the upper reaches of the Muddy Branch watershed. These ponds support a variety of aquatic fauna but are not associated with nuclear materials operations. Several other manmade ponds also occur in the Muddy Branch watershed (Fig. 2.1).

3.5 Geology and Seismicity

3.5.1 Geology

The site lies within a part of the Piedmont physiographic province, which is underlain by gneiss and schist of the Wissahickon Formation of Precambrian to early Cambrian age (600 to 550 million years before the present). The schist,

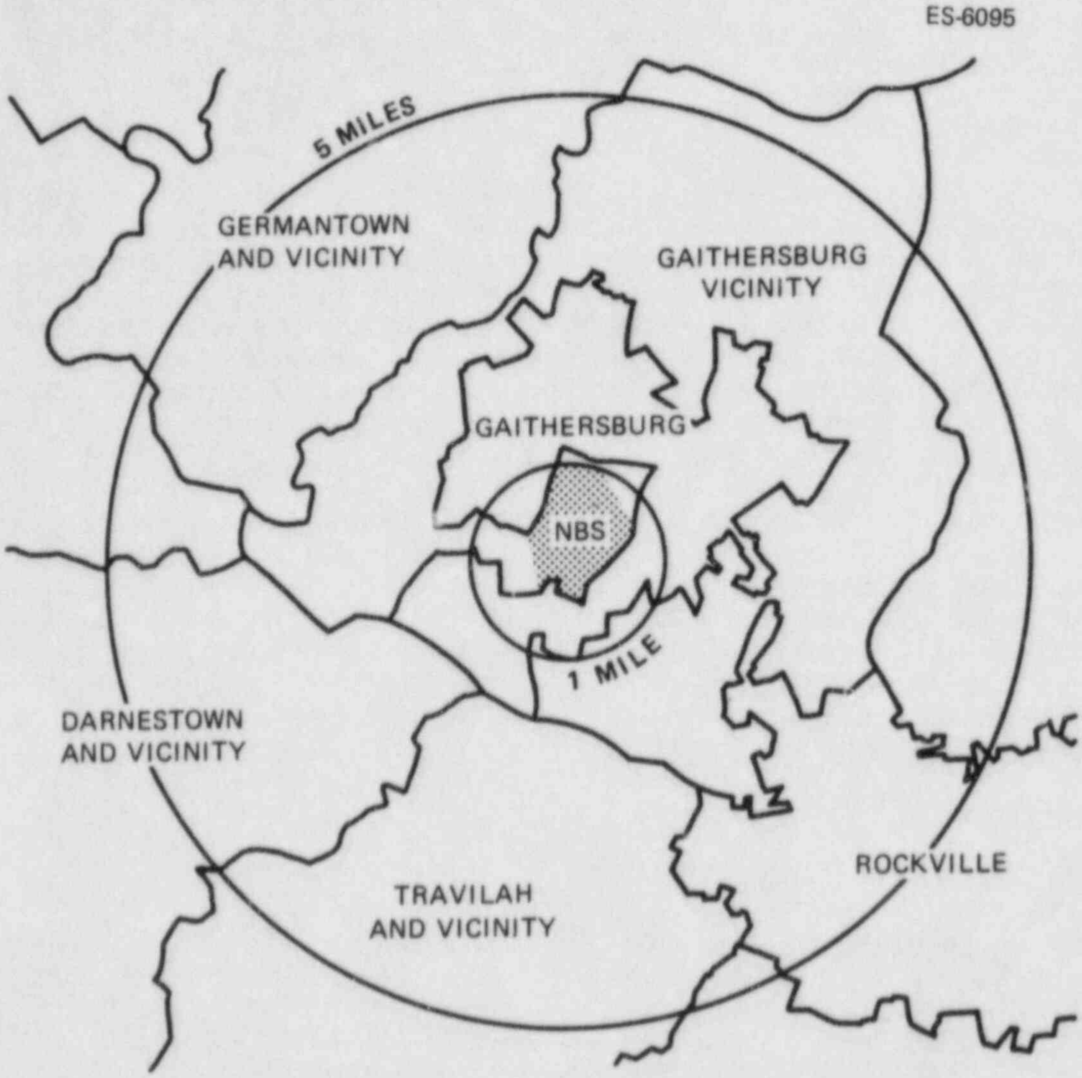

Fig. 3.3 Location of the National Bureau of Standards site in relation to adjacent urban areas

which is derived from greatly compressed sedimentary strata, is believed to be several thousand feet thick at the site.

Borings at the site indicate that the upper surface of relatively sound rock ranges from 11 to 23 m (35 to 74 ft) below ground surface. Above this sound rock is badly weathered rock and then various grades of saprolite, ranging from a fine silty sand with weathered rock fragments to silty clay in the 1.5 to 3.0 m (5 to 10 ft) below the surface top soil.

3.5.2 Seismicity

The applicant presented a geological history of the different structures in the region and correlated these structures with trends of local seismicity. The level of seismicity was found to be more uniform in the Southern Appalachian fold belt, but nowhere is it defined well enough to indicate individually active structures. Figure 3.4 shows that the site is in a region of minor seismic risk, but near a region of moderate seismic risk that correlates well with the observed seismic activity in an east-west belt in Central Virginia.[3] The largest event identified occurred near Richmond, Virginia, in 1875 and was a modified Mercalli intensity VII event.[4]

A probabilistic acceleration map (Fig. 3.5) indicates that the horizontal acceleration at the NBS site, with a 90% probability of not being exceeded in 50 years, is about 0.04 gravities. This is consistent with an earlier communication from the U.S. Coast and Geodetic Survey,[5] which indicates that the maximum potential earthquake for the area would result in a maximum ground acceleration of 0.07 g at the NBS site. On the basis of the historic seismicity record and the tectonic framework of the region, it is highly unlikely that an earthquake of high magnitude will affect the site.

3.6 Hydrology

3.6.1 Surface Water

There are no permanent streams on the NBS site, which lies on uplands between the watersheds of Muddy Branch and Long Draught Branch (Fig. 2.1). During intense rainstorms, some surface water may run off to Muddy Branch to the south and Long Draught Branch to the west and north, and to the Potomac River. Two large ponds on the site lie in the upper reaches of a tributary of Muddy Branch (Fig. 2.1). Drains located at parking lots and in the large expanses of lawns around the facilities direct much of the site's surface runoff to storm sewers, which empty into the Washington Suburban Sanitary Commission sewage system, and then into the Potomac River.

3.6.2 Groundwater

The source of the groundwater at NBS is local precipitation, which averages about 102 cm (40 in.) per year (Sect. 3.2.1). A zone of saturation or water table is maintained in the subsoils by rainwater that neither runs off directly nor evaporates. Generally, the water table is a subdued replica of the topography of the land surface, and the hydraulic gradients result in the movement of groundwater to the streams. The rate of groundwater movement varies; in the subsoil or saprolite zone, the rate may be 3 to 30 cm/d (1 to 12 in./d), while

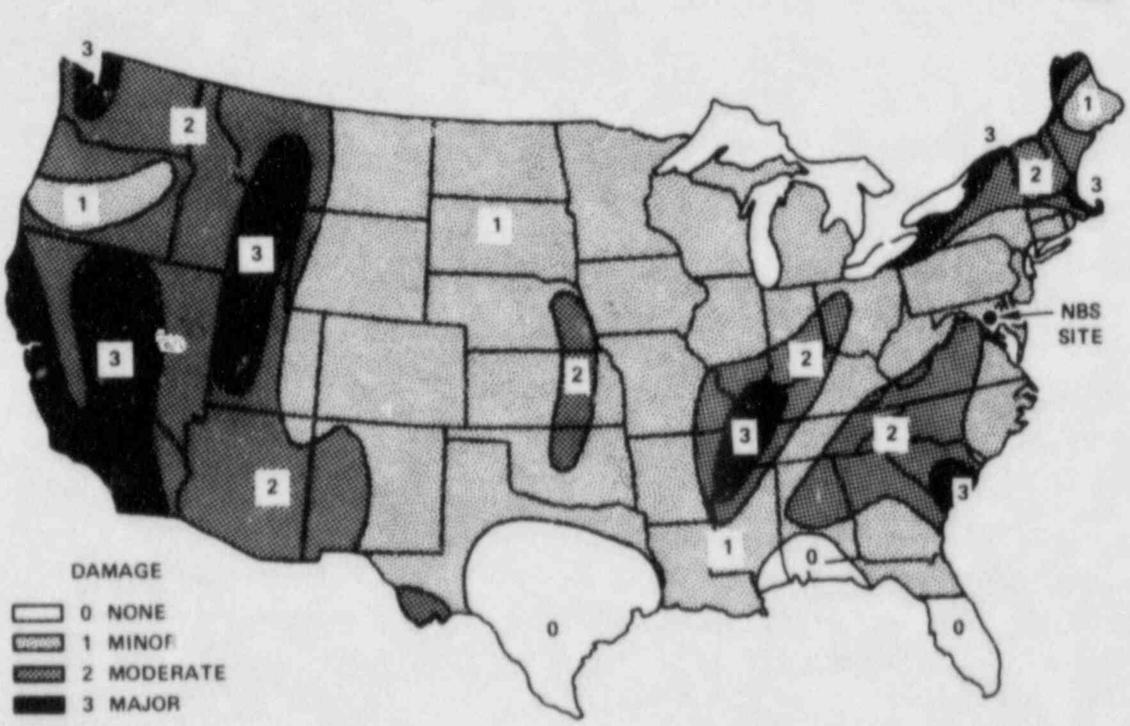

Fig. 3.4 Seismic risk map of the United States

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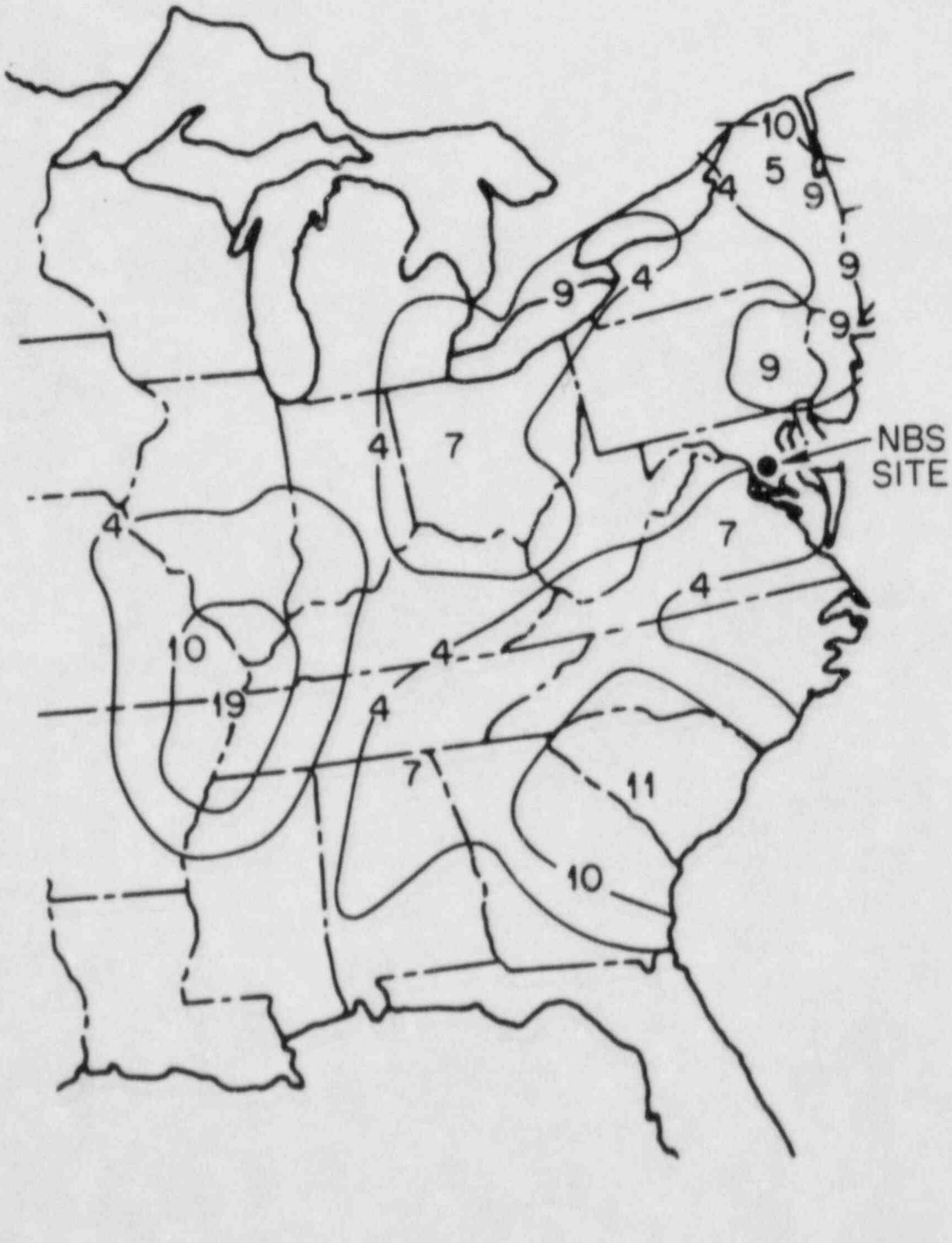

Fig. 3.5 Preliminary map of horizontal acceleration (expressed as percent of gravity) in rock with 90% probability of not being exceeded in 50 years

the rate in the underlying rock is much slower. Probably all groundwater at the site flows toward either Muddy Branch or Long Draught Branch.

The major use of groundwater within a 1.6-km (1-mile) radius of the site is for domestic and farm purposes. Five currently inactive wells, located southwest of the center of Gaithersburg, are public-supply wells owned by the Washington Suburban Sanitary Commission; these wells formerly supplied the town with water. Currently, water is piped to NBS and Gaithersburg from the surface waters of Sanitary Commission reservoirs.

3.7 Biota

3.7.1 Terrestrial

Natural plant communities on the NBS site are lacking, as the site consists of extensive lawns with widely scattered plantings of trees and shrubs. Such habitats support relatively low wildlife populations and relatively few wildlife species. Robins, house finches, and house sparrows are common. The two large ponds on the site (Fig. 2.1) may provide habitat for migratory and resident waterfowl species.

3.7.2 Aquatic

The only permanent aquatic habitats on the site are two large ponds lying in the upper reaches of a tributary of Muddy Branch (Fig. 2.1). These may support several species of reptiles (e.g., frogs and turtles) and fish.

3.7.3 Endangered Species

Aquatic or terrestrial species listed as endangered by the U.S. Department of the Interior (50 CFR Parts 17.11 and 17.12) are unlikely to occur at the site. Bald eagles and peregrine falcons may occur rarely as visitors in the area, but no habitat in the area is important to their continued existence.

3.8 Radiological Characteristics (Background)

The total-body dose rate for the population in the vicinity of the NBS site is approximately 113 millirem/year.[6] This dose rate includes 40 millirem/year from cosmic rays, 55 millirem/year from terrestial sources, and 18 millirem/year from internal emitters.

REFERENCES FOR SECTION 3

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2. U.S. Department of the Interior, "National Register of Historic Places: Annual Listing of Historic Places," Fed. Regist. 44(26), 7415-7649 (Feb. 6, 1979); 45(54), 17446-17519 (Mar. 18, 1980); 46(22), 10622-10679 (Feb. 3, 1981); 47(22), 4932-4969 (Feb. 2, 1982); 48(41), 86268679 (Mar. 1, 1983).

3. Hadley, J. B. and J. F. Devine, "Seismotectonic Map of the Eastern United States," United States Geological Survey, 1974.

4. Bollinger, G. A., and M. G. Hopper, "Virginia's Two Largest Earthquakes-December 22, 1875, and May 31, 1897," Seismological Society of America Bulletin 61: 1033-39 (1971).

5. Tison, Director of U.S. Coast and Geodetic Survey, letter with enclosures to Price, Director of Regulations, USAEC, Feb. 8, 1967.

6. D. T. Oakley, Natural Radiation Exposure in the United States, ORP/SID 72-1, U.S. Environmental Protection Agency, June 1972.

4. ENVIRONMENTAL CONSEQUENCES OF PROPOSED LICENSE RENEWAL

4.1 Monitoring Programs and Mitigatory Measures

The environmental monitoring program at NBS includes sampling and analysis activities to detect changes in environmental radioactivity levels that could result from operation of the facility.[1] There is no monitoring program for release or environmental accumulation of adverse nonradioactive material.

4.1.1 Effluent Monitoring

The applicant collects samples from liquid waste tanks at the Reactor Building and at the Radiation Physics Building and analyzes them for radioactivity prior to releasing the liquid waste to the municipal sewer systems. Little or no radioactivity above background has ever been detected in these liquid wastes.

The applicant does not monitor for radioactivity in the gaseous waste streams from the building vents. Because of the large number of vents and the low quantity of gaseous radioactivity that might be discharged, the concentrations would probably be much lower than the sensitivity of available detectors.

Potentially contaminated solid wastes, including glassware, cloth and paper wipes, packaging material, and laboratory filters, are packaged for offsite disposal at a licensed facility. These wastes are examined for unusual radioactivity to ensure that important source material is not accidentally discarded.

4.1.2 Environmental Monitoring

Soil samples from four designated areas on the NBS site are collected periodically, except during the growing season, when grass samples are collected from five areas (Fig. 4.1). The soil and grass samples are analyzed for radioactivity by gamma spectroscopy.

Water samples are collected periodically from five surface streams and one residential well in the vicinity of the NBS facility (Fig. 4.1). These samples are analyzed for gross gamma activity by gamma spectroscopy and for tritium activity by liquid scintillation counting.

4.1.3 External, Background Monitoring

The ambient-background radiation level at the NBS site is measured by about 50 thermoluminescent dosimeters (TLDs) placed around the site perimeter fence and on NBS buildings. Control monitors are kept at locations 5 to 32 km (3 to 20 miles) from NBS. The minimum detectable level for this monitoring is 4 millirems or less per TLD.

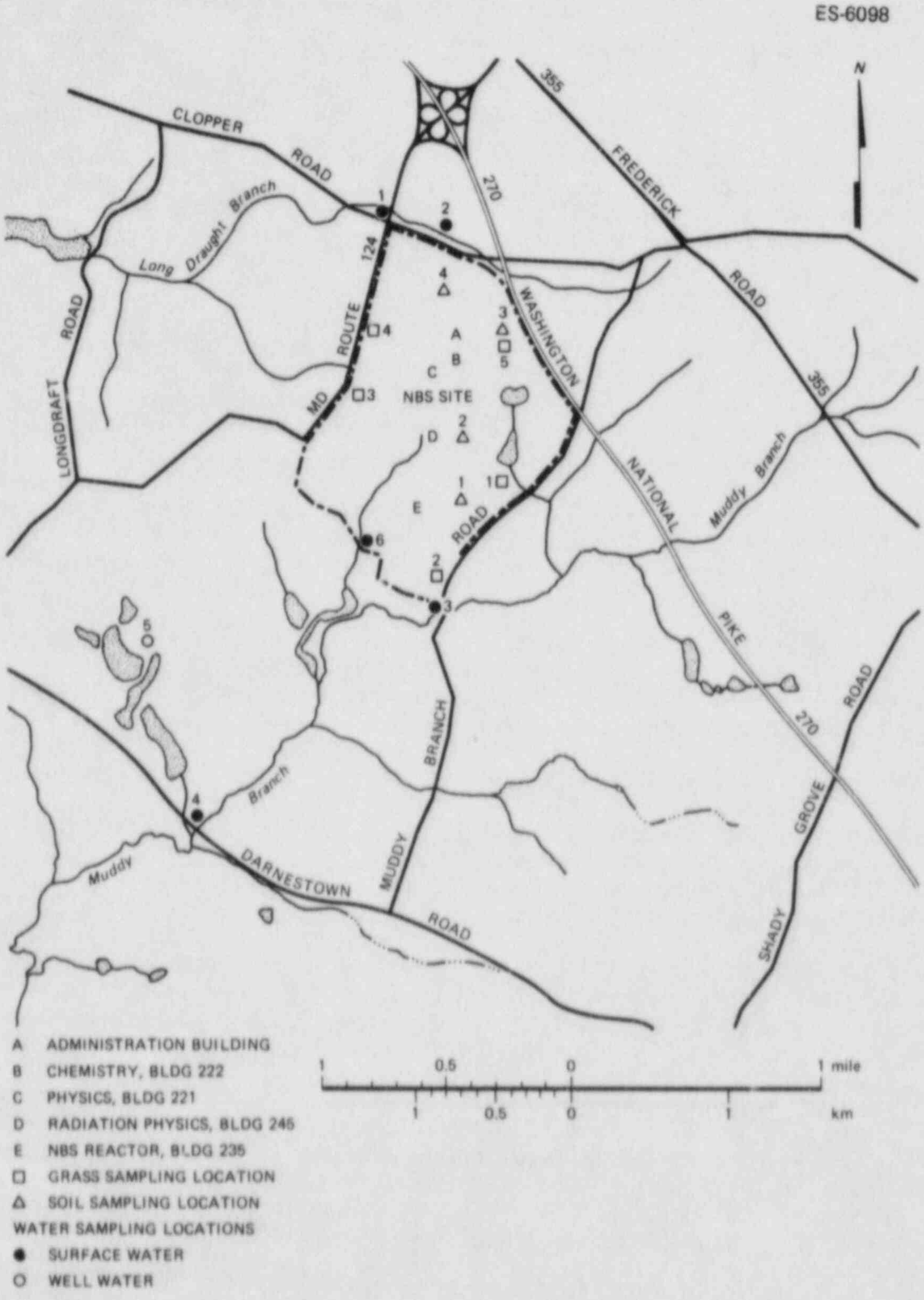

Fig. 4.1 Location of radiclogical monitoring site and the principal buildings in which radioactive materials are stored or used

4.1.4 Monitoring Results

The environmental monitoring program at NBS began in 1963 with the collection of water samples. Soil and grass sampling was initiated in 1965 and background radiation measurements were initiated in 1966. According to the applicant,[1] no significant changes in activity levels have been observed since the start of the monitoring program. Minor fluctuations in levels were observed over time, but the variations could not be correlated with any NBS operation.[1]

For the years 1981-1983, analysis of composite surface water samples indicated no more than 0.018 pCi/ml of tritium, which is only 7% of the 0.25 pCi/ml average concentration in drinking water in selected cities of the United States.[2]

For the composite soil and grass samples, the analysis indicates no more than 0.8 pCi/g of ^{89}Sr, 0.31 pCi/g of ^{90}Sr, and 0.9 pCi/g of ^{137}Cs. These concentrations are within the range of values for residual atmospheric fallout in U.S. cities,[2] indicating that NBS has not measurably added to the radioactivity on the site.

4.2 Direct Effects And Their Significance

4.2.1 Air Quality

National ambient air quality standards and/or guidelines have been promulgated to limit the impacts of sulfur dioxide, nitrogen oxides, carbon monoxide, particulates, and hydrocarbons on air quality. Releases of these substances from operations associated with the proposed action are either nonexistent or so small (Sect. 2.2.2) that there is no concern that they would violate the standards. Releases of non-regulated substances such as various organics are also very small and have no potential for significant impact on air quality. No measurable changes in air quality should occur on or off the NBS site. Radiological impacts on air quality are discussed in Sect. 4.2.5.

4.2.2 Land Use

No land use impacts have occurred as a result of NBS operations associated with the proposed action. No additional buildings, major additions to existing buildings, or changes in operations are planned for activities with nuclear materials. Therefore, no new impacts on land use, soils, or vegetation are expected. Emissions to the air are very minor and will have no impact on soils or vegetation important to landscaping, residential horticulture, agriculture, or other land uses in the local area. No historic sites, floodplains, or wetlands will be affected.

4.2.3 Water Use

Water for NBS operations is obtained from the treated Montgomery County water supply. Total daily water use for all NBS operations is 1.3 million L (343,460 gal). Water use associated with the proposed action is a very small fraction of this amount. No equipment associated with the proposed action requires water for cooling.

4.2.4 Ecological

Because no new facilities are planned as part of this licensing action, there will be no construction-related impacts on terrestrial or aquatic ecosystems. Gaseous and particulate emissions from the facilities are inconsequential and will have no effect on vegetation or animals. All liquid effluents are routed to the sanitary sewer system and therefore will have no effect on surface waters and aquatic ecology at the NBS site. The site is well landscaped and areas not occupied by the facilities are well covered with vegetation so that sediment-laden surface runoff from rainstorms is minimal. No endangered species resides or occurs regularly in the area, and none is affected by NBS operations.

4.2.5 Radiological Impacts

General-purpose laboratory facilities are contained in Buildings 222 and 245, and radiochemical work is done in both buildings. In addition, Building 245 contains several irradiators and some isotopic neutron sources. There are no routine releases of radionuclides from these facilities; however, for radionuclide operations, roughing and HEPA filtration is available for discharges that could result from accidental releases.

4.2.5.1 Direct Radiation

There is some direct radiation from the ^{252}Cf facility in Building 245. According to the applicant, direct radiation at the site boundary is about 0.004 millirems/h. That boundary separates NBS from undeveloped land, and the nearest resident (667 m distance) is shielded from line-of-sight by at least 50 m of earth. The sky shine contribution is about 0.0005 millirems/h. Since operation of the ^{252}Cf facility is intermittent, the total-body dose to the nearest resident or nearest line-of-sight boundary is estimated to be less than 0.1 millirems/year.

4.2.5.2 Maximum Individual Doses from Accidental Releases

Two radiochemical operations can be considered as representative of potential releases of radioactivity to the environment. Noble gases are occasionally used in Building 245 for standard production of source capsules, and occasional alpha chemistry is done. Both of these are batch processes and occur infrequently.

Atmospheric dilution factors were calculated by the staff for the boundary distance (560 m) and the nearest resident distance (667 m). Using methodology given in NUREG/CR-2260,[3] releases were assumed to be at ground level, in Class D (neutral) weather, and into a wind speed of 3 m/s.[3]

Dose conversion factors were taken from Kocher[4] for external doses and from Dunning, et al.,[5] for internal doses.

For the noble gas case, a process using 1 Ci ^{85}Kr might be considered. It is assumed that a 10% loss occurs during a 1-h operation. All of this loss is released into the exhaust system and into the atmosphere. This would lead to estimated concentrations in air of 1.3×10^{-9} µCi/mL at the boundary and 8.8 10^{-10} µCi/mL at the nearest residence. Estimated doses to the total-body and selected organs of exposed individuals at the boundary and at the nearest residence are given in Table 4.1.

Table 4.1 Maximum individual doses from an accidental release of 100 mci of ^{85}kr

Organ	Dose to individual (millirem)[a]	
	Boundary	Nearest resident
Total body	1.6×10^{-6}	1.1×10^{-6}
Skin	2.2×10^{-6}	1.5×10^{-6}
Red marrow	1.5×10^{-6}	1.0×10^{-6}
Endostial cells	1.7×10^{-6}	1.2×10^{-6}
Lungs	1.5×10^{-6}	1.0×10^{-6}
Liver	1.4×10^{-6}	9.5×10^{-6}
Kidney	1.4×10^{-6}	9.5×10^{-6}

[a]Exposure is for a 1-h period of submersion in a radioactive plume.

For the alpha chemistry case, it is assumed that a 1-h operation involving 1 mCi of ^{239}Pu is conducted in a hood. It is further assumed that 10% of this amount escapes into the hood and that 1% is released into the environment through the building exhaust. This 1-μCi release gives a concentration in air of 1.3×10^{-14} μCi/mL at the boundary and 9×10^{-15} μCi/mL at the nearest residence. Estimated doses to an individual at the boundary and at the nearest residence are given in Table 4.2 for the inhalation pathway of exposure. External doses from submersion in the radioactive plume would be less than 10^{-12} millirem.

Table 4.2 Maximum individual doses from an accidental release of 1 μCi of ^{239}Pu

Organ	Dose to individual (millirem)[a]	
	Boundary	Nearest resident
Total body	1.3×10^{-3}	9.1×10^{-4}
Red marrow	5.9×10^{-3}	4.1×10^{-3}
Endostial cells	8.5×10^{-2}	5.6×10^{-2}
Lungs	1.1×10^{-2}	8.3×10^{-3}
Liver	1.5×10^{-2}	1.0×10^{-2}
Kidney	2.0×10^{-3}	1.4×10^{-3}

[a]Exposure is for a 1-h period of inhalation (air intake is 0.93 m^3) and represents a 50-year dose commitment.

Maximum individual doses associated with either the ^{85}Kr or ^{239}Pu release are orders of magnitude below limits set for routine releases for uranium fuel-cycle facilities. For example, the total-body doses from ^{85}Kr (1.6 x 10^{-6} millirem) and ^{239}Pu (1.3 x 10^{-3} millirem) are 6.4 x 10^{-6} and 5.2 x 10^{-3}% respectively, of the 25 millirem/year total-body dose limit given in 40 CFR Pt. 190. Moreover, the doses range from one-thousandth to one-millionth of a percent of the annual natural background radiation received by an individual (Sect. 3.8).

4.2.5.3 Population Doses from Accidental Releases

Since complete site meteorological data were not available, an estimate of radiation doses to the surrounding population within 16 km (10 miles) was made as follows. It was conservatively assumed that the population exposed to airborne radioactivities resides at a distance of 4000 m (2.5 miles) from the release point and that they are evenly distributed about the perimeter. The activity concentrations in air at 4000 m are 2.8 x 10^{-12} µCi/mL for ^{85}Kr and 2.8 10^{-17} µCi/mL for ^{239}Pu. For the 284,900 persons within the 16-km radius, the population doses are given in Table 4.3. The conservatively calculated doses for either the ^{85}Kr or ^{239}Pu release are all much smaller than 1 person-rem. This may be compared to an annual background radiation dose of about 3.2 10^4 person-rem (total body) for this population.

Table 4.3 Population doses from accidents involving ^{85}Kr and ^{239}Pu

	Dose from $^{85}Kr^a$ (person-rem)	Dose from $^{239}Pu^a$ (person-rem)
Total Body	9.5 x 10^{-7}	8.0 x 10^{-4}
Skin	1.4 x 10^{-6}	1.3 x 10^{-9}
Red Marrow	9.1 x 10^{-7}	3.6 x 10^{-3}
Endostial cells	1.0 x 10^{-6}	5.0 x 10^{-2}
Lungs	8.9 x 10^{-7}	7.3 x 10^{-3}
Liver	8.3 x 10^{-7}	9.5 x 10^{-3}
Kidney	8.6 x 10^{-7}	1.2 x 10^{-3}

[a]Collective dose to 284,900 persons living within 16 km (10 miles) of the facility assuming this population resides 4 km (2.5 miles) from the site.

4.3 Indirect Effects and Their Significance

4.3.1 Socioeconomic Effects

Because employment at the NBS facility is only about 1% of the population within 16 km (10 miles) and is less than 0.2% of the population within 32 km (20 miles), operations at the site have an insignificant effect on the local economy. Therefore, neither license renewal or discontinuance of operations with SNM would have a measurable socioeconomic impact.

4.3.2 Potential Effects of Accidents

The NBS operations authorized by the SNM licenses involve small quantities of nonradioactive chemicals that would result in insignificant offsite impacts if accidentally released.

As discussed in Sect. 4.2.5, the effects of potential accidental releases of radioactive materials, which could only occur infrequently because of the infrequent operations involved, would result in radiation exposures that are orders of magnitude below applicable Environmental Protection Agency (EPA) standards (40 CFR Pt. 190) for an individual and virtually immeasurable for the regional population.

The administrative controls established by the applicant, as described in the application documents,[6] include (1) review committees for every process involving SNM, (2) limitations on the quantity of SNM permitted in a laboratory for a processing operation, (3) responsibility assigned to one person for any SNM removed from storage, and (4) a strict materials accountability program administered by an independent health physics department. The administrative controls are believed adequate to ensure that accidental releases of SNM from the batch processing at the NBS site do not exceed the conservative values used in the assessment in Sect. 4.2.5.

4.3.3 Possible Conflicts Between the Proposed Action and the Objectives of Federal, Regional, State, and Local Plans and Policies

At this time, the staff is not aware of any conflict between the proposed action and the objectives of federal, regional, state (Maryland), or local plans, policies, or controls for the action proposed as long as the proper agencies are contacted, the proper applications are submitted, and proper monitoring and mitigatory measures, if necessary, are taken to protect the environment and public health and safety.

4.3.4 Effects on Urban Quality, Historical and Cultural Resources, and Society

The environmental effects of the proposed license renewal action as discussed above are considered to be insignificant. The facility has not affected historical or cultural resources. The short-term social effects during operation are immeasurable.

REFERENCES FOR SECTION 4

1. National Bureau of Standards, Environmental Information in Support of the Application for U.S. NRC Materials License Consolidation, Docket No. 70-398, Feb. 29, 1984.

2. U.S. Environmental Protection Agency, Radiological Quality of the Environment, EPA-520/1-76-010, 1976.

3. U.S. Nuclear Regulatory Commission, Technical Basis for Regulatory Guide 1.145, Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants, NUREG/CR-2260, October 1981.

4. D. C. Kocher, Dose-rate Conversion Factors for External Exposure to Photons and Electrons, NUREG/CR-1918, August 1981.

5. D. E. Dunning, G. G. Killough, S. R. Bernard, J. C. Pleasant, and P. J. Walsh, Estimates of Internal Dose Equivalent to 22 Target Organs for Radionuclides Occurring in Routine Releases from Nuclear Fuel Cycle Facilities, Vol. III, NUREG/CR-0150, November 1981.

6. National Bureau of Standards, Materials License Document (Application for Renewal and Consolidation of License Numbers 08-00566-05, 08-00566-10, 08-00566-11G, 08-00566-C12, 08-0566-13E, SMB-405, and SNM-362; Docket Nos. 30-3918, 30-6894, 30-3919, 30-9796, 30-1167, 40-4348, and 70-398), November 1983.

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This Environmental Assessment is issued by the U.S. Nuclear Regulatory Commission (NRC) in response to an application by the U.S. Department of Commerce, National Bureau of Standards, for the renewal and consolidation of five Materials Licenses for radiological activities at the National Bureau of Standards site.

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