Radioactive Effluent Release Report January 1 through December 31, 2001

Protection Standards

Soon after the discovery of x-rays in 1895 by Wilhelm Roentgen, the potential hazards of ionizing radiation were recognized and efforts were made to establish radiation protection standards. The primary source of recommendations for radiation protection standards within the United States is the National Council on Radiation Protection and Measurement (NCRP). Many of these recommendations have been given legislative authority through publication in the Code of Federal Regulations (CFR) by the Nuclear Regulatory Commission (NRC).

The main objective in the control of radiation is to ensure that any dose is kept not only within regulatory limits, but As Low As Reasonably Achievable (ALARA). The ALARA principle applies to reducing radiation dose both to the individual working at Davis-Besse and to the general public. "Reasonably achievable" means that exposure reduction is based on sound economic decisions and operating practices. By practicing ALARA, Davis-Besse minimizes health risk and environmental detriment and ensures that doses are maintained well below regulatory limits.

Sources of Radioactivity Released

During the normal operation of a nuclear power station, most of the fission products are retained within the fuel and fuel cladding. However, small amounts of radioactive fission products and trace amounts of the component and structure surfaces which have been activated are present in the primary coolant water. The three types of radioactive material released are noble gases, iodine and particulates, and tritium.

The noble gas fission products in the primary coolant are given off as a gas when the coolant is depressurized. These gases are then collected by a system designed for gas collection and stored for radioactive decay prior to release.

Small releases of radioactivity in liquids may occur from valves, piping or equipment associated with the primary coolant system. These liquids are collected through a series of floor and equipment drains and sumps. All liquids of this nature are monitored and processed, if necessary, prior to release.

Noble Gas

Some of the fission products released in airborne effluents are radioactive isotopes of noble gases, such as xenon and krypton. Noble gases are biologically and chemically nonreactive.

They do not concentrate in humans or other organisms. They contribute to human radiation dose by being an external source of radiation exposure to the body. Xenon-133 and xenon-135, with half-lives of approximately five days and nine hours, respectively, are the major radioactive noble gases released. They are readily dispersed in the atmosphere.

Iodine and Particulates

Annual releases of radioisotopes of iodine, and those particulates with half-lives greater than 8 days, in gaseous and liquid effluents are small. Factors such as their high chemical reactivity and solubility in water, combined with the high efficiency of gaseous and liquid processing systems, minimize their discharge. The predominant radioiodine released is iodine-131 with a half-life of approximately eight days. The main contribution of radioactive iodine to human dose is to the thyroid gland, where the body concentrates iodine.

The principal radioactive particulates released are fission products (e.g., cesium-134 and cesium-137) and activation products (e.g., cobalt-58 and cobalt-60). Radioactive cesium and cobalt contribute to internal radiation exposure of tissues such as the muscle, liver, and intestines. These particulates are also a source of external radiation exposure if deposited on the ground.

Tritium

Tritium, a radioactive isotope of hydrogen, is the predominant radionuclide in liquid effluents. It is also present in gaseous effluents. Tritium is produced in the reactor coolant as a result of neutron interaction with deuterium (also a hydrogen isotope) present in the water and with the boron in the primary coolant. When tritium, in the form of water or water vapor, is ingested or inhaled it is dispersed throughout the body until eliminated.

Processing and Monitoring

Effluents are strictly controlled to ensure radioactivity released to the environment is minimal and does not exceed regulatory limits. Effluent control includes the operation of monitoring systems, in-plant and environmental sampling and analyses programs, quality assurance programs for effluent and environmental programs, and procedures covering all aspects of effluent and environmental monitoring.

The radioactive waste treatment systems at Davis-Besse are designed to collect and process the liquid and gaseous wastes which contain radioactivity. For example, the Waste Gas Decay Tanks are holding tanks which allow radioactivity in gases to decay prior to release via the station vent.

Radioactivity monitoring systems are used to ensure that all releases are below regulatory limits. These instruments provide a continuous indication of the radioactivity present. Each instrument is equipped with alarms and indicators in the control room. The alarm setpoints are low enough to ensure the limits will not be exceeded. If a monitor alarms, a release from a tank is automatically stopped.

All wastes are sampled prior to release and analyzed in a laboratory to identify the specific concentrations of radionuclides being released. Sampling and analysis provide a more sensitive and precise method of determining effluent composition than with monitoring instruments alone.

A meteorological tower is located in the southwest sector of the Station. It is linked to computers which record the meteorological data. Coupled with the effluent release data, the meteorological data are used to calculate the dose to the public.

Beyond the plant, devices maintained in conjunction with the Radiological Environmental Monitoring Program constantly sample the air in the surrounding environment. Frequent samples of other environmental media, such as water and vegetation, are also taken to determine if buildup of deposited radioactive material has occurred in the area.

Exposure Pathways

Radiological exposure pathways define the methods by which people may become exposed to radioactive material. The major pathways of concern are those which could cause the highest calculated radiation dose. These projected pathways are determined from the type and amount of radioactive material released, the environmental transport mechanism, and the use of the environment. The environmental transport mechanism includes consideration of physical factors, such as the hydrological (water) and meteorological (weather) characteristics of the area. An Annual average on the water flow, wind speed, and wind direction are used to evaluate how the radionuclides will be distributed in an area for gaseous or liquid releases. An important factor in evaluating the exposure pathways is the use of the environment. Many factors are considered such as dietary intake of residents, recreational use of the area, and the locations of homes and farms in the area.

The external and internal exposure pathways considered are shown in Figure 30. The release of radioactive gaseous effluents involves pathways such as external whole body exposure, deposition of radioactive material on plants, deposition on soil, inhalation by animals destined for human consumption, and inhalation by humans. The release of radioactive material in liquid effluents involves pathways such as drinking water, fish consumption, and direct exposure from the lake at the shoreline while swimming.

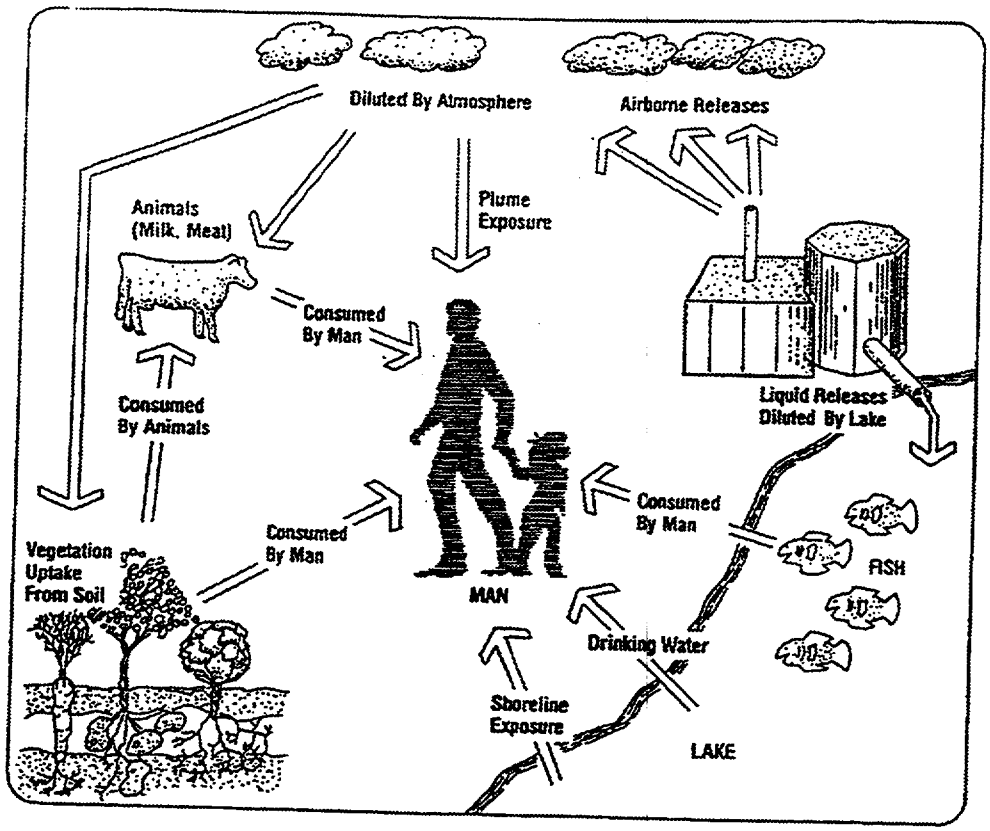


Figure 29: The exposure pathways shown here are monitored through the Radiological Environmental Monitoring Program (REMP) and are considered when calculating doses to the public.

Although radionuclides can reach humans by many different pathways, some result in more dose than others. The critical pathway is the exposure route that will provide, for a specific radionuclide, the greatest dose to a population, or to a specific group of the population called the critical group. The critical group may vary depending on the radionuclides involved, the age and diet of the group, or other cultural factors. The dose may be delivered to the whole body or to a specific organ. The organ receiving the greatest fraction of the dose is called the critical organ.

Dose Assessment

Dose is the energy deposited by radiation in an exposed individual. Whole body exposure to radiation involves the exposure of all organs. Most background exposures are of this form. Both non-radioactive and radioactive elements can enter the body through inhalation or ingestion. When they do, they are usually not distributed evenly. For example, iodine concentrates in the thyroid gland, cesium collects in muscle and liver tissue, and strontium collects in bone tissue.

The total dose to organs from a given radionuclide depends on the amount of radioactive material present in the organ and the amount of time that the radionuclide remains in the organ. Some radionuclides remain for very short times due to their rapid radioactive decay and/or elimination rate from the body, while other radionuclides may remain in the body for longer periods of time.

The dose to the general public in the area surrounding Davis-Besse is calculated for each liquid or gaseous release. The dose due to radioactive material released in gaseous effluents is calculated using factors such as the amount of radioactive material released, the concentration beyond the site boundary, the average weather conditions at the time of the release, the locations of exposure pathways (cow milk, goat milk, vegetable gardens and residences), and usage factors (inhalation, food consumption). The dose due to radioactive material released in liquid effluents is calculated using factors such as the total volume of liquid, the total volume of dilution water, near field dilution, and usage factors (water and fish consumption, shoreline and swimming factors). These calculations produce a conservative estimation of the dose.

Results

The Radioactive Effluent Release Report is a detailed listing of radioactivity released from the Davis-Besse Nuclear Power Station during the period from January 1, 2001 through December 31, 2001.

- Summation of the quantities of radioactive material released in gaseous and liquid effluents (Tables 17-21)
- Summation of the quantities of radioactive material contained in solid waste packaged and shipped for offsite disposal at federally approved sites (Table 22)
- A listing of all radioactive effluent monitoring instrumentation required by the Offsite Dose Calculation Manual, but which were inoperable for more than 30 days

During this reporting period, the estimated maximum individual offsite dose due to radioactivity released in effluent was:

Liquid Effluents:

- 7.75E-02 **mrem,** whole body
- 8.03E-02 **mrem,** thyroid

Gaseous Effluents:

Noble Gas:

- 2.71E-04 **mrad,** whole body
- 9.27E-04 **mrad**, skin

Iodine - 131, Tritium, and Particulates with Half-lives greater than 8 Days:

- 1.99E-03 **mrem**, whole body
- 2.54E-03 **mrem**, thyroid

These doses are an extremely small fraction of the limits set by the NRC in the Davis-Besse ODCM.

Additional normal release pathways from the secondary system exist. For gaseous effluents, these pathways include the auxiliary feed pump turbine exhausts, the main steam safety valve system and the atmospheric vent valve system, steam packing exhaust and main feed water. For liquid effluents, the additional pathways include the Turbine Building drains via the settling basins. Releases via these pathways are included in the normal release tables in this report.

Regulatory Limits

Gaseous Effluents

In accordance with Offsite Dose Calculation Manual, dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:

Noble gases:

- Released at a rate equal to or less than 500 mrem TEDE per year. (Note: the total dose due to these releases is also limited to 50 mrem in any calendar year.)
- Released at a rate such that the total dose to the skin will be less than or equal to 3000 mrem in a year.

Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:

- Released at a rate such that the total dose to any organ will be less than or equal to 1500 mrem in a year.

In accordance with 10CFR50, Appendix I, Sec. IIB. 1, air dose due to radioactivity released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:

- Less than or equal to 10 mrad total for gamma radiation and less than or equal to 20 mrad total for beta radiation in any calendar year.

In accordance with 10CFR50, Appendix I, Sec. IIC, dose to a member of the public from Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

- Less than or equal to 15 total mrem to any organ in any calendar year.

Liquid Effluents

In accordance with 10CFR50, Appendix I, Sec IIA, the dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to accumulated doses of:

- Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ in any calendar year.

Effluent Concentration Limits

The Effluent Concentration Limits (ECs) for liquid and gaseous effluents at and beyond the site boundary are listed in 10CFR20, Appendix B, Table II, Column 2, with the most restrictive EC being used in all cases. For dissolved and entrained gases the EC of 2.0E-04 uCi/ml is applied. This EC is based on the Xe-135 DAC of 1E-05 uCi/ml of air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

Average Energy

The Davis-Besse ODCM limits the dose equivalent rates due to the release of fission and activation products to less than or equal to 500 mrem per year to the total body and less than or equal to 3000 mrem per year to the skin. Therefore, the average beta and gamma energies (E) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants" are not applicable.

Measurements of Total Activity

Fission and Activation Gases:

These gases, excluding tritium, are collected in a marinelli beaker specially modified for gas sampling, steel flasks, or glass vials and are counted on a germanium detector for principal gamma emitters. Radionuclides that are detected are quantified via gamma spectroscopy.

Tritium gas is collected using a bubbler apparatus and counted by liquid scintillation.

Iodine

Iodine is collected on a charcoal cartridge filter and counted on a germanium detector. Specific quantification of each iodine radionuclide is via gamma spectroscopy.

Particulates

Particulates are collected on filter paper and counted on a germanium detector. Specific quantification of each radionuclide present on the filter paper is via gamma spectroscopy.

Liquid Effluents

Liquid effluents are collected in a marinelli beaker and counted on a germanium detector. Quantification of each gamma-emitting radionuclide present in liquid samples is via gamma spectroscopy. Tritium in the liquid effluent is quantified by counting an aliquot of a composite sample in a liquid scintillation counting system.

Batch Releases

Liquid from 1/1/01 through 12/31/01

1. Number of batch releases:	51
2. Total time period for the batch releases:	85.5 hours
3. Maximum time period for a batch release:	133 minutes
4. Minimum time period for a batch release:	81 minutes
5. Average time period for a batch release:	100.6 minutes

Gaseous from 1/1/01 through 12/31/01

1. Number of batch releases:	6
2. Total time period for the batch releases:	61.92 hours
3. Maximum time period for a batch release:	2473 minutes
4. Minimum time period for a batch release:	172 minutes
5. Average time period for batch release:	619.2 minutes

Abnormal Releases

Total 2001 activity due to Abnormal Releases 0.0

Total 2001 Dose due to Abnormal Releases is 0.00E+00 mRem

Percent of ODCM Release Limits

The following table presents the ODCM annual dose limits and the associated offsite dose to the public, in percent of limits, for January 1, 2001 through December 31, 2001.

SPECIFICATION	ANNUAL DOSE	LIMIT	PERCENT OF LIMIT
Report Period: January 1, 2001- December 31, 2001 (gaseous)			
Noble gases (gamma)	2.71E-04 **mrad**	10 **mrad**	2.71E-03
Noble gases (beta)	6.56E-04 **mrad**	20 **mrad**	3.28E-03
I-131, tritium and particulates	1.99E-03 **mrem**	15 **mrem**	1.33E-02
Report Period: January 1, 2001 - December 31, 2001 (liquid)			
Total body	7.75E-02 **mrem**	3 **mrem**	2.58E+00
Organ	8.03E-02 **mrem**	10 **mrem**	8.03E-01

Sources of Input Data

- Water Usage: Survey of Water Treatment Plants (DSR-95-00347)
- 0-50 mile meat, milk, vegetable production, and population data was taken from 1982 Annual Environmental Operating Report entitled, "Evaluation of Compliance with Appendix I to 10CFR50: Updated Population, Agricultural, Meat - Animal, and Milk Production Data Tables for 1982". This evaluation was based on the 1980 Census, the Agricultural Ministry of Ontario 1980 report entitled "Agricultural Statistics and Livestock Marketing Account", the Agricultural Ministry of Ontario report entitled "Agricultural Statistics for Ontario, Publication 21, 1980", the Michigan Department of Agriculture report entitled "Michigan Agricultural Statistics, 1981", and the Ohio Crop Reporting Service report entitled "Ohio Agricultural Statistics, 1981".
- Gaseous and liquid source terms: Tables 17 through 21 of this report.
- Location of the nearest individuals and pathways by sector within 5 miles, see Land Use Census Section of the report.
- Population of the 50-mile Radius of Davis-Besse (DSR-95-00398).

Dose to Public Due to Activities Inside the Site Boundary

In accordance with ODCM Section 7.2, the Radioactive Effluent Release Report includes an assessment of radiation doses from radioactivity released in liquid and gaseous effluents to members of the public due to activities inside the site boundary.

In special instances, members of the public are permitted access to the Radiologically Restricted Area within the Davis-Besse Station. Tours for the public are conducted with the assurance that no individual will receive any appreciable dose due to radioactivity released in gaseous or liquid effluents (i.e., not more than a small fraction of the 40 CFR190 standards.)

The Wellness Center, Pavilion, Training Center pond and the forebay/canal area located inside DBNPS Owner Controlled Area are accessible to members of the public. The Pavilion is accessible to the public for social activities. The Training Center pond, forebay/canal area allows the member of the public to fish on site under a "catch-an-release" program; therefore the fish pathway is not considered applicable. Considering the frequency and duration of the visits, the resultant dose would be a small fraction of the calculated maximum site boundary dose. For purposes of assessing the dose to members of the public in accordance with ODCM Section 7.2, the following exposure assumptions are used:

- Exposure time for maximally-exposed visitors is 250 hours (1 hr/day, 5 day/ week, 50 wk/yr)
- Annual average meteorological dispersion (conservative, default use of maximum site boundary dispersion).
- For direct "shine" from the Independent Spent Fuel Storage Installation (ISFSI), default use of the maximum dose rate for a completed (full) ISFSI, and a distance of 950 feet.

The equations in the ODCM may be used for calculating the potential dose to a member of the public for activities inside the site boundary. Based on these assumptions, this dose would be at least a factor of 35 less than the maximum site boundary air dose, as calculated in the ODCM. Nowhere onsite are areas accessible to the public where exposure to liquid effluents could occur. Therefore, the modeling of the ODCM conservatively estimates the maximum potential dose to members of the public.

Inoperable Radioactive Effluent Monitoring Equipment

There were no radioactive effluent monitoring equipment required to be operable that was in operable for greater than 30 days during the reporting period.

Changes to the ODCM and PCP

There were two alterations to the OCDM, Revision 14.0 and Rev. 15.0. The Process Control Program (PCP) had no changes in the reporting period.

Borated Water Storage Tank Radionuclide Concentration

During the Reporting Period of 2001, the BWST tank concentration did not exceed the ODCM specification of Section 2.2.4. The sum of the limiting fraction of nuclides, a unitless number between 0 and 1, the BWST tank did not exceed the limit of 1. Of the ten samples taken for the reporting period of 2001, all samples analyzed for the sum of the limiting fractions of nuclides reported were <0.05.

Table 17
Gaseous Effluents - Summation of All Releases

Type	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001	Est. Total % Error
Fission and Activation Gases						
Total Release	Ci	3.33E+00	3.09E+00	2.75E+00	5.93E+00	2.5E+01
Average Release Rate for Period[a]	µCi/sec	4.22E-01	3.93E-01	3.49E-01	7.52E-01	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Monitor Setpoint Determination					
Iodines						
Total Iodines (I-131)	Ci	5.24E-06	2.97E-05	5.66E+00	1.13E-04	2.5E+01
Average Release Rate for Period[a]	µCi/sec	6.65E-07	3.77E-06	7.18E-06	1.43E-05	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Monitor Setpoint Determination					
Particulates						
Particulates with half-lives greater than 8 days	Ci	0.00E+00	0.00E+00	0.00E+00	7.33E-07	2.5E+01
Average Release Rate for Period[a]	µCi/sec	0.00E+00	0.00E+00	0.00E+00	9.30E-08	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Monitor Setpoint Determination					
Gross Alpha Activity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.5E+01
Tritium						
Total Release	Ci	1.02E+01	7.33E+00	5.62E+00	4.78E+00	2.5E+01
Average Release Rate for Period[a]	µCi/sec	1.29E+00	9.21E-01	7.12E-01	6.07E-01	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Monitor Setpoint Determination					

[a] The average release rate is taken over the entire quarter. It is NOT averaged over the time period of the releases.

Table 18

Gaseous Effluents - Ground Level Releases

Batch Mode[a]

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Fission Gases	Ci				
Kr-85		LLD[b]	LLD[b]	LLD[b]	LLD[b]
Kr-85m		LLD	LLD	LLD	LLD
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-133		LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Iodines	Ci				
I-131		LLD	LLD	LLD	LLD
I-132		LLD	LLD	LLD	LLD
I-133		LLD	LLD	LLD	LLD
I-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Particulates and Tritium	Ci				
H-3		9.65E-03	8.69E-03	1.10E-02	6.35E-03
Sr-89		LLD	LLD	LLD	LLD
Sr-90		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Co-58		LLD	LLD	LLD	LLD
Total for Period:		9.65E-03	8.69E-03	1.10E-02	6.35E-03

Table 18 (Continued)
Gaseous Effluents - Ground Level Releases
Continuous Mode[c]

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Fission Gases	Ci				
Kr-85		LLD[b]	LLD[b]	LLD[b]	LLD
Kr-85m		LLD	LLD	LLD	LLD
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-133		LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Iodines	Ci				
I-131		LLD	LLD	LLD	LLD
I-133		LLD	LLD	LLD	LLD
I-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Particulates and Tritium	Ci				
H-3		1.11 E-02	1.13E-02	1.88E-02	2.34E-02
Sr-89		LLD	LLD	LLD	LLD
Sr-90		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Total for Period:		1.11E-02	1.13E-02	1.88E-02	2.34E-02

Table 18 (Continued)
Gaseous Effluents - Ground Level Releases
Continuous and Batch Mode

Ar-41:	<2.2E-08	µCi/ml
Kr-85:	<6.2E-06	µCi/ml
Kr-85m:	<2.0E-08	µCi/ml
Kr-87:	<3.4E-08	µCi/ml
Kr-88:	<4.0E-08	µCi/ml
Xe-131m:	<9.0E-08	µCi/ml
Xe-133:	<4.6E-08	µCi/ml
Xe-133m:	<1.6E-07	µCi/ml
Xe-135:	<1.9E-08	µCi/ml
Xe-135m:	<4.0E-07	µCi/ml
Xe-138:	<2.5E-07	µCi/ml
I-131:	<1.0E-07	µCi/ml
I-133:	<2.1E-08	µCi/ml
I-135:	<2.1E-08	µCi/ml
Mn-54	<2.0E-08	µCi/ml
Fe-59:	<4.0E-08	µCi/ml
Co-58:	<3.0E-08	µCi/ml
Co-60:	<2.0E-08	µCi/ml
Zn-65:	<4.0E-08	µCi/ml
Mo-99:	<2.0E-07	µCi/ml
Cs-134:	<2.1E-08	µCi/ml
Cs-137:	<3.0E-08	µCi/ml
Ce-141:	<3.0E-08	µCi/ml
Ce-144:	<1.2E-07	µCi/ml
Ba-140:	<7.0E-08	µCi/ml
La-140:	<3.0E-08	µCi/ml
Sr-89:	<5.0E-08	µCi/ml
Sr-90:	<6.0E-09	µCi/ml

a Auxiliary Feed Pump Turbine Exhaust, Main Steam Safety Valves, and Auxiliary Boiler Outage Release are listed as batch releases.

b These radionuclides were not identified in concentrations above the lower limit of detection (LLD).

c Atmospheric Vent Valve weepage and Steam Packing Exhaust are continuous releases.

Table 19

Gaseous Effluents - Mixed Mode Releases

Batch Mode

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Fission Gases					
Ar-41	Ci	LLD	LLD	LLD	LLD
Kr-85	Ci	1.06E-01	LLD	2.05E-01	3.54E-01
Kr-85m	Ci	LLD	LLD	LLD	LLD
Kr-87	Ci	LLD	LLD	LLD	LLD
Kr-88	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	LLD	1.74E-02	LLD	7.24E-01
Xe-133m	Ci	LLD	LLD	LLD	LLD
Xe-135	Ci	LLD	LLD	LLD	LLD
Xe-135m	Ci	LLD	LLD	LLD	LLD
Xe-138	Ci	LLD	LLD	LLD	LLD
Xe-131m	Ci	LLD	LLD	LLD	4.10E-02
Total for Period:		1.06E-01	1.74E-02	2.05E-01	1.12E+00
***Iodines**					
I-131	Ci	LLD	LLD	LLD	LLD
I-132	Ci	LLD	LLD	LLD	LLD
I-133	Ci	LLD	LLD	LLD	LLD
I-135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	LLD	LLD	LLD	LLD
***Particulates**					
H-3	Ci	1.21E-03	5.85E-04	3.06E-02	4.65E-03
Total for Period:	Ci	1.21E-03	5.85E-04	3.06E-02	4.65E-03

* Release of iodines and particulates are quantified in Mixed Mode Releases, Continuous Mode (Unit Station Vent)

Table 19 (Continued)

Gaseous Effluents - Mixed Mode Releases

Continuous Mode

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2000	3rd Qtr 2000	4th Qtr 2000
Fission Gases					
Ar-41	Ci	LLD	LLD	LLD	LLD
Kr-85	Ci	LLD	LLD	LLD	LLD
Kr-85m	Ci	LLD	LLD	LLD	LLD
Kr-87	Ci	LLD	LLD	LLD	LLD
Kr-88	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	2.88E+00	2.65E+00	1.84+00	4.57E+00
Xe-133m	Ci	LLD	LLD	LLD	LLD
Xe-135	Ci	3.39E-01	4.23E-01	7.11E-01	2.40E-01
Xe-135m	Ci	LLD	LLD	LLD	LLD
Xe-138	Ci	LLD	LLD	LLD	LLD
Total for Period:		3.22E+00	3.07+00	2.55E+00	4.81E+00
Iodines					
I-131	Ci	5.24E-06	2.97E-05	5.66E-05	1.13E-04
I-133	Ci	LLD	3.52E-06	5.39E-05	1.49E-04
I-135	Ci	LLD	LLD	LLD	LLD
I-132	Ci	LLD	LLD	LLD	LLD
Total for Period:		5.24E-6	3.32E-05	1.11E-04	2.62E-04
Particulates and Tritium					
H-3	Ci	1.02E+01	7.31E+00	5.56E+00	4.75E+00
Sr-89[b,c]	Ci	LLD	LLD	LLD	LLD
Sr-90[b,c]	Ci	LLD	LLD	LLD	LLD
Cs-134	Ci	LLD	LLD	LLD	LLD
Cs-137	Ci	LLD	LLD	LLD	LLD
Ba-140	Ci	LLD	LLD	LLD	LLD
Co-58	Ci	LLD	LLD	LLD	7.33E-07
La-140	Ci	LLD	LLD	LLD	LLD
Co-60	Ci	LLD	LLD	LLD	LLD
Total for Period:		1.02E+01	7.31E+00	5.56E+00	4.75E+00

Table 19 (Continued)

Gaseous Effluents - Mixed Mode Releases

Continuous Mode[a]

Ar-41	<2.9E-08	μCi/ml
Kr-85	<3.3E-06	μCi/ml
Kr-85m	<1.3E-08	μCi/ml
Kr-87	<6.0E-08	μCi/ml
Kr-88	<6.0E-08	μCi/ml
Xe-131m	<4.4E-07	μCi/ml
Xe-133m	<7.2E-08	μCi/ml
Xe-135	<1.1E-08	μCi/ml
Xe-135m	<5.9E-06	μCi/ml
Xe-138	<2.0E-05	μCi/ml
I-135[c]	<3.9E-10	μCi/ml
Mn-54[c]	<2.6E-14	μCi/ml
Fe-59[c]	<3.0E-14	μCi/ml
Co-58[c]	<3.0E-14	μCi/ml
Co-60[c]	<2.5E-14	μCi/ml
Zn-65[c]	<1.0E-13	μCi/ml
Mo-99[c]	<1.8E-14	μCi/ml
Cs-134[c]	<1.6E-14	μCi/ml
Cs-137[c]	<1.3E-14	μCi/ml
Ce-141[c]	<1.2E-13	μCi/ml
Ce-144[c]	<1.2E-14	μCi/ml
Ba-140[c]	<4.0E-14	μCi/ml
La-140[c]	<1.0E-14	μCi/ml
Sr-89[b,c]	<9.3E-16	μCi/ml
Sr-90[b,c]	<3.1E-16	μCi/ml

Batch Mode[a]

Kr-87	<4.5E-06	μCi/ml
Kr-88	<6.6E-06	μCi/ml
Xe-135	<1.4E-05	μCi/ml
Xe-135m	<2.1E-06	μCi/ml
Xe-138	<2.8E-05	μCi/ml
Ar-41	<1.8E-06	μCi/ml
Kr-85	<1.2E-06	μCi/ml
Xe-133	<2.4E-06	μCi/ml
Xe-133m	<1.0E-05	μCi/ml

a These radionuclides were not identified in every quarter in concentrations above the lower limit of detection (LLD). The largest LLD value is listed.

b Quarterly composite sample for continuous mode.

c Analysis not required for batch release.

Table 20
Liquid Effluents - Summation of All Releases

Type	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001	Est. Total % Error
Fission and Activation Products						
Total Release (without Tritium, Gases, Alpha)	Ci	3.37E-03	1.08E-03	1.20E-03	5.55E-04	2.0E+01
Average Diluted Concentration During Period[a]	µCi/ml	3.24E-10	1.01E-10	9.75E-11	5.18E-11	
Percent of ODCM Limits	%	See Supplement information in ODCM Release Limits Section				
Percent of 10CFR20 Limit	%	2.16E-03	1.61E-03	1.65E-03	3.26E-03	
Tritium						
Total Release	Ci	1.65E+02	1.36E+02	1.29E+02	1.36E+02	2.0E+01
Average Diluted Concentration During Period[a]	µCi/ml	1.58E-05	1.27E-05	1.05E-05	1.27E-05	
Percent of 10CFR20 Limit	%	1.58E+00	1.27E+00	1.05E+00	1.27E+0	
Dissolved and Entrained Gases						
Total Release	Ci	1.39E-05	4.68E-04	5.46E-05	1.99E-03	2.0E+01
Average Diluted Concentration During Period[a]	µCi/ml	1.33E-12	4.36E-11	4.44E-12	1.86E-10	
Percent of 10CFR20 Limit	%	6.67E-07	2.18E-05	2.22E-06	9.30E-05	
Gross Alpha						
Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	4.61E-03	2.0E+01
Volume of Waste Released (prior to dilution)						
Batch	liter	3.45E+05	3.42E+05	3.73E+05	3.96E+05	2.0E+01
Continuous	liter	9.05E+07	8.04E+07	7.97E+07	1.02E+08	2.0E+01
Volume of Dilution Water						
Batch	liter	1.01E+08	1.01E+08	1.10E+08	1.17E+08	2.0E+01
Continuous	liter	1.02E+10	1.06E+10	1.21E+10	1.05E+10	2.0E+01
Total Volume of Water Released	liter	1.04E+10	1.07E+10	1.23E+10	1.07E+10	

[a] Tritium and alpha are found in both continuous and batch releases. Average diluted concentrations are based on total volume of water released during the quarter. Fission and Activation products and Dissolved and Entrained Gases are normally only detected in batch releases.

Table 21

Liquid Effluents - Nuclides Released

Batch Releases

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Fission and Activation Products					
Co-58	Ci	6.40E-05	3.95E-05	1.24E-04	1.34E-03
Co-60	Ci	7.42E-05	1.37E-04	1.28E-04	1.80E-05
Ag-110m	Ci	5.55E-04	3.84E-04	7.96E-04	7.52E-05
Sb-125	Ci	2.36E-03	4.67E-04	LLD	LLD
Cs-134	Ci	6.90E-06	LLD	LLD	LLD
Cs-137	Ci	1.32E-05	LLD	8.17E-07	4.23E-07
Sr-89[a, b]	Ci	LLD	LLD	LLD	LLD
Sr-90[a, b]	Ci	LLD	LLD	LLD	LLD
Fe-55	Ci	1.97E-04	LLD	1.32E-04	1.15E-04
Cr-51	Ci	7.11E-05	LLD	LLD	LLD
I-131	Ci	LLD	4.44E-05	1.88E-05	3.12E-04
I-132	Ci	LLD	LLD	LLD	LLD
I-133	Ci	LLD	LLD	LLD	2.00E-05
Te-132	Ci	LLD	LLD	LLD	LLD
Tc-99m	Ci	LLD	LLD	LLD	LLD
Sb-124	Ci	LLD	LLD	LLD	LLD
Sn-113	Ci	LLD	LLD	LLD	LLD
Ru-103	Ci	LLD	LLD	LLD	LLD
Mn-54	Ci	LLD	LLD	LLD	LLD
Np-239	Ci	LLD	LLD	LLD	LLD
Co-57	Ci	LLD	LLD	LLD	LLD
Nb-95	Ci	LLD	LLD	LLD	LLD
Zr-95	Ci	LLD	LLD	LLD	1.43E-06
Se-75	Ci	LLD	LLD	LLD	LLD
Fe-59	Ci	LLD	LLD	LLD	LLD
Zn-65	Ci	LLD	LLD	LLD	LLD
Ce-144	Ci	LLD	LLD	LLD	LLD
Na-24	Ci	LLD	LLD	LLD	LLD
Zr-97	Ci	2.53E-05	7.73E-06	LLD	LLD
Ce-141	Ci	LLD	LLD	LLD	LLD
Nb-97	Ci	LLD	LLD	LLD	LLD
La-140	Ci	LLD	LLD	LLD	LLD
Ba-140	Ci	LLD	LLD	LLD	LLD
Ru-106	Ci	LLD	LLD	LLD	LLD
Ba-139	Ci	LLD	LLD	LLD	LLD
Mo-99	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	3.37E-03	1.08E-03	1.20E-03	5.55E-04

Table 21 (continued)

Liquid Effluents - Nuclides Released

Batch Releases

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Tritium	Ci	1.65E+02	1.36E+02	1.29E+02	1.36E+2
Dissolved and Entrained Gases					
Kr-85m	Ci	LLD[a]	LLD[a]	LLD[a]	LLD[a]
Kr-85	Ci	LLD	LLD	LLD	LLD
Xe-131m	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	1.39E-05	4.68E-04	5.38E-05	1.94E-03
Xe-135	Ci	LLD	LLD	8.69E-07	4.68E-05
Xe-133m	Ci	LLD	LLD	LLD	LLD
I -135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	1.39E-05	4.68E-04	5.47E-05	1.99E-03

Table 21 (continued)

Liquid Effluents - Nuclides Released

Continuous Releases

Nuclide	Unit	1st Qtr 2001	2nd Qtr 2001	3rd Qtr 2001	4th Qtr 2001
Fission and Activation Products					
Cr-51	Ci	LLD[a]	LLD[a]	LLD[a]	LLD[a]
Fe-59	Ci	LLD	LLD	LLD	LLD
Co-58	Ci	LLD	LLD	LLD	LLD
Co-60	Ci	LLD	LLD	LLD	LLD
Zn-65	Ci	LLD	LLD	LLD	LLD
Sr-89[a,b]	Ci	LLD	LLD	LLD	LLD
Sr-90[a,b]	Ci	LLD	LLD	LLD	LLD
Nb-95	Ci	LLD	LLD	LLD	LLD
Zr-95	Ci	LLD	LLD	LLD	LLD
Mo-99	Ci	LLD	LLD	LLD	LLD
Tc-99m	Ci	LLD	LLD	LLD	LLD
I-131	Ci	LLD	LLD	LLD	LLD
Cs-134	Ci	LLD	LLD	LLD	LLD
Cs-137	Ci	LLD	LLD	LLD	LLD
Ba-140/La-140	Ci	LLD	LLD	LLD	LLD
Ce-141	Ci	LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Tritium	Ci	2.37E-01	1.29E-01	2.97E-01	9.45E-02
Dissolved and Entrained Gases					
Kr-85	Ci	LLD	LLD	LLD	LLD
Xe-131m	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	LLD	LLD	LLD	LLD
Xe-133m	Ci	LLD	LLD	LLD	LLD
Xe-135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	N/A	N/A	N/A	N/A

Table 21 (continued)

Liquid Effluents - Nuclides Released[a]

Na-24	<2.0E-08	μCi/ml	Sb-124	<1.0E-08	μCi/ml
Cr-51	<1.7E-07	μCi/ml	Sb-125	<1.7E-08	μCi/ml
Mn-54	<2.1E-08	μCi/ml	Te-132	<1.8E-08	μCi/ml
Fe-55[b]	<7.0E-07	μCi/ml	Ce-141	<3.0E-08	μCi/ml
Fe-59	<4.2E-08	μCi/ml	Ce-144	<1.7E-07	μCi/ml
Co-57	<1.6E-08	μCi/ml	Cs-134	<2.1E-08	μCi/ml
Co-58	<1.9E-08	μCi/ml	Ce-136	<2.8E-08	μCi/ml
Co-60	<2.5E-08	μCi/ml	Cs-137	<2.7E-08	μCi/ml
Zn-65	<5.2E-08	μCi/ml	Ba-140	<7.0E-08	μCi/ml
Se-75	<2.4E-08	μCi/ml	La-140	<3.0E-08	μCi/ml
Sr-89[b]	<3.0E-08	μCi/ml	Np-239	<1.2E-07	μCi/ml
Sr-90[b]	<8.0E-09	μCi/ml	I-131	<2.5E-08	μCi/ml
Zr-95	<4.0E-08	μCi/ml	I-132	<1.0E-08	μCi/ml
Zr-97	<2.5E-08	μCi/ml	I-133	<2.1E-08	μCi/ml
Nb-95	<2.1E-08	μCi/ml	I-135	<1.7E-07	μCi/ml
Mo-99	<1.6E-07	μCi/ml	Kr-85	<6.2E-06	μCi/ml
Tc-99m	<1.8E-08	μCi/ml	Xe-131	<7.7E-07	μCi/ml
Ru-103	<2.2E-08	μCi/ml	Xe-133	<4.6E-08	μCi/ml
Ag-110m	<2.5E-08	μCi/ml	Xe-133m	<1.6E-07	μCi/ml
Sn-113	<2.8E-08	μCi/ml	Xe-135	<1.9E-08	μCi/ml

[a] These radionuclides were not identified every quarter in concentrations above the lower limit of detection (LLD). The largest LLD value is used for each radionuclide. LLDs are applicable to both batch and continuous modes due to identical sample and analysis methods.

[b] Quarterly composite sample

Table 22

Solid Waste and Irradiated Fuel Shipments

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of Waste		Unit	12-month Period	Est. Total Error, %
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m^3	5.45E+00	2.5E+01
		Ci	2.03E+02	2.5E+01
b.	Dry compressible waste, contaminated equip., etc.	m^3	1.02E+02	2.5E+01
		Ci	3.85E+00	2.5E+01
c.	Irradiated components, control rods, etc.	m^3		
		Ci	N/A	N/A
d.	Others: dewatered primary system cartridge filters	m^3	9.10E-02	2.5E+01
		Ci	1.44E-02	2.5E+01

2. Estimate of major nuclide composition (by type of waste)

	Type	Percent (%)	Est. Total Error, %
a. Spent Resins	Fe^{55}	2.78E+00	2.50E+01
	Co^{60}	7.71E+00	2.50E+01
	Ni^{63}	2.93E+01	2.50E+01
	Cs^{134}	4.76E+00	2.50E+01
	Cs^{137}	5.38E+02	2.50E+01
b. Dry compressible waste, contaminated equipment, etc.	Fe^{55}	6.38E+01	2.50E+01
	Co^{60}	1.75E+01	2.50E+01
	C^{14}	3.59E+00	2.50E+01
	Ni^{63}	6.54E+00	2.50E+01
	Co^{58}	2.00E+00	2.50E+01
c. None			
d. Cartridge filters	Fe^{55}	2.63E+01	2.50E+01
	Co^{58}	5.26E+01	2.50E+01
	Ni^{63}	5.06E+00	2.50E+01
	Ag^{110m}	2.36E+00	2.50E+01
	Zr^{95}	1.49E+00	2.50E+01
	Co^{60}	5.37E+00	2.50E+01
	C^{14}	1.96E+00	2.50E+01

Table 22 (continued)

Solid Waste and Irradiated Fuel Shipments

3. Solid Waste Disposition

Number of Shipments:	2
Mode of Transportation:	Truck
Destination:	STUDSVIK Processing Facility, Erwin TN For processing then disposal at Barnwell S.C.
Type of Container (Container Volume):	High Integrity Container (3.75 m3)
Volume shipped for processing	7.5 m^3
Volume disposed	0.64 m^3

Number of Shipments:	4
Mode of Transportation:	Truck
Destination:	US Ecology, Oak Ridge, TN for processing then disposal at Envirocare of Utah
Type of Container (Container Volume):	Metal boxes (36.3 m^3)
Volume shipped for processing	194.05 m^3
Volume disposed	39.96 m^3

Number of Shipments:	1
Mode of Transportation:	Truck
Destination:	ATG Inc. Richland Washington for processing then disposal at Envirocare of Utah or Barnwell S.C.
Type of Container (Container Volume):	Metal Boxes (2.6 m^3)
Volume shipped for processing	8.15 m^3
Volume disposed	Processing not complete in 2001 Est. 0.82 m^3

Number of Shipments:	1
Mode of Transportation:	Truck
Destination:	ATG Inc, Oak Ridge Tenn. for processing then disposal at Barnwell S.C.
Type of Container (Container Volume):	High Integrity Container (5.72m^3)
Volume shipped for processing	5.72 m^3
Volume disposed	5.72 m^3

Number of Shipments	9
Mode of Transportation	Truck
Destination	ALARON Corp., Wampam Pa. For processing then Disposal at Envirocare of Utah.
Type of Container (Container Volume)	Metal Boxes (73.42 m^3)
Volume shipped for processing	259.83 m^3 (spent fuel racks)
Volume disposed	Processing not complete in 2001 Est. 61.28 m^3

B. IRRADIATED FUEL SHIPMENTS

Table 23

Doses Due to Gaseous Releases

for January through December 2001

Maximum Individual Dose Due to I-131, H-3 and Particulates with Half-Lives Greater than 8 days.	
Whole Body Dose	1.99E-03 mrem
Significant Organ Dose	2.54E-03 mrem
Maximum Individual Dose Due to Noble Gas	
Whole Body Dose	2.71E-04 mrad
Skin Dose	9.27E-04 mrad
Population Dose Due to I-131, H-3 and Particulates with Half-Lives Greater than 8 days.	
Total Integrated Population Dose	7.02E-03 person-rem
Average Dose to Individual in Population	3.21E-06 mrem
Population Dose Due to Noble Gas	
Total Integrated Population Dose	5.03E-04 person-rem
Average Dose to Individual in Population	2.30E-07 mrem

Table 24

Doses Due to Liquid Releases

for January through December 2001

Maximum Individual Whole Body Dose	7.75E-02 mrem
Maximum Individual Significant Organ Dose	8.03E-02 mrem
Population Dose	
Total Integrated Population Dose	7.31E-01 person-rem
Average Dose to Individual	3.35E-04 mrem

Table 25

Annual Dose to The Most Exposed (from all pathways) Member of The Public 2001

	ANNUAL DOSE (mrem)	40CFR190 LIMIT (mrem)	PERCENT OF LIMIT
Whole Body Dose*			
Noble Gas	2.98E-04		
Iodine, Tritium, Particulates	1.99E-03		
Liquid	7.75E-02		
Total Whole Body Dose	7.98E-02	25	3.19E-01
Thyroid Dose			
Iodine, Tritium, Particulates	8.28E-02	75	1.10E-01
Skin Dose			
Noble Gas	1.02E-03	25	4.08E-03
Significant Organ Dose (Thyroid)	8.28E-02	25	3.31E-01

Meteorological Data

Meteorological data on 3½ inch microdisk for January through December 31, 2001, has been submitted with this document to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555.

*Direct radiation from the facility is not distinguishable from natural background and is, therefore, not included in this compilation.

Land Use Census

Land Use Census

Program Design

Each year a Land Use Census is conducted by Davis-Besse in order to update information necessary to estimate radiation dose to the general public and to determine if any modifications are necessary to the Radiological Environmental Monitoring Program (REMP). The Land Use Census is required by Title 10 of the Code of Federal Regulations, Part 50, Appendix I and Davis-Besse Nuclear Power Station Offsite Dose Calculation Manual, Section 5, Assessment of Land Use Census Data. The Land Use Census identifies gaseous pathways by which radioactive material may reach the general population around Davis-Besse. The information gathered during the Land Use Census for dose assessment and input into the REMP ensure these programs are as current as possible. The pathways of concern are listed below:

- **Inhalation Pathway** - Internal exposure as a result of breathing radionuclides carried in the air.
- **Ground Exposure Pathway** - External exposure from radionuclides deposited on the ground
- **Plume Exposure Pathway** - External exposure directly from a plume or cloud of radioactive material.
- **Vegetation Pathway** - Internal exposure as a result of eating vegetables, fruit, etc. which have a build up of deposited radioactive material or which have absorbed radionuclides through the soil.
- **Milk Pathway** - Internal exposure as a result of drinking milk, which may contain radioactive material as a result of a cow or goat grazing on a pasture contaminated by radionuclides.

Methodology

The Land Use Census consists of recording and mapping the locations of the closest residences, dairy cattle and goats, and broad leaf vegetable gardens (greater than 500 square feet) in each meteorological sector within a five mile radius of Davis-Besse.

The surveillance portion of the 2001 Land Use Census was performed during the month of August. In order to gather as much information as possible, the locations of residences, dairy cows, dairy goats, and vegetable gardens were recorded. The residences, vegetable gardens, and milk animals are used in the dose assessment program. The gardens must be at least 500 square feet in size, with at least 20% of the vegetables being broadleaf plants (such as lettuce and cabbage).

Each residence is tabulated as being an inhalation pathway, as well as ground and plume exposure pathways. Each garden is tabulated as a vegetation pathway.

All of the locations identified are plotted on a map (based on the U.S. Geological Survey 7.5 minute series of the relevant quadrangles) which has been divided into 16 equal sectors corresponding to the 16 cardinal compass points (Figure 31). The closest residence, milk animal, and vegetable garden in each sector are determined by measuring the distance from each to the vent at Davis-Besse.

Results

The following changes in the pathways were recorded in the 2001 census:

- **S Sector** – A garden at 5830 meters replaced a garden at 4960 meters
- **SW Sector** - The garden at 5400 meters was replaced by a garden at 5180 meters.
- **WSW Sector** – The garden at 4270 meters was replaced with a garden at 7430 meters.
- **SE Sector** – a residence at 8000 meters was added.
- **SW Sector** – the former closest residence was replaced with a residence at 1070 meters.

The critical receptor identified by the 2001 Land Use Census is a garden in the **W** sector at 1610 meters from Davis-Besse.

The detailed list in Table 26 was used to update the database of the effluent dispersion model used in dose calculations. Table 26 is divided by sectors and lists the distance (in meters) of the closest pathway in each meteorological sector.

Table 27 provided information on pathways, critical age group, atmospheric dispersion (X/Q) and deposition (D/Q) parameters for each sector. This information is used to update the Offsite Dose Calculation Manual (ODCM). The ODCM describes the methodology and parameters used in calculating offsite doses from radioactivity released in liquid and gaseous effluents and in calculating liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints.

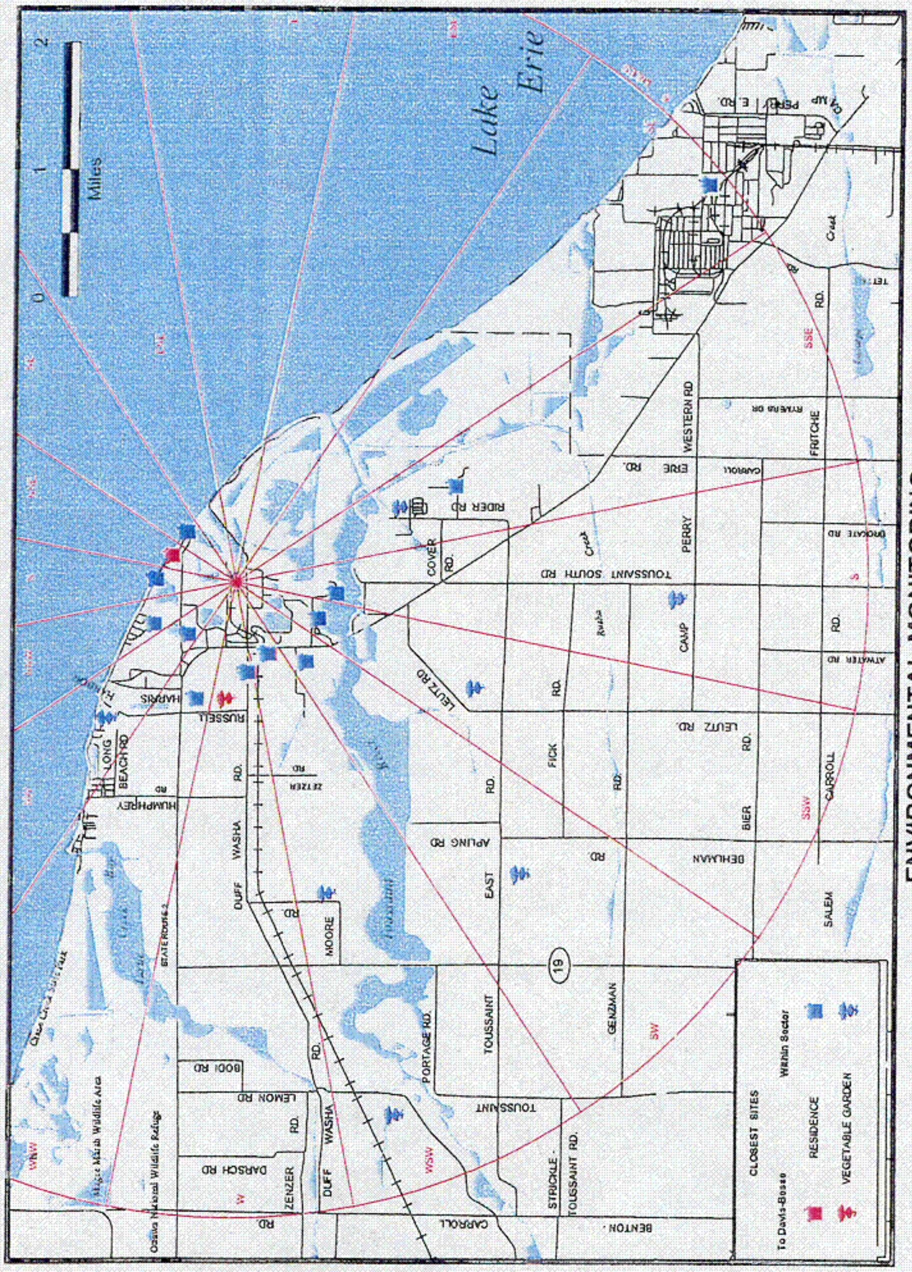
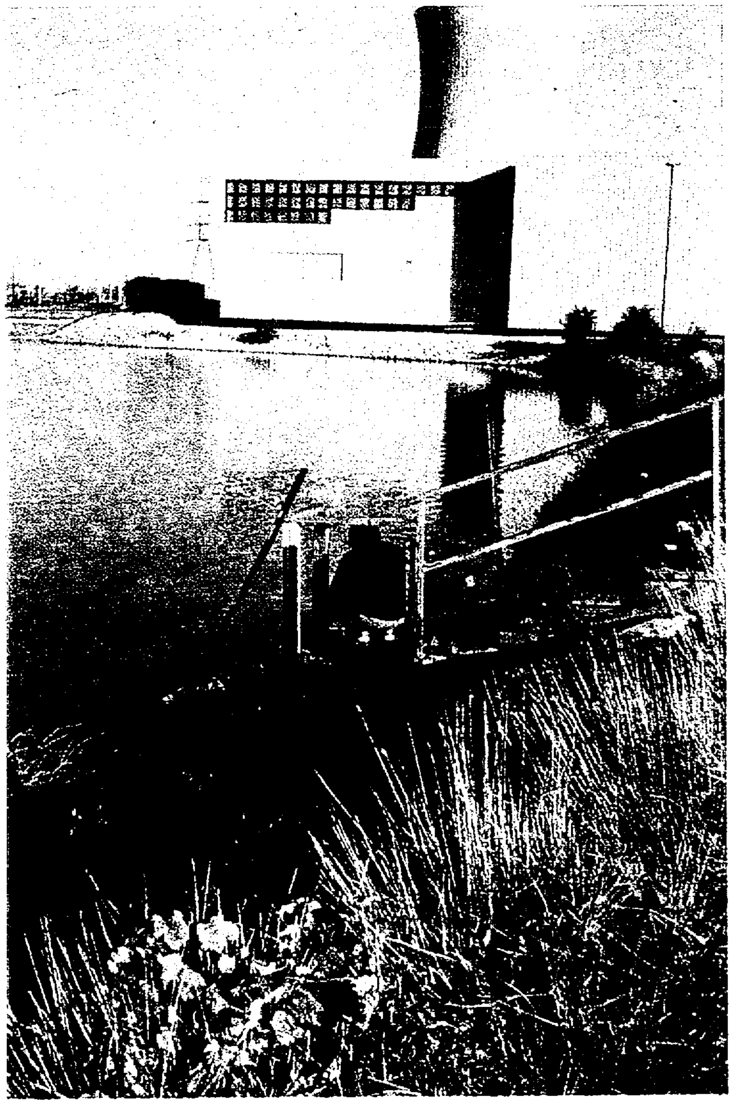


Figure 31: Land Use Census Map

C01



Radioactive Effluent Release Report

Table 26
Closest Exposure Pathways Present in 2001

Sector	Distance from Station (meters)	Closest Pathways
N	880	Inhalation Ground Exposure Plume Exposure
NNE	880	Inhalation Ground Exposure Plume Exposure
NE	900	Inhalation Ground Exposure Plume Exposure
ENE, E, ESE	N/A	Located over Lake Erie
SE**	8000	Inhalation Ground Exposure Plume Exposure
SSE	2860	Vegetation
SSE	1970	Inhalation Ground Exposure Plume Exposure
S**	5830	Vegetation
S	1030	Inhalation Ground Exposure Plume Exposure
SSW	2350	Vegetation
SSW	980	Inhalation Ground Exposure Plume Exposure
SW**	5180	Vegetation
SW**	1070	Inhalation Ground Exposure Plume Exposure

**Changes since 2000

Table 26 (continued)
Closest Exposure Pathways Present in 2001

Sector	Distance from Station (meters)	Closest Pathways
WSW	1540	Inhalation Ground Exposure Plume Exposure
WSW**	7430	Vegetation
W	980	Inhalation Ground Exposure Plume Exposure
W	1610	Vegetation
WNW	1750	Inhalation Ground Exposure Plume Exposure
NW	1490	Inhalation Ground Exposure Plume Exposure
NW	2300	Vegetation
NNW	1270	Inhalation Ground Exposure Plume Exposure

** Changes since 2000

Table 27
Pathway Locations and Corresponding Atmospheric Dispersion (X/Q) and Deposition (D/Q) Parameters

SECTOR	METERS	CRITICAL PATHWAY	AGE GROUP	X/Q (SEC/M^3)	D/Q (M^{-2})
N	880	Inhalation	Child	9.15E-07	8.40E-09
NNE	880	Inhalation	Child	1.24E-06	1.44E-08
NE	900	Inhalation	Child	1.26E-06	1.58E-08
ENE*	---	---	---	---	---
E*	---	---	---	---	---
ESE*	---	---	---	---	---
SE**	8000	Inhalation	Child	3.43E-8	1.45E-10
SSE	2860	Vegetation	Child	6.91E-08	8.13E-10
S**	5830	Vegetation	Child	2.90E-08	1.67E-10
SSW	2350	Vegetation	Child	5.90E-08	1.03E-09
SW**	5180	Vegetation	Child	3.85E-08	3.40E-10
WSW**	7430	Vegetation	Child	3.40E-08	1.80E-10
W	1610	Vegetation	Child	2.77E-07	4.37E-09
WNW	1750	Inhalation	Child	1.46E-07	1.72E-09
NW	2300	Vegetation	Child	6.98 E-08	5.79E-10
NNW	1270	Inhalation	Child	2.41E-07	1.73E-09

* Since these sectors are located over marsh areas and Lake Erie, no ingestion pathways are present.

** Changes since 2000

Non-Radiological Environmental Programs

Non-Radiological Environmental Programs

Meteorological Monitoring

The Meteorological Monitoring Program at Davis-Besse is required by the Nuclear Regulatory Commission (NRC) as part of the program for evaluating the effects of routine operation of nuclear power stations on the surrounding environment. Both NRC regulations and the Davis-Besse Technical Requirements Manual provide guidelines for the Meteorological Monitoring Program. These guidelines ensure that Davis-Besse has the proper equipment, in good working order, to support the many programs utilizing meteorological data.

Meteorological observations at Davis-Besse began in October 1968. The Meteorological Monitoring Program at Davis-Besse has an extensive record of data with which to perform climatological studies which are used to determine whether Davis-Besse has had any impact upon the local climate. After extensive statistical comparative research the meteorological personnel have found no impact upon local climate or short-term weather patterns.

The Meteorological Monitoring Program also provides data that can be used by many other groups and programs: Radiological Environmental Monitoring Program, The Emergency Preparedness Program, The Chemistry Unit, and groups such as Plant Operations, Plant Security, Materials Management, Industrial Safety Program, plant personnel and members of the surrounding community.

The Radiological Environmental Monitoring Program uses meteorological data to aid in evaluating the radiological impact, if any, of radioactivity released in Station effluents. The meteorological data is used to evaluate radiological environmental monitoring sites to assure the program is as current as possible. The Emergency Preparedness Program uses meteorological data to calculate emergency dose scenarios for emergency drills and exercises and uses weather data to plan evacuations or station isolation during adverse weather. The Chemistry Unit uses meteorological data for chemical spill response activities, marsh management studies, and wastewater discharge flow calculations. Plant Operations uses meteorological data for cooling tower efficiency calculations, forebay water level availability and plant work which needs certain environmental conditions to be met before work begins. Plant Security utilizes weather data in their routine planning and activities. Materials Management plans certain plant shipments around adverse weather conditions to avoid high winds and precipitation, which would cause delays in material deliveries and safety concerns. Industrial Safety uses weather and climatological data to advise personnel of unsafe working conditions due to environmental conditions, providing a safer place to work. Legal Affairs uses climatological data for their investigation into adverse weather accidents to the plant and personnel.

On-site Meteorological Monitoring

System Description

At Davis-Besse there are two meteorological systems, a primary and a backup. They are both housed in separate environmentally controlled buildings with independent power supplies. Both primary and backup systems have been analyzed to be "statistically identical" to the other so if one system fails the other can take its place. The instrumentation of each system follows:

PRIMARY	BACKUP
100 Meter Wind Speed	100 Meter Wind Speed
75 Meter Wind Speed	75 Meter Wind Speed
10 Meter Wind Speed	10 Meter Wind Speed
100 Meter Wind Direction	100 Meter Wind Direction
75 Meter Wind Direction	75 Meter Wind Direction
10 Meter Wind Direction	10 Meter Wind Direction
100 Meter Delta Temperature	100 Meter Delta Temperature
75 Meter Delta Temperature	75 Meter Delta Temperature
10 Meter Ambient Temperature	10 Meter Ambient Temperature
10 Meter Dew Point	10 Meter Solar Incidence
Precipitation	

Meteorological Instrumentation

The meteorological system consists of one monitoring site located at an elevation of 577 feet above mean sea level (IGLD 1955)*, a 100m free-standing tower located about 3,000 feet SSW of the cooling tower, and an auxiliary 10m foot tower located 100 feet west of the 100 m tower, are used to gather the meteorological data. The 100m tower has primary and backup instruments for wind speed and wind direction at 100m and 75m. The 100m tower also measures differential temperature (delta Ts): 100-10m and 75-10m. The 10m tower has instruments for wind speed and wind direction. Precipitation is measured by a tipping bucket rain gauge located near the base of the 10m tower.

According to the Davis-Besse Nuclear Power Station Technical Requirements Manual, a minimum of five instruments are required to be operable at the two lower levels (75m and 10m) to measure temperature, wind speed, and wind direction. During 2001, annual data recoveries for all required instruments were 99.27 percent. Minor losses of data occurred during routine instrument maintenance, calibration, and data validation.

Personnel at Davis-Besse inspect the meteorological site and instrumentation regularly. Data is reviewed daily to ensure that all communication pathways, data availability and data reliability are working as required. Tower instrumentation maintenance and semiannual calibrations are performed by in-house facilities and by an outside consulting firm. These instruments are wind tunnel tested to assure compliance with applicable regulations and plant specifications.

* International Great Lakes Data - 1955

Meteorological Data Handling and Reduction

Each meteorological system, primary and backup, have two Campbell Scientific Dataloggers (model 21XL) assigned to them. The primary system has a first datalogger to communicate 900 second averages to the control room via a Digital Alpha computer system. This is a dedicated line. If a failure occurs at any point between the primary meteorological system and the control room the control room can utilize the second data logger in the primary shelter. Each datalogger has its own dedicated communication link with battery backup. The backup meteorological system is designed the same as the primary; so to lose all meteorological data the primary and backup meteorological systems would have to lose all four dataloggers. However, this would be difficult since each is powered by a different power supply and equipped with lightning and surge protection, plus four independent communication lines and datalogger battery backup.

The data from the primary and backup meteorological systems are stored in a 30-day circular storage module with permanent storage held by the Digital Alpha computer. Data goes back to 1988 in this format and to 1968 in both digital and hardcopy formats. All data points are scrutinized every 900 seconds by meteorological statistics programs running continuously. These are then reviewed by meteorological personnel daily for validity based on actual weather conditions. A monthly review is performed using 21 NRC computer codes, which statistically analyze all data points for their availability and validity. If questionable data on the primary system can not be corroborated by the backup system, the data in question is eliminated and not incorporated into the final database. All validated data is then documented and stored on hard copy and in digital format for a permanent record of meteorological conditions.

Meteorological Data Summaries

This section contains Tables 28-30, which summarize meteorological data collected from the on-site monitoring program in 2001.

Wind Speed and Wind Direction

Wind sector graphics represent the frequency of wind direction by sector and the wind speed in mph by sector. This data is used by the NRC to better understand local wind patterns as they relate to defined past climatological wind patterns reported in Davis-Besse's Updated Safety Analysis Report. The maximum measured sustained wind speeds for 2001 were 51.03 mph for the 100m level on April 12, 45.85 mph for the 75m level on October 25, and 39.02mph for the 10m level on April 12.

Figures 32-34 give an annual sector graphic of average wind speed and percent frequency by direction measured at the three monitoring levels. Each wind sector graphic has two radial bars. The darker bar represents the percent of time the wind blew from that direction. The hatched bar represents the average wind speed from that direction. Wind direction sectors are classified using Pasquill Stabilities. Percent calms (less than or equal to 1.0 mph) are shown in the middle of the wind sector graphic.

Ambient and Differential Temperatures

Monthly average, minimum and maximum ambient temperatures for 2001 are given in Table 29. These data are measured at the 10m level; with differential temperatures taken from 100m and 75m levels. The yearly average ambient temperature for 2001 was 51.86°F. The maximum temperature was 92.28°F on August 8 with the minimum temperature of 4.78°F on January 02. Yearly average differential temperatures were -0.21°F (100m), and -0.07°F (75m). Maximum differential temperatures for 100m and 75m levels were 7.99°F on December 11, (100m), and 7.99°F on November 11, (75m). Minimum differential temperatures for 100m and 75m levels were –4.00°F on September 8, (100m) and –2.86°F on April 18, (75m). Differential temperatures are a measurement of atmospheric stability and used to calculate radioactive plume dispersions based on Gaussian Plume Models of continuous effluent releases.

Dew Point Temperatures and Relative Humidity

Monthly average and extreme dew point and humidity temperatures for 2001 are provided in Table 29. These data are measured at the 10 meter level. The average dew point temperature was 43.05°F with a maximum dew point temperature of 77.10°F on July 23. Please note that dew point temperatures above 75°F are highly suspect and are possibly due to calm winds and high solar heating allowing the aspirated dew point processor to retain heat. The minimum dew point (dew point under 32°F is frost point) temperature was 3.76°F on January 9. Average relative humidity is 73.52 percent for the year. The maximum relative humidity was 100.00 percent on November 11. The minimum relative humidity was 27.11 on May 4. It is possible to have relative humidity above 100 percent, which is known as supersaturation. Conditions for super saturation have been met a few times at Davis-Besse due to its close proximity to Lake Erie and the evaporative pool of moisture available by such a large body of water.

Precipitation

Monthly totals and extremes of precipitation at Davis-Besse for 2001 are given in Table 29. Total precipitation for the year was 22.91 inches. The maximum daily precipitation total was 1.34 inches in September. The minimum was 0.19 inches recorded in January. It is likely that precipitation totals recorded in colder months are somewhat less than actual due to snow/sleet blowing across the collection unit rather than accumulating in the gauge.

Lake Breeze and Lake Level Monitoring

Lake Breeze is monitored at Davis-Besse because of its potential to cause major atmospheric/ dispersion problems during an unlikely radioactive release. A lake breeze event occurs during the daytime, usually during the summer, where the land surface heats up faster than the water, and therefore reaches higher temperatures than the water. The warmer air above the land rises faster because it is less dense than the cooler air over the lake. This leads to rising air currents over the land with descending denser air over the lake. This starts a wind circulation, which draws air from the water to the land during the daytime, creating a "Lake Breeze" effect. This event could be problematic if a release were to occur because diffusion would be slow thus creating an adverse atmosphere to the surrounding site.

Lake and forebay levels are monitored at Davis-Besse to observe, evaluate, predict and disseminate high or low lake level information. This data is critical in the running of the plant due to the large amounts of water needed to cool plant components. If water levels get too low the plant operators can take measures for the safe shutdown of the plant. Since Lake Erie is the shallowest of the Great Lakes, it is not uncommon for a plus or minus five feet lake level fluctuation to occur within an eight to ten hour period. High water levels also effect the plant due to emergency transportation and evacuation pathways.

Table 28
Summary of Meteorological Data Recovery for 2001

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2001
100m Wind Speed	100	94.20	100	99.17	100	100	100	100	100	96.64	100	99.73	99.18
100M Wind Direction	100	100	100	99.17	100	100	100	100	100	100	100	99.73	99.91
75M Wind speed	100	100	100	99.17	100	100	100	100	100	96.91	100	99.73	99.65
75M Wind Direction	100	100	100	99.17	100	100	100	100	100	100	100	99.73	99.91
10M Wind Speed	100	100	100	99.17	100	100	100	100	100	97.18	100	99.73	99.67
10M Wind Direction	100	100	100	99.17	100	100	100	100	100	100	100	99.73	99.91
10M Ambient Air Temp	100	100	100	99.17	100	100	99.87	98.92	100	88.31	100	99.73	98.81
10M Dew Point Temp	100	100	100	99.17	100	100	100	100	100	99.73	100	99.73	99.89
Delta T (100M-10M)	100	100	100	99.17	100	100	99.87	98.92	100	88.17	100	99.73	98.80
Delta T (75M-10M)	100	100	100	99.17	100	100	99.87	98.92	100	88.17	100	99.73	98.80
Joint 100M Winds and Delta T (100M-10M)	100	94.20	100	99.17	100	100	99.87	98.92	100	87.23	100	99.73	98.28
Joint 75M Winds and Delta T (100M-10M)	100	100	100	99.17	100	100	99.87	98.92	100	87.37	100	99.73	98.73
Joint 10M Winds and Delta T (75M-10M)	100	100	100	99.17	100	100	99.87	98.92	100	87.37	100	99.73	98.76

*all data for individual months expressed as percent of time instrument was operable during the month, divided by the maximum number of hours in that month that the instrument could be operable. Values for annual data recoveries equals the percent of time instrument was operable during the year, divided by the number of hours in the year that the instrument was operable.

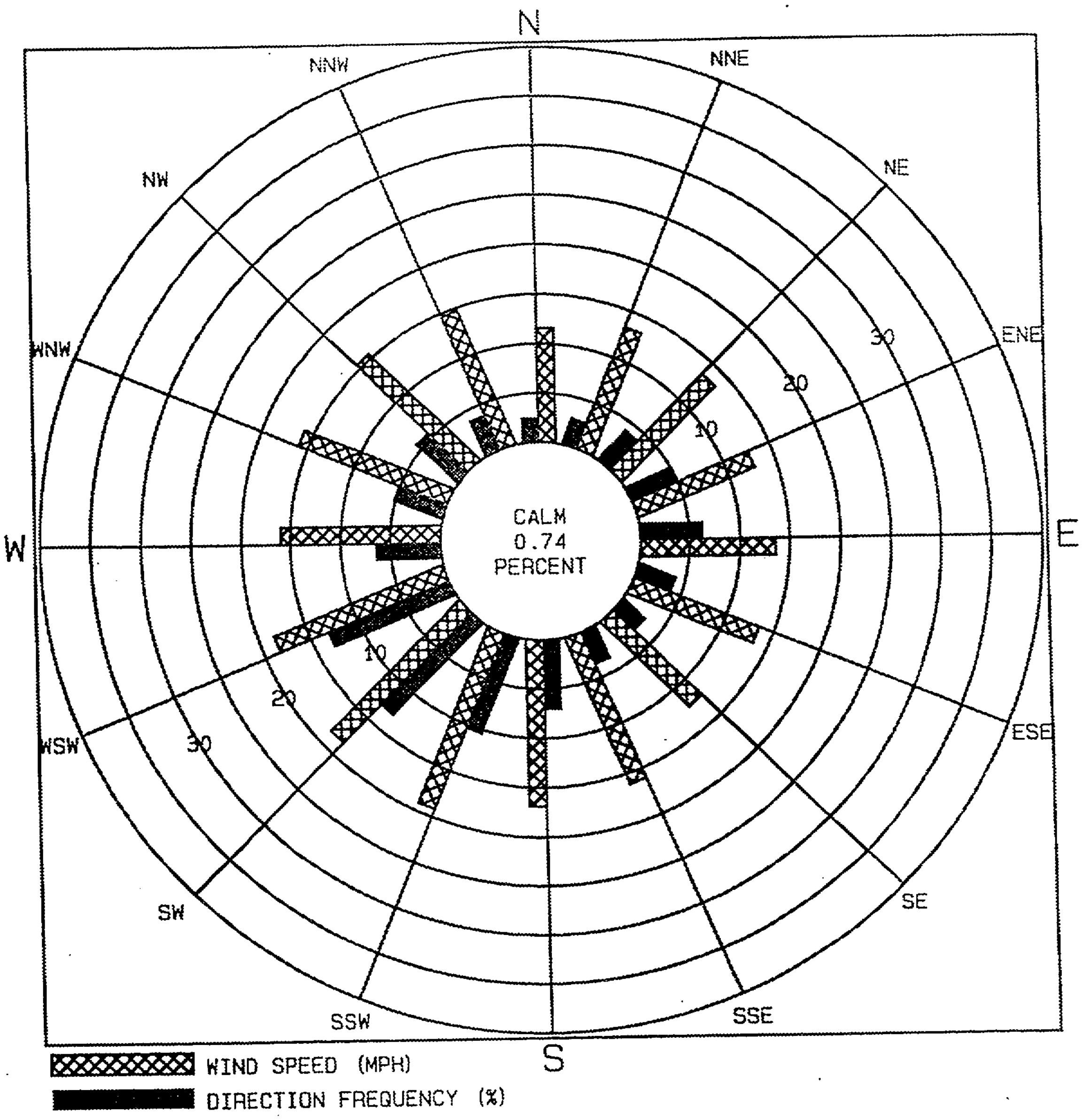
Table 29
Summary of Meteorological Data Measured for 2001

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2001
100M WIND													
Max Speed (mph)	33.83	48.50	41.33	51.03	34.01	38.54	25.32	25.62	32.99	48.35	40.15	35.89	51.03
Date of Max Speed	01/03	02/25	03/06	04/12	05/04	06/12	07/26	08/16	09/24	10/25	11/24	12/14	04/12
Min Speed (mph)	1.33	2.80	2.12	2.46	2.38	1.44	1.42	1.53	0.81	2.13	2.56	1.46	0.81
Date of Min Speed	01/12	02/13	03/29	04/30	05/17	06/08	07/30	08/10	09/30	10/21	11/07	12/11	09/30
Ave Wind Speed	17.42	18.01	16.88	18.13	15.38	12.44	12.73	12.63	15.13	19.73	18.33	18.06	16.25
75M WIND													
Max Speed (mph)	31.90	44.76	39.08	42.93	32.17	35.25	23.17	23.99	31.75	45.85	38.02	34.49	45.85
Date of Max Speed	01/03	02/25	03/06	04/12	05/21	06/12	07/01	08/16	09/24	10/25	11/24	12/14	10/25
Min Speed (mph)	1.94	2.53	1.32	1.96	2.87	1.47	1.65	1.41	1.35	1.94	2.77	1.43	1.32
Date of Min Speed	01/12	02/13	03/19	04/30	05/18	06/08	07/13	08/10	09/15	10/21	11/26	12/11	03/19
Ave Wind Speed	15.80	16.18	15.45	16.54	14.03	11.52	11.88	11.56	13.82	17.99	16.89	16.55	14.83
10M WIND													
Max Speed (mph)	23.44	34.71	29.43	39.02	24.70	22.67	18.83	19.23	22.68	36.02	28.13	25.86	39.02
Date of Max Speed	01/03	02/25	03/06	04/12	05/21	06/12	07/26	08/31	09/24	10/25	11/25	12/14	04/12
Min Speed (mph)	0.98	2.16	0.48	1.05	1.13	1.34	1.39	1.01	1.18	1.57	1.60	1.60	0.48
Date of Min Speed	01/12	02/13	03/19	04/01	05/18	6/05	07/31	08/01	09/15	10/21	11/11	12/17	03/19
Ave Wind Speed	10.08	10.70	10.97	10.82	8.48	7.00	7.68	7.99	8.49	10.66	9.73	10.91	9/36

Table 29 (continued)
Summary of Meteorological Data Measured for 2001

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2001
10M AMBIENT TEMP													
Max (F)	45.78	59.70	52.54	79.37	84.25	90.35	91.15	92.28	87.75	79.8	68.13	67.87	92.28
Date of Max	01/30	02/09	03/22	04/23	05/04	06/15	07/24	08/08	09/07	10/03	11/01	12/05	08/08
Min (F)	4.78	14.73	12.83	29.71	47.94	47.60	56.43	41.21	41.94	34.19	30.55	11.08	4.78
Date of Min	01/02	02/18	03/26	04/17	05/23	06/04	07/02	08/23	09/25	10/28	11/12	12/30	01/02
Ave Temp	26.93	30.83	34.26	51.09	61.52	69.38	72.97	73.34	62.90	53.21	48.16	36.86	51.86
10M DEW POINT TEMP													
Mean (F)	24.55	24.83	26.83	40.68	49.72	57.68	60.99	63.51	53.11	43.42	38.79	31.25	43.05
Max (F)	46.48	51.99	46.48	63.77	67.25	70.60	77.10	76.34	71.53	64.60	58.84	52.64	77.10
Date of Max	01/30	02/09	03/12	04/11	05/17	06.14	07/23	08/09	09/07	10/13	11/02	12/04	07/23
Min (F)	3.76	4.56	7.30	20.73	31.13	43.19	40.10	46.91	37.88	24.21	25.05	7.58	3.76
Date of Min	01/09	02/21	03/26	04/17	05/13	06/01	07/06	08/14	09/26	10/28	11/20	12/30	01/09
PRECIPITATION													
Total (inches)	0.58	1.93	0.70	1.57	3.20	1.41	2.27	2.89	3.61	0.80	1.78	2.17	22.91
Max. in One Day	0.19	0.54	0.22	0.54	0.45	0.38	0.93	1.13	1.34	0.36	0.45	0.91	1.34
Date	01/30	02/09	03/12	04/06	05/15	06/02	07/25	08/22	09/09	10/24	11/29	12/14	09/09

Figure 32
Wind Rose Annual Average 100M



DAVIS-BESSE
ANNUAL 2001
100M LEVEL

Figure 33
Wind Rose Annual Average 75M

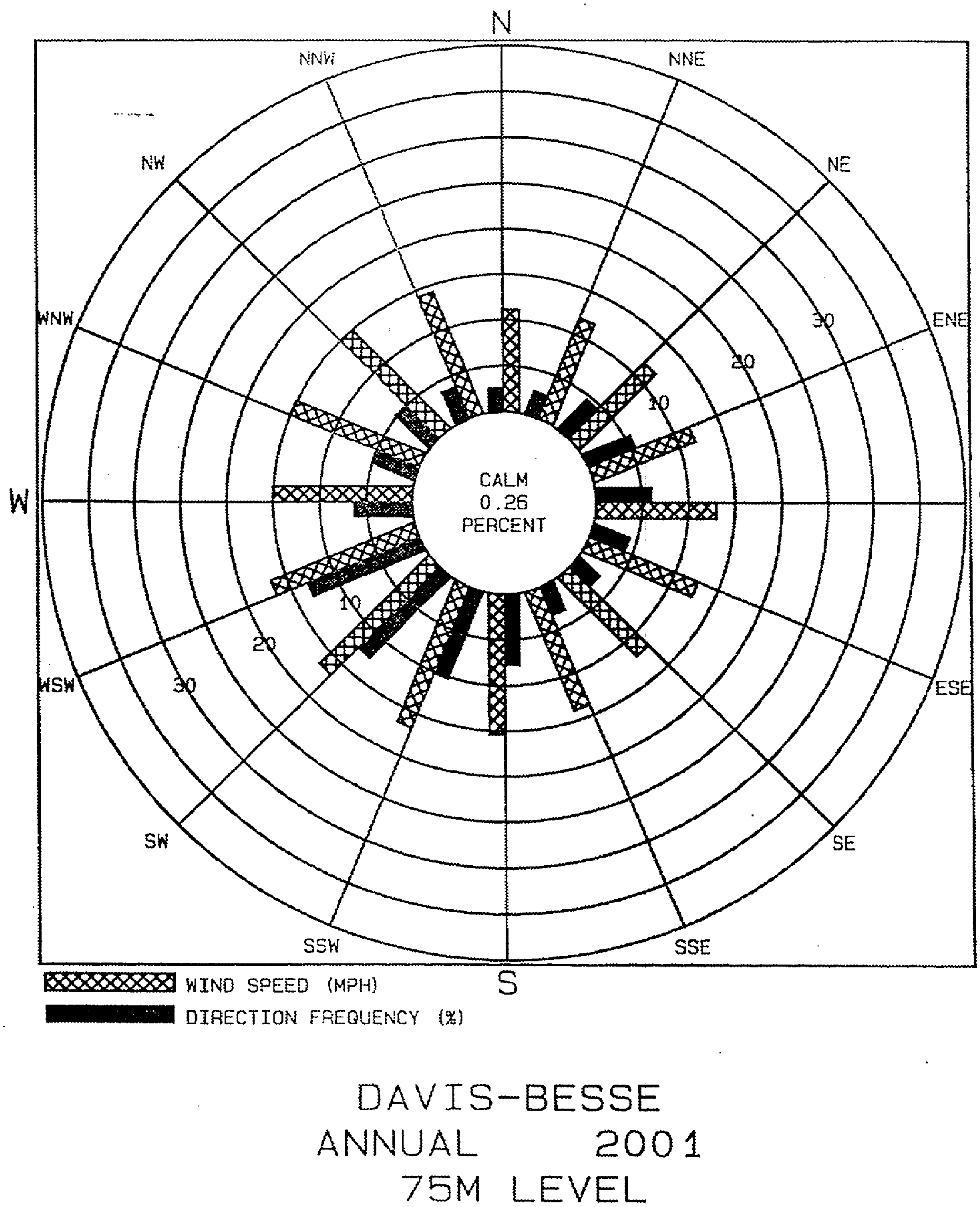
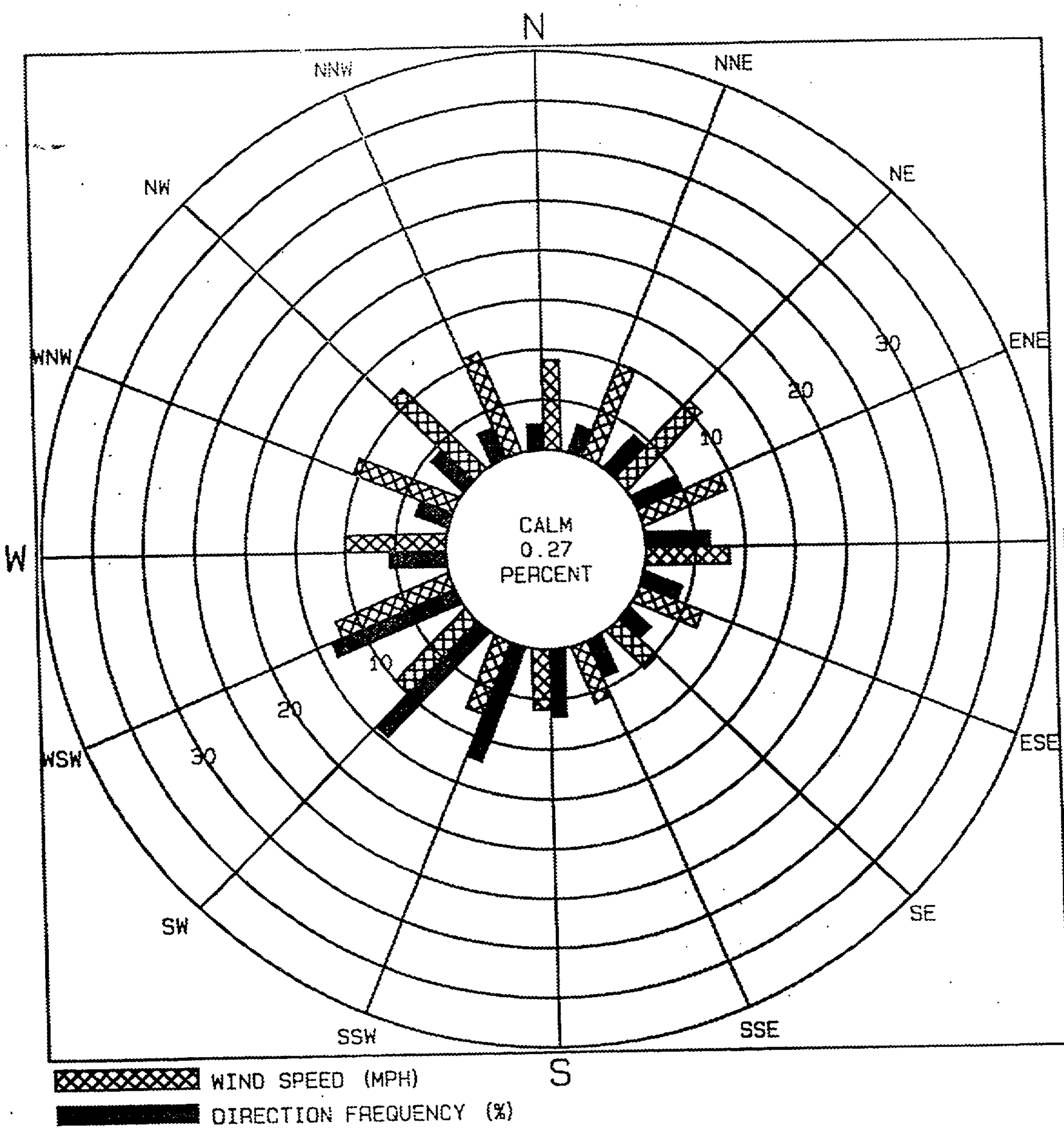


Figure 34
Wind Rose Annual Average 10M



DAVIS-BESSE
ANNUAL 2001
10M LEVEL

Table 30
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT *** * **24-JAN-02 PAGE 91

TIME OF DAY: 05:54:59

PROGRAM: JFD VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ******** SITE IDENTIFIER: 1

DATA PERIOD EXAMINED: 1/ 1/ 1 - 12/ 31/ 1

*** ANNUAL ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.50- 7.49	13	2	0	0	0	0	0	0	0	0	0	0	0	0	2	10	27
7.50-12.49	3	0	0	0	1	0	0	0	0	1	2	1	0	1	12	5	26
12.50-18.49	0	0	0	0	0	0	0	0	0	0	2	3	1	3	14	4	27
18.50-24.49	0	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	5
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTAL	17	4	1	1	2	0	0	0	0	1	4	4	1	5	28	19	87

STABILITY CLASS B

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.50- 7.49	9	8	0	0	0	0	0	0	1	2	1	0	0	1	1	11	34
7.50-12.49	10	1	0	2	4	0	0	0	0	3	11	28	2	0	4	13	78
12.50-18.49	2	0	2	7	3	0	0	0	0	1	12	13	3	2	3	7	55
18.50-24.49	0	2	0	1	0	0	0	0	0	0	0	2	2	1	1	0	9
>24.49	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
TOTAL	21	11	2	10	7	0	0	0	1	6	24	44	8	4	9	31	178

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT *** * **24-JAN-02 PAGE 92
TIME OF DAY: 05:54:59

PROGRAM: JFD VERSION: F77-1.0

SITE IDENTIFIER: 1

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********
DATA PERIOD EXAMINED: 1/ 1/ 1 - 12/ 31/ 1

*** ANNUAL ***

STABILITY CLASS C

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
3.50- 7.49	9	5	2	1	0	1	1	0	2	7	4	5	1	1	4	9	52
7.50-12.49	9	2	2	16	11	2	0	1	1	16	25	36	8	0	8	30	169
12.50-18.49	2	1	1	8	9	0	0	0	0	0	10	35	2	7	9	4	88
18.50-24.49	1	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	14
>24.49	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
TOTAL	22	8	5	25	22	3	1	1	3	25	41	80	14	10	23	44	327

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	5	3	2	5	10	6	12	6	5	3	5	2	1	3	4	2	74
3.50- 7.49	51	65	66	92	110	54	42	34	58	64	58	68	37	36	26	35	896
7.50-12.49	62	72	146	159	168	92	22	29	81	141	165	238	105	66	110	82	1738
12.50-18.49	31	66	85	34	51	10	3	9	7	63	187	286	83	72	94	42	1123
18.50-24.49	9	7	36	11	0	0	0	0	1	7	55	113	21	14	17	19	310
>24.49	0	1	0	0	0	0	0	0	0	0	5	32	2	3	1	9	53
TOTAL	158	214	335	301	339	162	79	78	152	278	475	739	249	194	252	189	4194

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT *** * **24-JAN-02 PAGE 93

TIME OF DAY: 05:54:59

PROGRAM: JFD VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ******** SITE IDENTIFIER: 1

DATA PERIOD EXAMINED: 1/ 1/ 1 - 12/ 31/ 1

*** ANNUAL ***

STABILITY CLASS E

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	1
1.01- 3.49	2	3	4	6	7	19	36	37	36	30	22	14	8	7	5	3	239
3.50- 7.49	11	13	18	49	89	105	81	83	132	185	165	92	72	43	14	8	1160
7.50-12.49	5	13	18	50	64	42	24	36	38	218	194	102	92	35	36	19	986
12.50-18.49	0	2	7	7	4	2	1	8	8	41	70	50	11	13	10	8	242
18.50-24.49	4	1	0	0	0	0	0	1	4	9	10	12	5	0	2	0	48
>24.49	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	4
TOTAL	22	32	47	112	164	168	142	165	218	483	464	271	188	98	67	38	2680

STABILITY CLASS F

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	2
1.01- 3.49	1	4	2	1	2	4	17	32	48	47	23	18	6	5	5	1	216
3.50- 7.49	1	0	2	7	13	25	19	44	102	150	125	43	30	7	7	1	576
7.50-12.49	1	0	0	0	7	10	0	7	5	8	12	11	6	7	1	0	75
12.50-18.49	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	4
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	4	4	8	22	39	36	83	156	206	161	73	42	19	13	2	873

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT ***   * **24-JAN-02   PAGE 94

TIME OF DAY: 05:54:59

PROGRAM: JFD   VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********   SITE IDENTIFIER: 1

DATA PERIOD EXAMINED: 1/ 1/ 1 - 12/ 31/ 1

*** ANNUAL ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	0	0	0	1	2	1	10	20	27	13	12	3	0	0	0	89
3.50- 7.49	0	0	1	0	8	13	10	11	26	66	54	14	2	1	0	1	207
7.50-12.49	0	0	0	1	7	2	1	0	1	1	1	2	0	0	0	0	16
12.50-18.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	1	1	16	17	12	21	47	94	68	28	5	1	0	1	312

STABILITY CLASS ALL

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	3
1.01- 3.49	10	10	8	12	20	31	66	85	109	107	63	46	19	15	14	6	621
3.50- 7.49	94	93	89	149	220	198	153	172	321	474	407	222	142	89	54	75	2952
7.50-12.49	90	88	166	228	264	148	47	73	126	388	410	418	213	109	171	149	3088
12.50-18.49	35	69	95	56	67	12	4	17	16	106	282	388	100	97	130	65	1539
18.50-24.49	14	12	37	13	1	0	0	1	5	18	67	129	30	17	22	20	386
>24.49	0	1	0	0	0	0	0	0	0	0	8	36	3	4	1	9	62
TOTAL	243	273	395	458	572	389	270	348	577	1093	1237	1239	507	331	392	324	8651

Table 30 (continued)
Joint Frequency Distribution by Stability Class

```
*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT ***              * **24-JAN-02        PAGE  95
                                                                  TIME OF DAY:  05:54:59
PROGRAM: JFD      VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********                SITE IDENTIFIER:  1
DATA PERIOD EXAMINED:     1/   1/   1 -   12/  31/   1
                                               *** ANNUAL ***
STABILITY BASED ON: DELTA T      BETWEEN 250.0 AND  35.0 FEET
WIND  MEASURED  AT:  35.0 FEET
WIND THRESHOLD  AT:  1.00 MPH

TOTAL NUMBER OF OBSERVATIONS:  8760
TOTAL NUMBER OF VALID OBSERVATIONS:  8651
TOTAL NUMBER OF MISSING OBSERVATIONS:   109
PERCENT DATA RECOVERY FOR THIS PERIOD:  98.8 %
MEAN WIND SPEED FOR THIS PERIOD:   9.4 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA:      0
```

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
1.01	2.06	3.78	48.48	30.98	10.09	3.61

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	17	4	1	1	2	0	0	0	0	1	4	4	1	5	28	19	0
B	21	11	2	10	7	0	0	0	1	6	24	44	8	4	9	31	0
C	22	8	5	25	22	3	1	1	3	25	41	80	14	10	23	44	0
D	158	214	335	301	339	162	79	78	152	278	475	739	249	194	252	189	0
E	22	32	47	112	164	168	142	165	218	483	464	271	188	98	67	38	1
F	3	4	4	8	22	39	36	83	156	206	161	73	42	19	13	2	2
G	0	0	1	1	16	17	12	21	47	94	68	28	5	1	0	1	0
TOTAL	243	273	395	458	572	389	270	348	577	1093	1237	1239	507	331	392	324	3

Land and Wetlands Management

The Navarre Marsh, which is part of the Ottawa National Wildlife Refuge, makes up 733 acres of wetlands on the southwestern shore of Lake Erie and surrounds the Davis-Besse Nuclear Power Station. The marsh is owned by Toledo Edison and jointly managed by the U.S. Fish and Wildlife Service and Toledo Edison. Navarre Marsh is divided into three pools. The pools are separated from Lake Erie and each other by a series of dikes and revetments. Toledo Edison is responsible for the maintenance and repair of the dikes and controlling the water levels in each of the pools.

A revetment is a retaining structure designed to hold water back for the purposes of erosion control and beach formation. Revetments are built with a gradual slope, which causes waves to dissipate their energy when they strike their large surface area. Beach formation is encouraged through the passive deposition of sediment. A dike is a retaining structure designed to hold water for the purpose of flood control and to aid in the management of wetland habitat. When used as a marsh management tool, dikes help in controlling water levels in order to maintain desired vegetation and animal species. Manipulating water levels is one of the most important marsh management techniques used in the Navarre Marsh. Three major types of wetland communities exist in Navarre Marsh, the freshwater marsh, the swamp forest, and the wet meadow. Also, there exists a narrow dry beach ridge along the lakefront, with a sandbar extending out into Lake Erie. All these areas provide essential food, shelter and nesting habitat, as well as a resting area for migratory birds.

Davis-Besse personnel combine their efforts with a number of conservation agencies and organizations. The Ottawa National Wildlife Refuge, the Ohio Department of Natural Resources (ODNR), and the Black Swamp Bird Observatory work to preserve and enhance existing habitat. Knowledge is gained through research and is used to help educate the public about the importance of preserving wetlands.

With its location along two major migratory flyways, the Navarre Marsh serves as a refuge for a variety of birds in the spring and fall, giving them an area to rest and restore energy reserves before continuing their migration. The Black Swamp Bird Observatory, a volunteer research group, captures, bands, catalogues, and releases songbirds in the marsh during these periods.

Navarre Marsh is also home to wildlife that is typical of much of the marshland in this area, including deer, fox, coyote, muskrats, mink, rabbits, groundhogs, hawks, owls, ducks, geese, herons, snakes and turtles. For the first time in recent history, a pair of mature American Bald Eagles chose the Navarre Marsh as their nesting site in late 1994, and fledged a healthy eaglet in July 1995. The young eagle was one of record 38 eaglets fledged in Ohio in 1995. A new nest was built in 1999-2000, and fledged a pair of eaglets in the summer of 2000. Three more eaglets were fledged at Davis-Besse in 2001, and were part of a record hatch of 104 Ohio eaglets. The state has gone from a low of 4 nests in 1978 to a record of 73 nests in 2001.

Ohio's seventh Federal Junior Duck Stamp Art Contest was held at Davis-Besse. Young Ohio artists in grades K-12 submitted nearly 600 entries in four age brackets. The Junior Duck Stamp Art Contest was designed to teach conservation through the arts and give students a chance to experience the beauty and diversity of wildlife. A total of 101 ribbons were awarded to young Ohio artists, with the state Best-of-Show entry submitted to Washington, D.C. to compete in the national contest with other state Best-of-Show entries. The winner of this competition will be used to make this year's Junior Duck Stamp. The 1996 Ohio Junior Duck Stamp Art Contest winner of Best-of-Show, Adam Grimm, became the youngest artist ever to win the adult Federal Duck Stamp contest. His artwork was displayed on the 2000 federal duck stamp.

Davis-Besse also hosted a Volunteer Eagle Watchers Workshop. Training was given to over 80 volunteers who will be observing Ohio's expanding eagle population during the current breeding and nesting season.

Water Treatment Plant Operation

Description

The Davis-Besse Nuclear Power Station draws water from Lake Erie for its water treatment plant. The lake water is treated with chlorine, lime, and other chemicals to produce high purity water, which is used by many of the Station's cooling systems.

Treatment System

Raw water from Lake Erie enters an intake structure, then passes through traveling screens which will remove debris greater than one-half inch in size. The water is then pumped to chlorine detention tanks. Next, the water passes through one of two clarifiers. Davis-Besse uses upflow clarifiers, or precipitators, to remove sediment, organic debris, and dissolved agents from the raw water prior to filtration. Clarifiers combine the conventional treatment steps of coagulation, flocculation, and sedimentation into a single unit. Coagulation is the process by which a chemical, called a coagulant, is added, causing the small particles in the water to adhere to each other and form larger particles. During flocculation, the water is gently circulated, allowing these conglomerate particles to mass together further. Finally, during sedimentation, large conglomerate particles settle to the bottom of the clarifier. These processes normally require large separate tanks. However, the use of clarifiers saves both space and the manpower needed to operate the treatment plant.

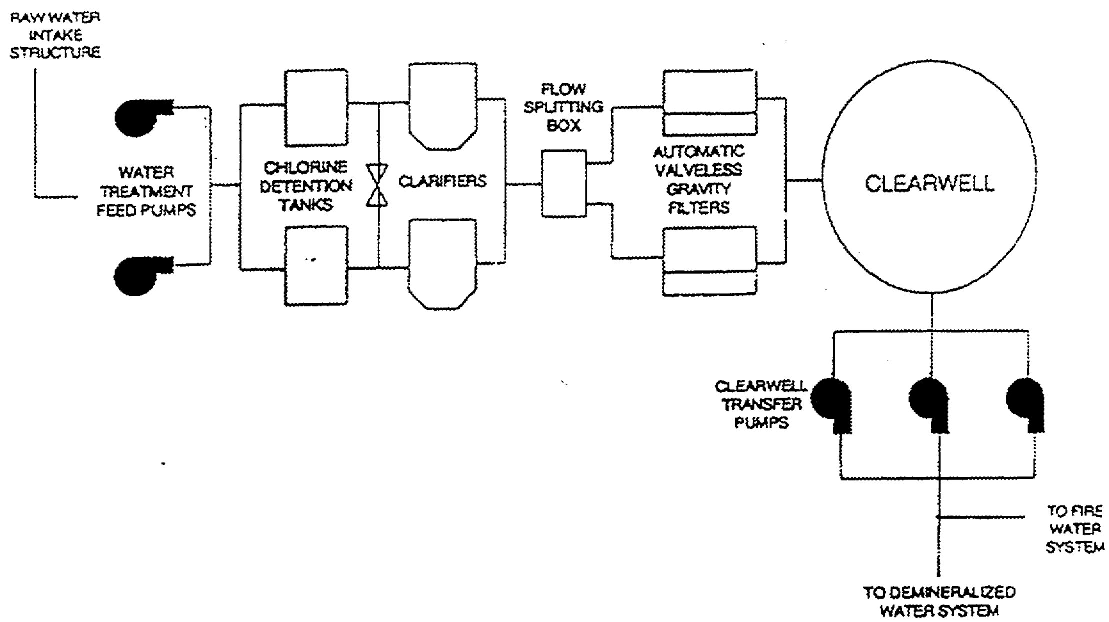


Figure 35: At Davis-Besse, raw water is drawn into the water treatment plant and processed to make water for plant systems.

After the clarifier, the water goes through a flow-splitting box, which equally divides the water flow to the Automatic Valveless Gravity Filters (AVGFs). The AVGFs contain of a 50:50 ratio of anthracite to filter sand. During this filtration process, suspended matter is removed from the water and turbidity is reduced.

After filtration, the water goes to a 32,000-gallon clearwell. The clearwell acts as a reservoir from which water can be drawn as needed for all systems, including firewater and demineralized water.

Domestic Water

When Davis-Besse began operation over 20 years ago, all site domestic water was produced in the Water Treatment Facility. Operation of the domestic water treatment and distribution system, including the collection and analysis of daily samples, was reportable to the Ohio Environmental Protection Agency.

Beginning in December 1998, domestic water needs at Davis-Besse have been met by the Carroll Township Water District. Since the Station no longer produces its own domestic water, these regulatory requirements have been discontinued.

Zebra Mussel Control

Introduction

The plant receives all of its water from an intake system from Lake Erie. Zebra mussels can severely impact the availability of water for plant processes. *Dreissena polymorpha*, commonly known as the zebra mussel, is a native European bivalve that was introduced into North

American waters in 1986 and was discovered in Lake Erie in 1989. Zebra mussels are prolific breeders that rapidly colonize an area by forming byssal threads that enable them to attach to solid surfaces and to each other. Because of their ability to attach in this manner, they may form layers several inches deep. This poses a problem to facilities that rely on water intakes from Lake Erie because mussels may attach to the intake structures and restrict water flow.

Zebra mussels have not caused any significant problems at Davis-Besse, but mussels have been found attached to the intake crib (the structure that allows water to be pulled in from the lake) and the first section of the intake conduit (the pipe that connects the crib to the intake canal).

Mussels have also been found on the trash racks, and the intake bay #3 walls prior to the traveling screens. These mussels are periodically cleaned using high-pressure water. Davis-Besse uses continuous low level chlorination of the intake bays to control the mussels.

The mussel population appears to be leveling off or declining. This is likely due to the increasing clarity of Lake Erie. As the food source for the zebra mussel declines, mussel populations decline correspondingly.

Wastewater Treatment Plant Operation

The WWTP operation is supervised by an Ohio licensed Wastewater Operator. Wastewater generated by site personnel is treated at an onsite extended aeration package treatment facility designed to accommodate up to 38,000 gallons per day. In the treatment process, wastewater from the various collection points around the site enters the facility through a grinder, from where it is distributed to the surge tanks of one or both of the treatment plants.

The wastewater is then pumped into aeration tanks, where it is digested by microorganisms. Oxygen is necessary for good sewage treatment, and is provided to the microbes by blowers and diffusers. The mixture of organics, microorganisms, and decomposed wastes is called activated sludge. The treated wastewater settles in a clarifier, and the clear liquid leaves the clarifier over a weir and exits the plant through an effluent trough. The activated sludge contains the organisms necessary for continued treatment, and is pumped back to the aeration tank to digest incoming wastewater. The effluent leaving the plant is pumped to the wastewater basin (NPDES Outfall 601) where further treatment takes place.

Summary of 2001 Wastewater Treatment Plant Operations

All wastewater parameters were within specifications during the year 2001.

National Pollutant Discharge Elimination System (NPDES) Reporting

The OEPA has established limits on the amount of pollutants that Davis-Besse may discharge to the environment. These limits are regulated through the Station's National Pollutant Discharge Elimination System (NPDES) permit, number 2IB00011. Parameters such as chlorine, suspended solids and pH are monitored under the NPDES permit. Toledo Edison personnel prepare the NPDES Reports and submit them to the OEPA each month.

Davis-Besse has eight sampling points described in the NPDES permit. Seven of these locations are discharge points, or *outfalls,* and one is a temperature monitoring location. Descriptions of these sampling points follow:

Outfall 001

Collection Box: a point representative of discharge to Lake Erie
Source of Wastes: Low volume wastes (Outfalls 601 and 602), Circulating Water system blowdown and service water

Outfall 002

Area Runoff: Discharge to Toussaint River
Source of Wastes: Storm water runoff, Circulating Water pump house sumps

Outfall 003

Screenwash Catch Basin: Outfall to Navarre Marsh
Source of Wastes: Backwash water and debris from water intake screens

Outfall 004

Cooling Tower Basin Ponds: Outfall to State Route 2 Ditch
Source of Wastes: Circulating Water System drain (only during system outages)

Outfall 588

Sludge Monitoring
Source of Wastes: Wastewater Plant sludge shipped for offsite processing

Outfall 601

Wastewater Plant Tertiary Treatment Basin: Discharge from Wastewater Treatment Plant
Sources of Wastes: Wastewater Treatment Plant

Outfall 602

Low volume wastes: Discharge from settling basins
Sources of wastes: Water treatment residues, Condensate Polishing Holdup Tank decantation and Condensate Pit sumps

Sampling Point 801

Intake Temperature: Intake water prior to cooling operation

2001 NPDES Summary

During 2001, the NPDES permit was renewed by the Ohio EPA. This permit expired on October 31, 2000, and a renewal application was submitted in May, 2000. The permit will be effective for 5 years, after which a new permit will be negotiated. A new sampling requirement with outfall designation 004 was added to the permit renewal application. This will be used to monitor water drained from the Circulating Water System during outages. Two violations of the NPDES permit occurred during 2001. The discharge limitation for Total Suspended Solids at Outfall 601 and the Total Residual Chlorine at Outfall 001 were each exceeded once.

Chemical Waste Management

The Chemical Waste Management Program for hazardous and nonhazardous chemical wastes generated at the Davis-Besse Nuclear Power Station was developed to ensure wastes are managed and disposed of in accordance with all applicable state and federal regulations.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is the statute which regulates solid hazardous waste. Solid waste is defined as a solid, liquid, semi-solid, or contained gaseous material. The major goals of RCRA are to establish a hazardous waste regulatory program to protect human health and the environment and to encourage the establishment of solid waste management, resource recovery, and resource conservation systems. The intent of the hazardous waste management program is to control hazardous wastes from the time they are generated until they are properly disposed of, commonly referred to as "cradle to grave" management. Anyone who generates, transports, stores, treats, or disposes of hazardous waste are subject to regulation under RCRA.

Under RCRA, there are essentially three categories of waste generators:

- Large quantity Generators - A facility which generates 1000 kilograms/month (2200 lbs./month) or more.
- Small quantity Generators - A facility which generates less than 1000 kilograms/ month (2200 lbs./month).
- Conditionally Exempt Small Quantity Generators - A facility which generates 100 kilograms/month (220 lbs./month).

In 2001, the Davis-Besse Nuclear Power Station qualified as a small quantity generator, generating 5,770 pounds of hazardous waste. Davis-Besse personnel also continuously strives to identify alternate ways of reducing hazardous waste generation.

Non-hazardous waste disposed of in 2001 included 2,250 gallons of used oil, 385 gallons of oil filters and solid oily debris. Other non-hazardous regulated waste generated included 505 gallons of other chemicals such as microfilm process chemicals and polystyrene resins.

RCRA mandates other requirements such as the use of proper storage and shipping containers, labels, manifests, reports, personnel training, a spill control plan and an accident contingency plan. These are part of the Chemical Management Program at Davis-Besse. The following are completed as part of the hazardous waste management program and RCRA regulations:

- Weekly Inspections of the Chemical Waste Accumulation Areas are designated throughout the site to ensure proper handling and disposal of chemical waste. These, along with the Chemical Waste Storage Area, are routinely patrolled by security personnel and inspected weekly by Environmental and Chemistry personnel. All areas used for storage or accumulation of hazardous waste are posted with warning signs and drums are color-coded for easy identification of waste categories.

- Waste Inventory Forms are placed on waste accumulation drums or provided in the accumulation area for employees to record the waste type and amount when chemicals are added to the drum. This ensures that incompatible wastes are not mixed and also identifies the drum contents for proper disposal.

Other Environmental Regulating Acts

Comprehensive Environmental Response, Compensation and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) established a federal authority and source of funding for responding to spills and other releases of hazardous materials, pollutants and contaminants into the environment. Superfund establishes "reportable quantities" for several hundred hazardous materials and regulates the cleanup of abandoned hazardous waste disposal sites.

Superfund Amendment and Reauthorization Act (SARA)

Superfund was amended in October 1986 to establish new reporting programs dealing with emergency preparedness and community right-to-know laws. As part of this program, CERCLA is enhanced by ensuring that the potential for release of hazardous substances is minimized, and that adequate and timely responses are made to protect surrounding populations.

Davis-Besse conducts site-wide inspections to identify and record all hazardous products and chemicals onsite as required by SARA. Determinations are made as to which products and chemicals are present in reportable quantities.

Annual SARA reports are submitted to local fire departments and state and local planning commissions by March 1 for the preceding calendar year. One additional water treatment chemical product was identified for calendar year 2001 .

Toxic Substances Control Act (TSCA)

The Toxic Substance Control Act (TSCA) was enacted to provide the USEPA with the authority to require testing of new chemical substances for potential health effects before they are introduced into the environment, and to regulate them where necessary. This law would have little impact on utilities except for the fact that one family of chemicals, polychlorinated biphenyls (PCBs), has been singled out by TSCA. This has resulted in an extensive PCB management system, very similar to the hazardous waste management system established under RCRA.

In 1992, Davis-Besse completed an aggressive program that eliminated PCB transformers onsite. PCB transformers were either changed out with non-PCB fluid transformers or retrofilled with non-PCB liquid.

Retro-filling PCB transformers involves flushing the PCB fluid out of a transformer, refilling it with PCB-leaching solvents and allowing the solvent to circulate in the transformer during operation. The entire retro-fill process takes several years and will extract almost all of the PCB. In all, Davis-Besse performed retro-fill activities on eleven PCB transformers between 1987 and 1992. The only remaining PCB containing equipment onsite are a limited number of capacitors. These capacitors are being replaced and disposed of during scheduled maintenance activities.

Clean Air Act

The Clean Air Act identifies substances that are considered air pollutants. Davis-Besse holds an OEPA permit to operate an Air Contaminant Source for the station Auxiliary Boiler. This boiler is used to heat the station and provide steam to plant systems when the reactor is not operating. A report detailing the Auxiliary Boiler operation is submitted annually.

The Ohio EPA has granted an exemption from permitting our six emergency diesel engines, including the Station Blackout Diesel Generator, the 2 Emergency Diesel Generators, the Emergency Response Facility Diesel Generator, the Miscellaneous Diesel, and the Fire Pump Diesel. These sources are operated infrequently to verify their reliability, and would only be used in the event of an emergency.

In response to recent "Clean Air Act Title V" legislation, an independent study identifying and quantifying all of the air pollution sources onsite was performed. Of particular significance is asbestos removal from renovation and demolition projects for which USEPA has outlined specific regulations concerning handling, removal, environmental protection, and disposal. Also, the Occupational Safety and Health Protection Administration (OSHA) strictly regulates asbestos with a concern for worker protection. Removal teams must meet medical surveillance, respirator fit tests, and training requirements prior to removing asbestos-containing material. Asbestos is not considered a hazardous waste by RCRA, but the EPA does require special handling and disposal of this waste under the Clean Air Act.

Transportation Safety Act

The transportation of hazardous chemicals, including chemical waste, is regulated by the Transportation Safety Act of 1976. These regulations are enforced by the United States Department of Transportation (DOT) and cover all aspects of transporting hazardous materials, including packing, handling, labeling, marking, and placarding. Before any wastes are transported off site, Davis-Besse must ensure that the wastes are identified, labeled and marked according to DOT regulations, including verification that the vehicle has appropriate placards and it is in good operating condition.

Other Environmental Programs

Underground Storage Tanks

According to RCRA, facilities with Underground Storage Tanks (USTs) are required to notify the State. This regulation was implemented in order to provided protection from tank contents leaking and causing damage to the environment. Additional standards require leak detection systems and performance standards for new tanks. At Davis-Besse two 40,000 gallon and one 8,000 gallon diesel fuel storage tanks are registered USTs.

Spill Kits

Spill control equipment is maintained throughout the Station at chemical storage areas and hazardous chemical and oil use areas. Equipment in the kits may include chemical-resistant coveralls, gloves, boots, decontamination agents, absorbent cloth, goggles and warning signs.

Waste Minimization and Recycling

Municipal Solid Waste (MSW) is normal trash produced by individuals at home and by industries. In some communities, MSW is burned in specially designed incinerators to produce power or is separated into waste types (such as aluminum, glass, and paper) and recycled. The vast majority of MSW is sent to landfills for disposal. As the population increases and older landfills reach their capacity, MSW disposal becomes an important economic, health, and resource issue.

The State of Ohio has addressed the issue with the State Solid Waste Management Plan, otherwise known as Ohio House Bill 592. The intent of the bill is to extend the life of existing landfills by reducing the amount of MSW produced, by reusing certain waste material, and by recycling other wastes. This is frequently referred to as **"Reduce, Reuse,** and **Recycle."**

Davis-Besse has implemented and participated in company wide programs that emphasize the reduction, reuse, recycle approach to MSW management. An active Investment Recovery Program has greatly contributed to the reduction of both hazardous and municipal waste generated by evaluating options for uses of surplus materials prior to the materials entering Davis-Besse's waste streams. Such programs include paper, cardboard, aluminum cans, used tires, and metals recycling or recovery. Paper and cardboard recycling is typically in excess of 50 tons annually. This represents a large volume of recyclable resources, which would have otherwise been placed in a landfill. Aluminum soft drink cans are collected for the Boy Scouts of America to recycle. Additionally, lead-acid batteries are recycled and tires are returned to the seller for proper disposal.

Although scrap metal is not usually considered part of the MSW stream, Davis-Besse does collect and recycle scrap metals, which are sold at current market price to a scrap dealer for resource recovery. These programs are continuously being expanded and reinforced as other components of MSW stream are targeted for reduction.

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental, Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2001 through December, 2001

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples (e.g., milk or water) containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

The results in Table A-1 were obtained through participation in the environmental sample crosscheck program for milk, water and air filters during the past twelve months. Data for previous years is available upon request.

This program was conducted by the U.S. Environmental Protection Agency Office of Research and Development National Exposure Research Laboratory Characterization Research Division-Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via various International Intercomparisons of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of crosscheck testing with Teledyne Brown Engineering are also listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

12-31-01

ATTACHMENT A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One Standard Deviation for single determinations
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	> 0.1 g/liter or kg	5% of known value
Gross alpha	20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	4,000 pCi/liter	1s = (pCi/liter) = 169.85 x $(known)^{0.0933}$
	> 4,000 pCi/liter	10% of known value
Radium-226,-228	0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	55 pCi/liter >55 pCi/liter	6.0 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	35 pCi/liter > 35 pCi/liter	6.0 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Others[b]	--	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory result[c]	ERA Result[d]	Control Limits
STW-897	WATER	Jan, 2001	Gr. Alpha	31.9 ± 2.1	45.7 ± 11.4	25.9 - 65.5
STW-897	WATER	Jan, 2001	Gr. Beta	25.3 ± 2.7	16.7 ± 5.0	8.0 - 25.4
STW-900	WATER	Feb, 2001	I-131	27.2 ± 0.8	28.3 ± 3.0	23.1 - 33.5
STW-902	WATER	Feb, 2001	Ra-226	4.0 ± 0.1	4.7 ± 0.7	3.4 - 5.9
STW-902	WATER	Feb, 2001	Ra-228	13.8 ± 0.4	14.4 ± 3.6	8.2 - 20.6
STW-902	WATER	Feb, 2001	Uranium	17.0 ± 0.3	20.4 ± 3.0	15.2 - 25.6
STW-903	WATER	Mar, 2001	H-3	17,400.0 ± 69.7	17,800.0 ± 1,780.0	14,700.0 - 20,900.0
STW-917	WATER	Apr, 2001	Gr. Alpha	57.4 ± 3.5	56.0 ± 14.0	31.8 - 80.2
STW-917	WATER	Apr, 2001	Ra-226	13.5 ± 0.4	17.7 ± 2.7	13.1 - 22.3
STW-917	WATER	Apr, 2001	Ra-228	10.1 ± 0.6	8.1 ± 2.0	4.6 - 11.6
STW-917	WATER	Apr, 2001	Uranium	14.2 ± 0.2	15.6 ± 3.0	10.4 - 20.8
STW-918	WATER	Apr, 2001	Co-60	27.9 ± 1.4	26.4 ± 5.0	17.7 - 35.1
STW-918	WATER	Apr, 2001	Cs-134	16.0 ± 0.4	16.9 ± 5.0	8.2 - 25.6
STW-918	WATER	Apr, 2001	Cs-137	195.4 ± 1.5	186.0 ± 9.3	170.0 - 202.0
STW-918	WATER	Apr, 2001	Gr. Beta	340.0 ± 51.0	343.0 ± 1.7	252.0 - 428.0
STW-918	WATER	Apr, 2001	Sr-89	62.8 ± 5.7	64.1 ± 5.0	55.5 - 72.8
STW-918	WATER	Apr, 2001	Sr-90	34.2 ± 1.6	33.8 ± 5.0	25.1 - 42.5
STW-919	WATER	Jun, 2001	Ba-133	37.8 ± 1.2	36.0 ± 5.0	27.3 - 44.7
STW-919	WATER	Jun, 2001	Co-60	49.9 ± 0.7	46.8 ± 5.0	38.1 - 55.5
STW-919	WATER	Jun, 2001	Cs-134	16.0 ± 1.4	15.9 ± 5.0	7.2 - 24.6
STW-919	WATER	Jun, 2001	Cs-137	208.0 ± 1.7	197.0 ± 9.9	180.0 - 214.0
STW-919	WATER	Jun, 2001	Zn-65	37.8 ± 0.7	36.2 ± 5.0	27.5 - 44.9
STW-920	WATER	Jun, 2001	Ra-226	14.6 ± 0.4	15.4 ± 2.3	11.4 - 19.4
STW-920	WATER	Jun, 2001	Ra-228	6.2 ± 0.2	4.5 ± 1.1	2.6 - 6.5
STW-920	WATER	Jun, 2001	Uranium	49.0 ± 1.0	55.7 ± 5.6	46.1 - 65.3
STW-921	WATER	Jul, 2001	Sr-89	19.8 ± 1.5	31.2 ± 5.0	22.5 - 39.9
Delay in processing may have attributed to deviation. Result of reanalysis; Sr-89, 35.3 ± 4.4 pCi/L. Sr-90, 25.0 ± 2.8 pCi/L.						
STW-921	WATER	Jul, 2001	Sr-90	26.3 ± 1.1	25.9 ± 5.0	17.2 - 34.6
STW-922	WATER	Jul, 2001	Gr. Alpha	23.3 ± 1.9	17.8 ± 5.0	9.1 - 26.5
STW-922	WATER	Jul, 2001	Gr. Beta	48.5 ± 4.6	53.0 ± 10.0	35.7 - 70.3
STW-924	WATER	Aug, 2001	H-3	2,680.0 ± 41.9	2,730.0 ± 356.0	2,110.0 - 3,350.0
STW-931	WATER	Sep, 2001	Ra-226	10.9 ± 0.2	10.8 ± 1.6	8.0 - 13.6
STW-931	WATER	Sep, 2001	Ra-228	9.7 ± 1.1	9.0 ± 2.2	5.1 - 12.8
STW-931	WATER	Sep, 2001	Uranium	11.2 ± 0.1	13.1 ± 3.0	7.9 - 18.3
STW-932	WATER	Oct, 2001	I-131	7.7 ± 0.3	7.7 ± 2.0	4.2 - 11.2
STW-933	WATER	Oct, 2001	Gr. Alpha	82.2 ± 4.0	97.5 ± 24.4	55.3 - 140.0
STW-933	WATER	Oct, 2001	Ra-226	9.5 ± 1.2	10.8 ± 1.6	8.0 - 13.6

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory result[c]	ERA Result[d]	Control Limits
STW-933	WATER	Oct, 2001	Ra-228	17.0 ± 0.8	15.6 ± 3.9	8.9 - 22.4
STW-933	WATER	Oct, 2001	Uranium	32.2 ± 1.4	37.2 ± 3.7	30.7 - 43.6
STW-934	WATER	Oct, 2001	Co-60	82.4 ± 0.9	78.4 ± 5.0	69.7 - 87.1
STW-934	WATER	Oct, 2001	Cs-134	52.2 ± 1.3	54.1 ± 5.0	45.4 - 62.8
STW-934	WATER	Oct, 2001	Cs-137	39.4 ± 0.6	37.9 ± 5.0	26.3 - 43.7
STW-934	WATER	Oct, 2001	Gr. Beta	166.0 ± 7.1	192.0 ± 28.8	142.0 - 242.0
STW-934	WATER	Oct, 2001	Sr-89	12.8 ± 0.8	16.7 ± 5.0	8.0 - 25.4
STW-934	WATER	Oct, 2001	Sr-90	6.8 ± 0.7	7.7 ± 5.0	-1.0 - 16.4
STW-935	WATER	Oct, 2001	Gr. Alpha	63.5 ± 2.5	64.0 ± 16.0	36.5 - 91.5
STW-935	WATER	Oct, 2001	Gr. Beta	26.0 ± 1.2	21.5 ± 5.0	12.8 - 30.2
STW-938	WATER	Nov, 2001	Ba-133	66.7 ± 1.2	69.3 ± 6.9	57.5 - 81.1
STW-938	WATER	Nov, 2001	Co-60	59.3 ± 0.6	59.7 ± 5.0	51.0 - 68.4
STW-938	WATER	Nov, 2001	Cs-134	86.7 ± 1.5	93.9 ± 5.0	85.2 - 103.0
STW-938	WATER	Nov, 2001	Cs-137	45.0 ± 1.0	42.0 ± 5.0	33.3 - 50.7
STW-938	WATER	Nov, 2001	Zn-65	80.7 ± 0.6	77.3 ± 7.7	63.9 - 90.7

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the environmental samples crosscheck program operated by Environmental Resources Associates (ERA).

[b] All results are in pCi/L, except for elemental potassium (K) data in milk, which are in mg/L; air filter samples, which are in pCi/Filter.

[c] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

				mR		
Lab Code	TLD Type	Date	Measurement	Known Value	Lab result ± 2 Sigma	Control Limits
Teledyne Brown Engineering						
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #1	17.8	14.4 ± 0.2	12.46 - 23.14
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #2	35.5	32.4 ± 0.1	24.85 - 46.15
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #3	62.2	61.8 ± 0.9	43.54 - 80.86
Teledyne Brown Engineering						
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #1	17.8	21.3 ± 0.3	12.46 - 23.14
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #2	35.5	40.1 ± 1.9	24.85 - 46.15
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #3	62.2	69.9 ± 3.5	43.54 - 80.86
Chips and cards irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March of 2000.						
12th International Intercomparison						
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field	161.0	184.9 ± 1.9	112.70 - 209.30
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 1	548.0	502.2 ± 1.7	383.60 - 712.40
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 2	391.0	412.0 ± 2.9	273.70 - 508.30
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 3	623.0	643.2 ± 2.9	436.10 - 809.90
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Lab, 1	391.0	442.8 ± 2.5	273.70 - 508.30
Environmental, Inc.						
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #1	4.0	3.7 ± 0.1	2.79 - 5.17
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #1	4.0	3.4 ± 0.1	2.79 - 5.17
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #2	7.1	7.9 ± 0.2	4.95 - 9.19
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #2	7.1	7.6 ± 0.3	4.95 - 9.19
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #3	15.9	18.6 ± 0.4	11.13 - 20.67
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #3	15.9	19.6 ± 0.1	11.13 - 20.67
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #4	63.6	78.2 ± 1.2	44.53 - 82.69
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #4	63.6	79.9 ± 2.5	44.53 - 82.69

Table A-3. In-house "spike" samples.

				Concentration in pCi/L[a]		
Lab Code	Sample Type	Date Collected	Analysis	Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPAP-477	Air Filter	Jan, 2001	Cs-137	1.76 ± 0.02	1.68	1.01 - 2.35
SPW-479	Water	Jan, 2001	H-3	54702.00 ± 644.00	54549.00	43639.20 - 65458.80
SPW-481	Water	Jan, 2001	Gr. Alpha	58.08 ± 2.79	69.14	34.57 - 103.71
SPW-481	Water	Jan, 2001	Gr. Beta	213.83 ± 3.07	220.26	198.23 - 242.29
SPW-482	Water	Jan, 2001	Gr. Alpha	51.77 ± 2.18	69.14	34.57 - 103.71
SPW-482	Water	Jan, 2001	Gr. Beta	202.48 ± 2.98	220.26	198.23 - 242.29
SPW-483	Water	Jan, 2001	Ra-226	20.11 ± 0.34	20.86	14.60 - 27.12
SPW-483	Water	Jan, 2001	Ra-228	10.55 ± 2.02	19.43	13.60 - 25.26
Sample was lost during analysis.						
SPW-485	Water	Jan, 2001	Co-60	33.53 ± 3.40	31.13	21.13 - 41.13
SPW-485	Water	Jan, 2001	Cs-134	32.80 ± 2.54	30.81	20.81 - 40.81
SPW-485	Water	Jan, 2001	Cs-137	42.10 ± 5.60	36.00	26.00 - 46.00
SPW-485	Water	Jan, 2001	Sr-90	154.34 ± 3.49	137.66	110.13 - 165.19
SPAP-754	Air Filter	Jan, 2001	Gr. Beta	8.53 ± 0.02	7.88	-2.12 - 17.88
SPW-1037	Water	Feb, 2001	U-233/4	3.74 ± 0.10	4.17	2.50 - 5.84
SPW-1037	Water	Feb, 2001	U-238	3.81 ± 0.10	4.17	-7.83 - 16.17
SPW-1224	Water	Feb, 2001	Ra-226	21.25 ± 0.50	20.68	14.48 - 26.88
SPW-1224	Water	Feb, 2001	Ra-228	21.76 ± 2.65	19.27	13.49 - 25.05
SPW-1225	Water	Feb, 2001	Gr. Alpha	71.87 ± 3.07	69.14	34.57 - 103.71
SPW-1225	Water	Feb, 2001	Gr. Beta	36.30 ± 1.47	28.75	18.75 - 38.75
SPW-1272	Water	Feb, 2001	I-131	56.82 ± 0.71	63.05	50.44 - 75.66
SPW-1272	Water	Feb, 2001	I-131(g)	65.69 ± 10.21	63.05	53.05 - 73.05
SPVE-1274	Vegetation	Feb, 2001	I-131(g)	0.78 ± 0.05	0.76	0.45 - 1.06
SPCH-1276	Charcoal	Feb, 2001	I-131(g)	1.57 ± 0.05	1.58	0.95 - 2.21
SPMI-1270	Milk	Mar, 2001	Cs-134	31.89 ± 4.71	29.77	19.77 - 39.77
SPMI-1270	Milk	Mar, 2001	Cs-137	46.61 ± 8.81	35.90	25.90 - 45.90
The Cs-137 spike is suspect; A new cesium spike has been prepared.						
SPMI-1270	Milk	Mar, 2001	I-131(g)	81.92 ± 10.80	81.95	71.95 - 91.95
SPU-2901	Urine	Mar, 2001	H-3	51512.00 ± 1369.00	50189.00	40151.20 - 60226.80
SPW-2161	Water	Mar, 2001	Ra-228	29.92 ± 5.13	31.75	22.23 - 41.28
SPU-3128	Urine	Apr, 2001	H-3	2065.00 ± 408.00	2008.00	1317.37 - 2698.63
SPW-3129	Water	Apr, 2001	Gr. Alpha	37.94 ± 2.42	34.57	17.29 - 51.86

Table A-3. In-house "spike" samples.

				Concentration in pCi/L[a]		
Lab Code	Sample Type	Date Collected	Analysis	Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3129	Water	Apr, 2001	Gr. Beta	117.83 ± 2.37	109.46	98.51 - 120.41
SPAP-3508	Air Filter	Apr, 2001	Gr. Beta	0.80 ± 0.01	0.78	-9.22 - 10.78
SPMI-3232	Milk	Apr, 2001	Cs-134	32.69 ± 6.50	33.96	23.96 - 43.96
SPMI-3232	Milk	Apr, 2001	Cs-137	44.20 ± 9.08	35.79	25.79 - 45.79
SPMI-3232	Milk	Apr, 2001	I-131	48.05 ± 0.90	56.68	45.34 - 68.02
SPMI-3232	Milk	Apr, 2001	I-131(g)	55.64 ± 11.39	56.68	46.68 - 66.68
SPMI-3232	Milk	Apr, 2001	Sr-90	143.77 ± 3.04	136.82	109.46 - 164.18
SPSO-3356	Soil	Apr, 2001	Co-60	18.49 ± 0.21	19.57	9.57 - 29.57
SPSO-3356	Soil	Apr, 2001	Cs-137	18.71 ± 0.24	16.61	6.61 - 26.61
SPAP-3359	Air Filter	Apr, 2001	Cs-137	1.80 ± 0.01	1.67	1.00 - 2.34
SPW-3376	Water	Apr, 2001	Co-60	48.17 ± 4.85	45.19	35.19 - 55.19
SPW-3376	Water	Apr, 2001	Cs-134	37.14 ± 3.90	33.96	23.96 - 43.96
SPW-3376	Water	Apr, 2001	Sr-90	159.84 ± 3.42	136.82	109.46 - 164.18
SPW-3377	Water	Apr, 2001	I-131	68.60 ± 2.63	85.02	68.02 - 102.02
SPW-3129/1	Water	May, 2001	Gr. Alpha	37.94 ± 2.42	34.57	17.29 - 51.86
SPW-3129/1	Water	May, 2001	Gr. Beta	117.83 ± 2.37	109.46	98.51 - 120.41
SPW-3129/2	Water	Jun, 2001	Gr. Alpha	34.42 ± 2.14	34.57	17.29 - 51.86
SPW-3129/2	Water	Jun, 2001	Gr. Beta	119.99 ± 2.45	109.46	98.51 - 120.41
SPVE-3303	Vegetation	Jun, 2001	I-131(g)	0.81 ± 0.03	0.86	0.51 - 1.20
SPSO-5701	Soil	Jul, 2001	Co-60	17.42 ± 0.19	19.05	9.05 - 29.05
SPSO-5701	Soil	Jul, 2001	Cs-137	16.03 ± 0.22	16.52	6.52 - 26.52
SPW-5779	Water	Jul, 2001	Co-60	250.05 ± 18.63	233.26	209.93 - 256.59
SPW-5779	Water	Jul, 2001	Cs-137	178.68 ± 19.89	175.91	158.32 - 193.50
SPW-5779	Water	Jul, 2001	Sr-90	72.12 ± 2.24	68.12	54.50 - 81.74
SPF-5781	Fish	Jul, 2001	Co-60	1.87 ± 0.08	1.79	1.07 - 2.51
SPF-5781	Fish	Jul, 2001	Cs-137	1.43 ± 0.07	1.39	0.83 - 1.95
SPW-5937	Water	Jul, 2001	H-3	51177.00 ± 631.00	50189.00	40151.20 - 60226.80
SPW-59441	Water	Jul, 2001	Ra-226	36.62 ± 1.74	34.46	24.12 - 44.80
SPW-59441	Water	Jul, 2001	Ra-228	41.46 ± 6.44	36.06	25.24 - 46.88
SPAP-5703	Air Filter	Jul, 2001	Cs-137	1.81 ± 0.02	1.67	1.00 - 2.34
SPW-3129/3	Water	Jul, 2001	Gr. Alpha	35.31 ± 3.04	34.75	17.38 - 52.13

Table A-3. In-house "spike" samples.

				Concentration in pCi/L[a]		
Lab Code	Sample Type	Date Collected	Analysis	Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3129/3	Water	Jul, 2001	Gr. Beta	113.28 ± 3.65	109.46	98.51 - 120.41
SPMI-6145	Milk	Jul, 2001	Cs-137	188.45 ± 19.10	175.91	158.32 - 193.50
SPW-6604	Water	Jul, 2001	Gr. Alpha	35.36 ± 1.94	34.57	17.29 - 51.86
SPW-6604	Water	Jul, 2001	Gr. Beta	112.56 ± 2.46	108.82	97.94 - 119.70
SPW-9008	Water	Oct, 2001	H-3	48285.00 ± 606.10	50189.00	40151.20 - 60226.80
SPAP-9010	Air Filter	Oct, 2001	Cs-137	1.91 ± 0.01	1.67	1.00 - 2.34
SPW-10723	Water	Dec, 2001	U-233/4	40.12 ± 1.09	41.73	25.04 - 58.42
SPW-10723	Water	Dec, 2001	U-238	40.16 ± 1.09	41.73	29.21 - 54.25
SPAP-11550	Air Filter	Dec, 2001	Gr. Beta	1.58 ± 0.02	1.56	-8.44 - 11.56
SPW-11757	Water	Dec, 2001	Co-60	43.82 ± 3.14	41.36	31.36 - 51.36
SPW-11757	Water	Dec, 2001	Cs-134	24.11 ± 2.42	22.59	12.59 - 32.59
SPW-11757	Water	Dec, 2001	Cs-137	52.11 ± 4.40	50.89	40.89 - 60.89
SPMI-11759	Milk	Dec, 2001	Cs-134	28.03 ± 2.64	27.10	17.10 - 37.10
SPMI-11759	Milk	Dec, 2001	Cs-137	54.59 ± 5.08	50.89	40.89 - 60.89
SPF-11761	Fish	Dec, 2001	Cs-134	0.94 ± 0.02	0.90	0.54 - 1.26
SPF-11761	Fish	Dec, 2001	Cs-137	1.43 ± 0.04	1.43	0.86 - 2.00

[a] All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in pCi/kg.
[b] Results are based on single determinations.
[c] Control limits are based on Attachment A, Page A2 of this report.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, coleslaw is used for the spike matrix.

Table A-4. In-house "blank" samples.

				Concentration pCi/L[a]		
				Laboratory results (4.66 Sigma)		Acceptance Criteria
Lab Code	Sample Type	Sample Date	Analysis	LLD	Activity[b]	(4.66 Sigma)
SPAP-478	AIR FILTER	Jan 2001	Co-60	< 1.12		< 100.0
SPAP-478	AIR FILTER	Jan 2001	Cs-134	< 1.66		< 100.0
SPAP-478	AIR FILTER	Jan 2001	Cs-137	< 2.46		< 100.0
SPW-480	WATER	Jan 2001	H-3	< 162.00	-1.86 ± 80.40	< 200.0
SPW-484	WATER	Jan 2001	Gr. Alpha	< 0.68		< 1.0
SPW-484	WATER	Jan 2001	Gr. Beta	< 1.35		< 3.2
SPW-484	WATER	Jan 2001	Ra-226	< 0.02	0.03 ± 0.01	< 1.0
SPW-484	WATER	Jan 2001	Ra-228	< 0.97	0.43 ± 0.50	< 2.0
SPW-486	WATER	Jan 2001	Co-60	< 2.68		< 10.0
SPW-486	WATER	Jan 2001	Cs-134	< 3.46		< 10.0
SPW-486	WATER	Jan 2001	Cs-137	< 5.43		< 10.0
SPW-486	WATER	Jan 2001	Sr-90	< 0.65	0.06 ± 0.31	< 1.0
SPAP-755	AIR FILTER	Jan 2001	Gr. Beta	< 1.60	0.16 ± 0.90	< 3.2
SPW-1038	WATER	Feb 2001	U-238	< 0.03		< 1.0
SPW-1038	WATER	Feb 2001	U-238	< 0.00		< 1.0
SPW-1223	WATER	Feb 2001	Gr. Alpha	< 0.46		< 1.0
SPW-1223	WATER	Feb 2001	Gr. Beta	< 1.50		< 3.2
SPW-1223	WATER	Feb 2001	Ra-226	< 0.02	0.03 ± 0.01	< 1.0
SPW-1223	WATER	Feb 2001	Ra-228	< 0.95	0.45 ± 0.49	< 2.0
SPMI-1268	MILK	Feb 2001	Cs-134	< 5.86		< 10.0
SPMI-1268	MILK	Feb 2001	Cs-137	< 3.02		< 10.0
SPMI-1268	MILK	Feb 2001	I-131(g)	< 7.46		< 20.0
SPW-1271	WATER	Feb 2001	Co-60	< 1.06		< 10.0
SPW-1271	WATER	Feb 2001	Cs-134	< 2.61		< 10.0
SPW-1271	WATER	Feb 2001	Cs-137	< 2.37		< 10.0
SPVE-1273	VEGETATION	Feb 2001	Cs-134	< 10.04		< 100.0
SPVE-1273	VEGETATION	Feb 2001	Cs-137	< 6.00		< 100.0
SPCH-1275	CHARCOAL CANISTER	Feb 2001	I-131(g)	< 0.01		< 9.6
SPW-2164	WATER	Mar 2001	Ra-226	< 0.02	0.05 ± 0.01	< 1.0
SPU-3126	URINE	Apr 2001	H-3	< 642.00	-66.00 ± 335.00	< 200.0

2.0 ml. sample volume.

Table A-4. In-house "blank" samples.

				Concentration pCi/L[a]		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
Lab Code	Sample Type	Sample Date	Analysis	LLD	Activity[b]	
SPDW-3130	WATER	Apr 2001	Gr. Alpha	< 0.54	0.04 ± 0.38	< 1.0
SPDW-3130	WATER	Apr 2001	Gr. Beta	< 1.46	0.67 ± 1.04	< 3.2
SPMI-3233	MILK	Apr 2001	Cs-137	< 2.66		< 10.0
SPMI-3233	MILK	Apr 2001	I-131	< 0.26	-0.06 ± 0.14	< 0.5
SPMI-3233	MILK	Apr 2001	I-131(g)	< 3.91		< 20.0
SPMI-3233	MILK	Apr 2001	Sr-89	< 0.79	-0.32 ± 0.79	< 5.0
SPMI-3233	MILK	Apr 2001	Sr-90		1.18 ± 0.35	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPSO-3357	SOIL	Apr 2001	Cs-134	< 14.77		< 100.0
SPSO-3357	SOIL	Apr 2001	Cs-137	< 11.72		< 100.0
SPAP-3358	AIR FILTER	Apr 2001	Cs-137	< 0.55		< 100.0
SPW-3375	WATER	Apr 2001	Co-60	< 2.90		< 10.0
SPW-3375	WATER	Apr 2001	Cs-134	< 3.71		< 10.0
SPW-3375	WATER	Apr 2001	I-131(g)	< 0.39	0.02 ± 0.22	< 20.0
SPW-3375	WATER	Apr 2001	Sr-90	< 0.56	0.05 ± 0.27	< 1.0
SPDW-3130	WATER	May 2001	Gr. Alpha	< 0.45	0.15 ± 0.34	< 1.0
SPDW-3130	WATER	May 2001	Gr. Beta	< 1.26	0.34 ± 0.95	< 3.2
SPDW-3130	WATER	Jun 2001	Gr. Alpha	< 0.44	0.09 ± 0.32	< 1.0
SPDW-3130	WATER	Jun 2001	Gr. Beta	< 1.46	0.66 ± 1.04	< 3.2
SPVE-3304	VEGETATION	Jun 2001	Co-60	< 7.06		< 100.0
SPVE-3304	VEGETATION	Jun 2001	Cs-134	< 11.56		< 100.0
SPVE-3304	VEGETATION	Jun 2001	Cs-137	< 8.30		< 100.0
SPSO-5702	SOIL	Jul 2001	Co-60	< 12.80		< 100.0
SPSO-5702	SOIL	Jul 2001	Cs-134	< 13.96		< 100.0
SPSO-5702	SOIL	Jul 2001	Cs-137	< 8.10		< 100.0
SPAP-5704	AIR FILTER	Jul 2001	Co-60	< 0.79		< 100.0
SPAP-5704	AIR FILTER	Jul 2001	Cs-134	< 0.84		< 100.0
SPAP-5704	AIR FILTER	Jul 2001	Cs-137	< 0.60		< 100.0
SPW-5780	WATER	Jul 2001	Co-60	< 1.86		< 10.0
SPW-5780	WATER	Jul 2001	Cs-134	< 2.46		< 10.0
SPW-5780	WATER	Jul 2001	Cs-137	< 3.77		< 10.0

Table A-4. In-house "blank" samples.

				Concentration pCi/L[a]		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
Lab Code	Sample Type	Sample Date	Analysis	LLD	Activity[b]	
SPF-5782	FISH	Jul 2001	Co-60	< 5.64		< 100.0
SPF-5782	FISH	Jul 2001	Cs-134	< 7.51		< 100.0
SPW-5938	WATER	Jul 2001	H-3	< 163.22	-16.21 ± 85.07	< 200.0
SPW-59451	WATER	Jul 2001	Ra-226	< 0.01	0.04 ± 0.01	< 1.0
SPW-59451	WATER	Jul 2001	Ra-228	< 0.77	0.70 ± 0.44	< 2.0
SPDW-3130	WATER	Jul 2001	Gr. Alpha	< 0.54	0.36 ± 0.40	< 1.0
SPDW-3130	WATER	Jul 2001	Gr. Beta	< 2.27	-0.78 ± 1.35	< 3.2
SPMI-6146	MILK	Jul 2001	Sr-90	< 0.50	1.09 ± 0.36	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPW-6605	WATER	Jul 2001	Gr. Beta	< 1.34	0.55 ± 1.01	< 3.2
SPW-9009	WATER	Oct 2001	H-3	< 160.00	-56.70 ± 76.50	< 200.0
SPAP-9011	AIR FILTER	Oct 2001	Co-60	< 0.76		< 100.0
SPAP-9011	AIR FILTER	Oct 2001	Cs-137	< 0.58		< 100.0
SPW-5780	WATER	Oct 2001	Sr-90	< 0.54	0.36 ± 0.30	< 1.0
SPW-10724	WATER	Dec 2001	U-238	< 0.13	0.04 ± 0.10	< 1.0
SPAP-11549	AIR FILTER	Dec 2001	Gr. Beta	< 0.00	0.01 ± 0.00	< 3.2
SPW-11756	WATER	Dec 2001	Cs-137	< 2.62		< 10.0
SPMI-11758	MILK	Dec 2001	Cs-137	< 4.00		< 10.0
SPMI-11758	MILK	Dec 2001	I-131(g)	< 16.57		< 20.0
SPF-11760	FISH	Dec 2001	Cs-137	< 7.96		< 100.0

[a] Liquid sample results are reported in pCi/Liter, air filter sample results are in pCi/filter, charcoal sample results are in pCi/charcoal, and solid sample results are in pCi/kilogram.
[b] The activity reported is the net activity result.

Table A-5. In-house "duplicate" samples.

			Concentration in pCi/L[a]		
Lab Codes	Sample Date	Analysis	First Result	Second Result	Averaged Result
AP-10675, 10676	Jan, 2001	Be-7	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01
AP-10803, 10804	Jan, 2001	Be-7	0.04 ± 0.01	0.04 ± 0.01	0.04 ± 0.01
AP-10833, 10834	Jan, 2001	Be-7	0.04 ± 0.01	0.04 ± 0.01	0.04 ± 0.01
WW-51, 52	Jan, 2001	H-3	362.60 ± 94.70	417.20 ± 96.80	389.90 ± 67.71
MI-72, 73	Jan, 2001	K-40	1,566.90 ± 196.80	1,372.40 ± 152.50	1,469.65 ± 124.49
MI-96, 97	Jan, 2001	K-40	1,418.30 ± 117.80	1,545.70 ± 162.50	1,482.00 ± 100.35
U-858, 859	Jan, 2001	Gr. Beta	2.17 ± 2.47	4.23 ± 2.74	3.20 ± 1.84
MI-389, 390	Jan, 2001	K-40	1,489.20 ± 141.10	1,463.30 ± 168.20	1,476.25 ± 109.77
DW-879, 880	Jan, 2001	Gr. Beta	2.63 ± 0.52	2.37 ± 0.50	2.50 ± 0.36
SWU-813, 814	Jan, 2001	Gr. Beta	2.48 ± 0.58	2.46 ± 0.63	2.47 ± 0.43
MI-708, 709	Feb, 2001	K-40	1,179.40 ± 103.00	1,280.40 ± 90.26	1,229.90 ± 68.48
MI-740, 741	Feb, 2001	I-131	0.01 ± 0.26	-0.12 ± 0.26	-0.05 ± 0.18
MI-740, 741	Feb, 2001	K-40	1,434.00 ± 156.50	1,435.00 ± 126.10	1,434.50 ± 100.49
MI-789, 790	Feb, 2001	K-40	1,584.30 ± 158.80	1,390.70 ± 136.50	1,487.50 ± 104.70
DW-901, 902	Feb, 2001	Gr. Beta	4.67 ± 1.08	5.54 ± 1.13	5.11 ± 0.78
SWU-1544, 1545	Feb, 2001	Gr. Beta	3.13 ± 0.63	2.33 ± 0.52	2.73 ± 0.41
DW-1426, 1427	Feb, 2001	Gr. Beta	2.05 ± 0.92	2.34 ± 0.93	2.20 ± 0.65
DW-1426, 1427	Feb, 2001	H-3	42.60 ± 94.23	131.31 ± 95.34	86.96 ± 67.02
WW-1476, 1477	Feb, 2001	H-3	53.06 ± 65.79	53.06 ± 93.03	53.06 ± 56.97
MI-1523, 1524	Mar, 2001	I-131	-0.01 ± 0.20	-0.10 ± 0.37	-0.06 ± 0.21
MI-1523, 1524	Mar, 2001	K-40	1,396.00 ± 184.80	1,576.00 ± 184.90	1,486.00 ± 130.71
MI-1572, 1573	Mar, 2001	K-40	1,499.20 ± 113.30	1,326.00 ± 118.80	1,412.60 ± 82.08
MI-1572, 1573	Mar, 2001	Sr-90	1.65 ± 0.44	1.51 ± 0.52	1.58 ± 0.34
SW-1648, 1649	Mar, 2001	K-40	297.80 ± 67.20	344.80 ± 82.30	321.30 ± 53.13
MI-1800, 1801	Mar, 2001	K-40	1,425.80 ± 183.30	1,372.20 ± 119.70	1,399.00 ± 109.46
SW-1779, 1780	Mar, 2001	Gr. Alpha	2.22 ± 0.73	2.14 ± 0.69	2.18 ± 0.50
SW-1779, 1780	Mar, 2001	Gr. Beta	6.28 ± 0.74	6.62 ± 0.70	6.45 ± 0.51
MI-1447, 1448	Mar, 2001	I-131	-0.65 ± 0.27	0.13 ± 0.55	-0.26 ± 0.31
MI-1447, 1448	Mar, 2001	K-40	1,496.20 ± 155.40	1,413.40 ± 169.60	1,454.80 ± 115.01
WW-2115, 2116	Mar, 2001	H-3	540.04 ± 111.84	500.85 ± 110.46	520.44 ± 78.59
SW-1698, 1699	Mar, 2001	Gr. Beta	6.07 ± 1.75	5.57 ± 1.85	5.82 ± 1.27
DW-2272, 2273	Mar, 2001	Gr. Beta	2.10 ± 0.86	1.63 ± 0.83	1.87 ± 0.60
WW-2356, 2357	Mar, 2001	Gr. Beta	1.22 ± 0.50	1.32 ± 0.47	1.27 ± 0.35
AP-2812, 2813	Mar, 2001	Be-7	0.07 ± 0.02	0.05 ± 0.01	0.06 ± 0.01
AP-2812, 2813	Mar, 2001	Be-7	0.07 ± 0.02	0.05 ± 0.01	0.06 ± 0.01
LW-2217, 2218	Mar, 2001	Gr. Beta	1.85 ± 0.51	2.23 ± 0.55	2.04 ± 0.37

Table A-5. In-house "duplicate" samples.

			Concentration in pCi/L[a]		
Lab Codes	Sample Date	Analysis	First Result	Second Result	Averaged Result
AP-2833, 2834	Mar, 2001	Be-7	0.04 ± 0.01	0.06 ± 0.02	0.05 ± 0.01
AP-3038, 3039	Mar, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
AP-3038, 3039	Mar, 2001	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
DW-2398, 2399	Mar, 2001	Gr. Beta	1.58 ± 0.89	1.81 ± 0.88	1.69 ± 0.63
LW-2467, 2468	Mar, 2001	Gr. Beta	2.52 ± 0.53	2.42 ± 0.53	2.47 ± 0.37
MI-2446, 2447	Apr, 2001	K-40	1,285.40 ± 177.10	1,376.00 ± 175.90	1,330.70 ± 124.81
AP-3017, 3018	Apr, 2001	Be-7	0.05 ± 0.01	0.05 ± 0.01	0.05 ± 0.00
SW-2423, 2424	Apr, 2001	K-40	255.60 ± 59.80	268.40 ± 65.40	262.00 ± 44.31
BS-3103, 3104	Apr, 2001	Gr. Beta	7.99 ± 1.80	8.17 ± 1.73	8.08 ± 1.25
SWU-3239, 3240	Apr, 2001	Gr. Beta	3.30 ± 0.60	4.30 ± 0.74	3.80 ± 0.48
SS-3322, 3323	Apr, 2001	K-40	15.99 ± 1.08	15.59 ± 1.01	15.79 ± 0.74
W-3990, 3991	Apr, 2001	Sr-89	91.35 ± 18.94	85.29 ± 23.99	88.32 ± 15.28
BS-4347, 4348	Apr, 2001	K-40	3,982.40 ± 489.60	3,255.80 ± 450.10	3,619.10 ± 332.53
BS-4347, 4348	Apr, 2001	K-40	3.26 ± 0.45	3.98 ± 0.49	3.62 ± 0.33
MI-3364, 3365	May, 2001	K-40	1,325.90 ± 160.20	1,453.20 ± 163.00	1,389.55 ± 114.27
SO-3385, 3386	May, 2001	Gr. Alpha	6.51 ± 3.09	9.01 ± 3.44	7.76 ± 2.31
SO-3385, 3386	May, 2001	Gr. Beta	24.63 ± 3.15	28.17 ± 3.12	26.40 ± 2.22
SO-3385, 3386	May, 2001	K-40	19.17 ± 1.08	17.94 ± 0.76	18.56 ± 0.66
CL-4068, 4069	May, 2001	K-40	1.09 ± 0.27	1.13 ± 0.23	1.11 ± 0.18
MI-3475, 3476	May, 2001	Gr. Beta	1,297.10 ± 114.60	1,433.60 ± 156.60	1,365.35 ± 97.03
WW-3545, 3546	May, 2001	Gr. Beta	1.57 ± 0.55	1.36 ± 0.53	1.47 ± 0.38
MI-3681, 3682	May, 2001	K-40	1,417.20 ± 125.70	1,496.20 ± 124.50	1,456.70 ± 88.46
SW-3702, 3703	May, 2001	Gr. Alpha	4.51 ± 1.66	3.22 ± 1.55	3.87 ± 1.13
SW-3702, 3703	May, 2001	Gr. Beta	8.74 ± 1.36	7.11 ± 1.38	7.93 ± 0.97
BS-4021, 4022	May, 2001	Cs-137	224.30 ± 30.20	205.90 ± 43.00	215.10 ± 26.27
BS-4021, 4022	May, 2001	H-3	842.00 ± 47.00	860.00 ± 48.00	851.00 ± 33.59
BS-4021, 4022	May, 2001	K-40	21,117.00 ± 953.00	21,629.00 ± 1,357.00	21,373.00 ± 829.10
BS-4021, 4022	May, 2001	Pu-238	80.30 ± 36.50	59.50 ± 22.00	69.90 ± 21.31
BS-4021, 4022	May, 2001	Pu-239/40	49.40 ± 31.80	41.10 ± 19.60	45.25 ± 18.68
BS-4021, 4022	May, 2001	Ra-226	7,436.00 ± 577.90	9,126.00 ± 751.90	8,281.00 ± 474.16
BS-4021, 4022	May, 2001	Sr-90	10.60 ± 2.71	16.80 ± 3.22	13.70 ± 2.10
F-3813, 3814	May, 2001	K-40	2.10 ± 0.17	2.30 ± 0.26	2.20 ± 0.16
G-4158, 4159	May, 2001	Be-7	0.37 ± 0.13	0.41 ± 0.14	0.39 ± 0.10
SO-4179, 4180	May, 2001	Ac-228	0.45 ± 0.13	0.52 ± 0.14	0.49 ± 0.10
SO-4179, 4180	May, 2001	Bi-214	0.31 ± 0.06	0.41 ± 0.06	0.36 ± 0.04
SO-4179, 4180	May, 2001	Cs-137	0.46 ± 0.05	0.47 ± 0.04	0.47 ± 0.03

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SO-4179, 4180	May, 2001	Gr. Beta	26.65 ± 2.63	24.68 ± 2.52	25.67 ± 1.82
SO-4179, 4180	May, 2001	K-40	16.35 ± 0.86	16.05 ± 0.82	16.20 ± 0.59
SO-4179, 4180	May, 2001	Pb-212	0.35 ± 0.04	0.43 ± 0.05	0.39 ± 0.03
SO-4179, 4180	May, 2001	Ra-226	0.56 ± 0.98	1.03 ± 0.31	0.79 ± 0.51
SO-4179, 4180	May, 2001	Tl-208	0.14 ± 0.03	0.17 ± 0.03	0.15 ± 0.02
BS-4233, 4234	May, 2001	Cs-137	0.03 ± 0.01	0.03 ± 0.02	0.03 ± 0.01
BS-4233, 4234	May, 2001	K-40	8.18 ± 0.48	7.80 ± 0.58	7.99 ± 0.38
SWU-4376, 4377	May, 2001	Gr. Beta	2.58 ± 0.55	2.94 ± 0.58	2.76 ± 0.40
DW-4449, 4450	May, 2001	Gr. Beta	2.83 ± 0.55	3.74 ± 0.65	3.29 ± 0.43
DW-4397, 4398	May, 2001	Gr. Beta	9.13 ± 1.26	10.20 ± 1.34	9.66 ± 0.92
MI-4114, 4115	May, 2001	K-40	1,325.90 ± 118.80	1,394.70 ± 133.10	1,360.30 ± 89.20
F-4284, 4285	May, 2001	K-40	2.23 ± 0.32	2.12 ± 0.35	2.18 ± 0.24
DW-4326, 4327	Jun, 2001	Gr. Beta	2.60 ± 0.97	1.47 ± 0.83	2.04 ± 0.64
MI-4470, 4471	Jun, 2001	K-40	1,514.50 ± 116.60	1,456.80 ± 130.90	1,485.65 ± 87.65
SW-4493, 4494	Jun, 2001	Gr. Beta	4.05 ± 1.23	4.64 ± 1.32	4.35 ± 0.90
BS-4725, 4726	Jun, 2001	Co-60	112.00 ± 24.30	84.50 ± 8.70	98.25 ± 12.91
BS-4725, 4726	Jun, 2001	Cs-137	3,083.10 ± 100.10	3,094.80 ± 35.30	3,088.95 ± 53.07
BS-4725, 4726	Jun, 2001	K-40	8,143.70 ± 640.40	8,083.80 ± 225.10	8,113.75 ± 339.40
MI-4775, 4776	Jun, 2001	K-40	1,362.20 ± 71.80	1,363.90 ± 73.40	1,363.05 ± 51.34
WW-5110, 5111	Jun, 2001	H-3	1,173.50 ± 129.10	1,046.80 ± 125.20	1,110.15 ± 89.92
G-5085, 5086	Jun, 2001	Be-7	0.89 ± 0.17	1.14 ± 0.39	1.02 ± 0.21
G-5085, 5086	Jun, 2001	K-40	5.13 ± 0.39	5.22 ± 0.70	5.17 ± 0.40
MI-5259, 5260	Jun, 2001	K-40	1,529.70 ± 122.70	1,406.20 ± 123.80	1,467.95 ± 87.15
MI-5259, 5260	Jun, 2001	Sr-90	1.69 ± 0.42	1.71 ± 0.44	1.70 ± 0.30
SWU-5422, 5423	Jun, 2001	Gr. Beta	2.59 ± 0.54	1.91 ± 0.52	2.25 ± 0.37
VE-5401, 5402	Jun, 2001	Gr. Beta	8.12 ± 0.24	8.88 ± 0.26	8.50 ± 0.18
VE-5401, 5402	Jun, 2001	K-40	6.55 ± 0.52	6.26 ± 0.65	6.40 ± 0.42
AP-5830, 5831	Jun, 2001	Be-7	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
SW-5557, 5558	Jun, 2001	Gr. Beta	5.43 ± 1.70	5.96 ± 1.56	5.70 ± 1.15
AP-5851, 5852	Jun, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
SW-5636, 5637	Jun, 2001	Gr. Beta	4.75 ± 1.38	4.18 ± 1.34	4.47 ± 0.96
LW-5681, 5682	Jun, 2001	Gr. Beta	2.42 ± 0.37	2.18 ± 0.34	2.30 ± 0.25
G-5535, 5536	Jul, 2001	Be-7	0.99 ± 0.29	0.97 ± 0.54	0.98 ± 0.31
G-5535, 5536	Jul, 2001	Gr. Beta	7.62 ± 0.12	7.72 ± 0.12	7.67 ± 0.08
G-5535, 5536	Jul, 2001	K-40	7.26 ± 1.03	7.64 ± 0.93	7.45 ± 0.69
AP-5788, 5789	Jul, 2001	Be-7	0.08 ± 0.02	0.07 ± 0.02	0.08 ± 0.01

Table A-5. In-house "duplicate" samples.

			Concentration in pCi/L[a]		
Lab Codes	Sample Date	Analysis	First Result	Second Result	Averaged Result
AP-5872, 5873	Jul, 2001	Be-7	0.07 ± 0.02	0.08 ± 0.02	0.07 ± 0.01
AP-5893, 5894	Jul, 2001	Be-7	0.08 ± 0.02	0.08 ± 0.01	0.08 ± 0.01
AP-5809, 5810	Jul, 2001	Be-7	0.07 ± 0.02	0.06 ± 0.01	0.06 ± 0.01
SW-5724, 5725	Jul, 2001	Gr. Alpha	2.95 ± 0.70	2.89 ± 0.60	2.92 ± 0.46
SW-5724, 5725	Jul, 2001	Gr. Beta	8.79 ± 0.71	8.21 ± 0.65	8.50 ± 0.48
SW-5767, 5768	Jul, 2001	I-131	0.79 ± 0.31	0.61 ± 0.26	0.70 ± 0.20
LW-5920, 5921	Jul, 2001	Gr. Beta	3.06 ± 0.64	3.15 ± 0.58	3.11 ± 0.43
SO-6172, 6173	Jul, 2001	Cs-137	0.30 ± 0.05	0.32 ± 0.04	0.31 ± 0.03
SO-6172, 6173	Jul, 2001	K-40	18.20 ± 1.08	17.55 ± 0.82	17.88 ± 0.68
SO-6172, 6173	Jul, 2001	Sr-90	0.03 ± 0.01	0.05 ± 0.02	0.04 ± 0.01
MI-6353, 6354	Jul, 2001	K-40	966.35 ± 82.28	986.31 ± 91.91	976.33 ± 61.68
SW-6376, 6377	Jul, 2001	I-131	0.58 ± 0.16	0.81 ± 0.17	0.70 ± 0.12
VE-6424, 6425	Jul, 2001	Gr. Beta	2.52 ± 0.05	2.49 ± 0.05	2.51 ± 0.03
VE-6424, 6425	Jul, 2001	K-40	3.04 ± 0.26	3.12 ± 0.37	3.08 ± 0.23
MI-6445, 6446	Jul, 2001	K-40	1,407.40 ± 97.10	1,442.20 ± 189.60	1,424.80 ± 106.51
LW-6489, 6490	Jul, 2001	Gr. Beta	2.61 ± 0.57	2.79 ± 0.54	2.70 ± 0.39
MI-6533, 6534	Jul, 2001	K-40	1,498.60 ± 113.90	1,375.50 ± 129.60	1,437.05 ± 86.27
DW-6835, 6836	Jul, 2001	Gr. Beta	2.01 ± 0.59	2.36 ± 0.63	2.19 ± 0.43
MI-6693, 6694	Aug, 2001	K-40	1,294.30 ± 118.70	1,417.30 ± 176.50	1,355.80 ± 106.35
MI-6693, 6694	Aug, 2001	Sr-90	1.47 ± 0.42	1.23 ± 0.41	1.35 ± 0.29
WW-6952, 6953	Aug, 2001	Gr. Beta	5.49 ± 0.69	5.80 ± 0.69	5.64 ± 0.49
MI-6906, 6907	Aug, 2001	K-40	1,613.80 ± 218.50	1,532.70 ± 135.80	1,573.25 ± 128.63
VE-6973, 6974	Aug, 2001	K-40	4.21 ± 0.24	4.29 ± 0.64	4.25 ± 0.34
LW-7851, 7852	Aug, 2001	Gr. Beta	2.20 ± 0.48	2.12 ± 0.42	2.16 ± 0.32
MI-7001, 7002	Aug, 2001	K-40	1,453.80 ± 148.10	1,285.30 ± 190.50	1,369.55 ± 120.65
MI-7073, 7074	Aug, 2001	K-40	1,217.30 ± 80.83	1,218.30 ± 99.13	1,217.80 ± 63.95
LW-7145, 7146	Aug, 2001	Gr. Beta	2.77 ± 0.53	3.60 ± 0.59	3.19 ± 0.39
MI-7221, 7222	Aug, 2001	K-40	1,192.90 ± 95.40	1,388.90 ± 132.70	1,290.90 ± 81.72
MI-7221, 7222	Aug, 2001	Sr-90	2.10 ± 0.48	1.72 ± 0.47	1.91 ± 0.34
SWU-7527, 7528	Aug, 2001	Gr. Beta	17.51 ± 3.06	20.36 ± 3.31	18.93 ± 2.25
VE-7485, 7486	Aug, 2001	K-40	2.12 ± 0.47	2.47 ± 0.34	2.30 ± 0.29
DW-7506, 7507	Aug, 2001	Gr. Beta	4.25 ± 1.18	4.13 ± 1.12	4.19 ± 0.81
MI-7622, 7623	Sep, 2001	K-40	1,340.10 ± 111.10	1,290.80 ± 116.50	1,315.45 ± 80.49
MI-7664, 7665	Sep, 2001	K-40	1,408.10 ± 102.70	1,396.90 ± 114.30	1,402.50 ± 76.83
MI-7876, 7877	Sep, 2001	K-40	1,416.40 ± 192.30	1,318.00 ± 155.50	1,367.20 ± 123.65
G-7960, 7961	Sep, 2001	Be-7	1.27 ± 0.21	1.25 ± 0.25	1.26 ± 0.16

Table A-5. In-house "duplicate" samples.

			Concentration in pCi/L[a]		
Lab Codes	Sample Date	Analysis	First Result	Second Result	Averaged Result
G-7960, 7961	Sep, 2001	K-40	5.21 ± 0.57	5.70 ± 0.63	5.45 ± 0.43
F-8011, 8012	Sep, 2001	Cs-137	0.06 ± 0.02	0.04 ± 0.02	0.05 ± 0.01
F-8011, 8012	Sep, 2001	Gr. Beta	3.68 ± 0.12	3.50 ± 0.11	3.59 ± 0.08
F-8011, 8012	Sep, 2001	K-40	3.47 ± 0.49	3.38 ± 0.47	3.43 ± 0.34
MI-8149, 8150	Sep, 2001	K-40	1,551.70 ± 118.00	1,489.90 ± 123.60	1,520.80 ± 85.44
MI-8343, 8344	Sep, 2001	K-40	1,550.30 ± 170.60	1,368.10 ± 126.70	1,459.20 ± 106.25
VE-8319, 8320	Sep, 2001	Gr. Beta	3.37 ± 0.10	3.42 ± 0.11	3.39 ± 0.07
VE-8319, 8320	Sep, 2001	K-40	2.14 ± 0.46	2.24 ± 0.37	2.19 ± 0.29
AP-9069, 9070	Sep, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
AP-9566, 9567	Sep, 2001	Be-7	0.08 ± 0.02	0.09 ± 0.03	0.09 ± 0.02
VE-8700, 8701	Oct, 2001	Be-7	0.24 ± 0.10	0.19 ± 0.10	0.22 ± 0.07
VE-8700, 8701	Oct, 2001	K-40	2.03 ± 0.24	2.03 ± 0.21	2.03 ± 0.16
VE-8700, 8701	Oct, 2001	Sr-90	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
AP-9048, 9049	Oct, 2001	Be-7	0.07 ± 0.01	0.07 ± 0.00	0.07 ± 0.01
DW-8636, 8637	Oct, 2001	Gr. Beta	4.74 ± 1.06	5.08 ± 1.21	4.91 ± 0.80
DW-8615, 8616	Oct, 2001	Gr. Beta	4.65 ± 0.58	4.28 ± 0.54	4.47 ± 0.40
AP-9090, 9091	Oct, 2001	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
AP-9166, 9167	Oct, 2001	Be-7	0.08 ± 0.02	0.08 ± 0.02	0.08 ± 0.01
AP-9187, 9188	Oct, 2001	Be-7	0.07 ± 0.01	0.05 ± 0.01	0.06 ± 0.01
VE-10562, 10563	Oct, 2001	Be-7	309.90 ± 158.80	348.30 ± 168.10	329.10 ± 115.62
VE-10562, 10563	Oct, 2001	K-40	6,407.10 ± 620.70	6,057.50 ± 660.40	6,232.30 ± 453.15
WW-8636, 8637	Oct, 2001	Gr. Beta	5.08 ± 1.20	4.74 ± 1.06	4.91 ± 0.80
DW-8894, 8895	Oct, 2001	Gr. Beta	4.28 ± 0.89	3.40 ± 0.90	3.84 ± 0.63
MI-9232, 9233	Oct, 2001	K-40	1,440.70 ± 46.60	1,424.80 ± 76.40	1,432.75 ± 44.75
VE-9518, 9519	Oct, 2001	K-40	1.91 ± 0.22	1.97 ± 0.39	1.94 ± 0.22
WW-10257, 10258	Nov, 2001	H-3	755.90 ± 102.50	684.70 ± 99.90	720.30 ± 71.57
VE-10333, 10334	Nov, 2001	Be-7	0.68 ± 0.26	0.99 ± 0.26	0.84 ± 0.18
VE-10333, 10334	Nov, 2001	K-40	6.10 ± 0.72	5.83 ± 0.72	5.97 ± 0.51
MI-10588, 10589	Nov, 2001	K-40	1,428.40 ± 114.70	1,445.50 ± 129.40	1,436.95 ± 86.46
DW-10688, 10689	Nov, 2001	Gr. Beta	3.49 ± 0.91	2.36 ± 0.76	2.93 ± 0.60
WW-10905, 10906	Dec, 2001	H-3	233.90 ± 90.60	226.30 ± 90.20	230.10 ± 63.92
SS-10953, 10954	Dec, 2001	Ac-228	1.10 ± 0.25	0.91 ± 0.16	1.00 ± 0.15
SS-10953, 10954	Dec, 2001	Bi-214	0.69 ± 0.08	0.75 ± 0.08	0.72 ± 0.06
SS-10953, 10954	Dec, 2001	Co-58	0.21 ± 0.05	0.18 ± 0.04	0.19 ± 0.03
SS-10953, 10954	Dec, 2001	Co-60	0.93 ± 0.06	0.94 ± 0.06	0.93 ± 0.04
SS-10953, 10954	Dec, 2001	Cs-137	0.13 ± 0.03	0.16 ± 0.03	0.14 ± 0.02

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SS-10953, 10954	Dec, 2001	K-40	9.91 ± 0.83	8.36 ± 0.80	9.13 ± 0.57
SS-10953, 10954	Dec, 2001	Pb-212	0.94 ± 0.05	0.91 ± 0.06	0.92 ± 0.04
SS-10953, 10954	Dec, 2001	Pb-214	0.83 ± 0.08	0.82 ± 0.07	0.83 ± 0.05
SS-10953, 10954	Dec, 2001	Ra-226	1.76 ± 0.37	1.67 ± 0.37	1.72 ± 0.26
SS-10953, 10954	Dec, 2001	Tl-208	0.34 ± 0.05	0.31 ± 0.05	0.32 ± 0.04
MI-11033, 11034	Dec, 2001	K-40	1,339.80 ± 128.70	1,435.80 ± 117.30	1,387.80 ± 87.07
MI-11033, 11034	Dec, 2001	Sr-90	1.31 ± 0.41	1.38 ± 0.37	1.35 ± 0.28
AP-11888, 11889	Dec, 2001	Be-7	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01

Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for elemental potassium (K) in milk (mg/L), air filters (pCi/Filter), food products and vegetation (pCi/g), soil and sediments (pCi/kg).

Table A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)[a].

				Concentration[b]		
Lab Code	Sample Type	Date Collected	Analysis	Laboratory result[c]	MAPEP Result[d] 1s, N=1	Control Limits
STSO-923	SOIL	Jan, 2001	Am-241			0.00 - 2.60
Included as false positive. Result of analyses; < 0.8 Bq/L.						
STSO-923	SOIL	Jan, 2001	Co-57	100.20 ± 3.50	103.00 ± 10.30	72.10 - 133.90
STSO-923	SOIL	Jan, 2001	Co-60	1,285.10 ± 5.30	1,270.00 ± 127.00	889.00 - 1,651.00
STSO-923	SOIL	Jan, 2001	Cs-134	81.10 ± 1.80	91.10 ± 9.11	63.77 - 118.43
STSO-923	SOIL	Jan, 2001	Cs-137	1,210.60 ± 6.60	1,240.00 ± 124.00	868.00 - 1,612.00
STSO-923	SOIL	Jan, 2001	K-40	732.60 ± 21.20	652.00 ± 65.20	456.40 - 847.60
STSO-923	SOIL	Jan, 2001	Mn-54	212.60 ± 6.70	203.00 ± 20.30	142.10 - 263.90
STSO-923	SOIL	Jan, 2001	Pu-238	110.70 ± 7.20	115.00 ± 11.50	80.50 - 149.50
STSO-923	SOIL	Jan, 2001	Pu-239/40	79.60 ± 5.90	83.40 ± 8.34	58.38 - 108.42
STSO-923	SOIL	Jan, 2001	Sr-90	159.80 ± 9.50	209.00 ± 20.90	146.30 - 271.70
STSO-923	SOIL	Jan, 2001	U-233/4	45.00 ± 3.90	60.00 ± 6.00	42.00 - 78.00
STSO-923	SOIL	Jan, 2001	U-238	165.60 ± 7.40	191.00 ± 19.10	133.70 - 248.30
STSO-923	SOIL	Jan, 2001	Zn-65	428.50 ± 10.90	382.00 ± 38.20	267.40 - 496.60

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho.

[b] All results are in Bq/kg or Bq/L as requested by the Department of Energy.

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP.

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result	EML Result[c]	Control Limits[d]
STSO-904	SOIL	Mar, 2001	Ac-228	45.600 ± 4.000	42.700	0.80 - 1.50
STSO-904	SOIL	Mar, 2001	Am-241	14.400 ± 0.500	14.800	0.63 - 2.64
STSO-904	SOIL	Mar, 2001	Bi-212	53.200 ± 3.100	42.000	0.45 - 1.23
	Possible effect of shield background.					
STSO-904	SOIL	Mar, 2001	Bi-214	42.100 ± 7.700	32.600	0.78 - 1.50
STSO-904	SOIL	Mar, 2001	Cs-137	1,772.600 ± 79.800	1,740.000	0.80 - 1.29
STSO-904	SOIL	Mar, 2001	K-40	583.800 ± 52.600	468.000	0.80 - 1.37
STSO-904	SOIL	Mar, 2001	Pb-212	46.600 ± 8.500	41.500	0.74 - 1.36
STSO-904	SOIL	Mar, 2001	Pb-214	45.300 ± 8.600	34.300	0.76 - 1.53
STSO-904	SOIL	Mar, 2001	Pu-239/40	26.000 ± 0.800	25.600	0.71 - 1.33
STSO-904	SOIL	Mar, 2001	Sr-90	55.600 ± 2.200	69.000	0.61 - 3.91
STW-905	WATER	Mar, 2001	Am-241	2.150 ± 0.140	1.670	0.76 - 1.48
STW-905	WATER	Mar, 2001	Co-60	97.000 ± 0.800	98.200	0.80 - 1.20
STW-905	WATER	Mar, 2001	Cs-137	70.100 ± 4.000	73.000	0.80 - 1.20
STW-905	WATER	Mar, 2001	H-3	76.500 ± 5.500	79.300	0.74 - 2.29
STW-905	WATER	Mar, 2001	Pu-238	1.690 ± 0.070	1.580	0.74 - 1.22
STW-905	WATER	Mar, 2001	Pu-239/40	1.690 ± 0.070	1.640	0.75 - 1.26
STW-905	WATER	Mar, 2001	Sr-90	3.850 ± 0.130	4.400	0.64 - 1.50
STW-905	WATER	Mar, 2001	U-233/4	0.900 ± 0.050	1.040	0.80 - 1.40
STW-905	WATER	Mar, 2001	U-238	0.880 ± 0.050	1.040	0.80 - 1.29
STW-906	WATER	Mar, 2001	Gr. Alpha	1,724.600 ± 141.700	1,900.000	0.58 - 1.26
STW-906	WATER	Mar, 2001	Gr. Beta	1,246.400 ± 31.100	1,297.000	0.56 - 1.50
STAP-907	AIR FILTER	Mar, 2001	Am-241	0.470 ± 0.040	0.486	0.69 - 2.40
STAP-907	AIR FILTER	Mar, 2001	Co-60	20.110 ± 0.160	19.440	0.79 - 1.30
STAP-907	AIR FILTER	Mar, 2001	Cs-134	2.710 ± 0.150	2.830	0.74 - 1.21
STAP-907	AIR FILTER	Mar, 2001	Cs-137	9.860 ± 0.230	8.760	0.78 - 1.35
STAP-907	AIR FILTER	Mar, 2001	Mn-54	7.250 ± 0.220	6.520	0.80 - 1.36
STAP-907	AIR FILTER	Mar, 2001	Pu-238	0.230 ± 0.030	0.215	0.66 - 1.35
STAP-907	AIR FILTER	Mar, 2001	Pu-239/40	0.120 ± 0.020	0.136	0.69 - 1.29

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result	EML Result[c]	Control Limits[d]
STAP-907	AIR FILTER	Mar, 2001	Sr-90	7.410 ± 0.150	7.100	0.55 - 2.05
STAP-907	AIR FILTER	Mar, 2001	U-233/4	0.050 ± 0.010	0.046	0.80 - 1.92
STAP-907	AIR FILTER	Mar, 2001	U-238	0.050 ± 0.010	0.046	0.80 - 1.59
STAP-908	AIR FILTER	Mar, 2001	Gr. Alpha	2.660 ± 0.020	3.970	0.57 - 1.47
STAP-908	AIR FILTER	Mar, 2001	Gr. Beta	2.300 ± 0.020	2.580	0.76 - 1.52
STVE-909	VEGETATION	Mar, 2001	Am-241	6.100 ± 0.200	6.170	0.72 - 2.34
STVE-909	VEGETATION	Mar, 2001	Cm-244	3.500 ± 0.500	3.690	0.61 - 1.61
STVE-909	VEGETATION	Mar, 2001	Co-60	28.500 ± 2.100	30.400	0.75 - 1.51
STVE-909	VEGETATION	Mar, 2001	Cs-137	795.500 ± 76.400	842.000	0.80 - 1.37
STVE-909	VEGETATION	Mar, 2001	K-40	592.600 ± 42.500	603.000	0.78 - 1.43
STVE-909	VEGETATION	Mar, 2001	Pu-239/40	8.500 ± 0.600	9.580	0.67 - 1.49
STVE-909	VEGETATION	Mar, 2001	Sr-90	1,239.600 ± 130.000	1,330.000	0.52 - 1.23
STW-925	WATER	Sep, 2001	Am-241	0.700 ± 0.100	0.760	0.76 - 1.48
STW-925	WATER	Sep, 2001	Co-60	206.700 ± 4.700	209.000	0.80 - 1.20
STW-925	WATER	Sep, 2001	Cs-137	46.600 ± 0.800	45.133	0.80 - 1.24
STW-925	WATER	Sep, 2001	H-3	254.100 ± 3.600	207.000	0.74 - 2.29
STW-925	WATER	Sep, 2001	Ni-63	50.900 ± 3.000	45.250	0.70 - 1.30
STW-925	WATER	Sep, 2001	Pu-238	1.100 ± 0.100	1.088	0.74 - 1.22
STW-925	WATER	Sep, 2001	Pu-239/40	1.600 ± 0.100	1.628	0.75 - 1.26
STW-925	WATER	Sep, 2001	Sr-90	4.100 ± 0.300	3.729	0.64 - 1.50
STW-925	WATER	Sep, 2001	Uranium	2.200 ± 0.200	2.372	0.73 - 1.37
STW-926	WATER	Sep, 2001	Gr. Alpha	1,220.000 ± 32.000	1,150.000	0.58 - 1.26
STW-926	WATER	Sep, 2001	Gr. Beta	8,461.000 ± 206.000	7,970.000	0.56 - 1.50
STSO-927	SOIL	Sep, 2001	Ac-228	68.100 ± 1.400	59.570	0.80 - 1.50
STSO-927	SOIL	Sep, 2001	Am-241	5.200 ± 1.300	4.432	0.63 - 2.64
STSO-927	SOIL	Sep, 2001	Bi-212	65.100 ± 1.600	62.067	0.45 - 1.23
STSO-927	SOIL	Sep, 2001	Bi-214	47.300 ± 4.700	36.900	0.78 - 1.50
STSO-927	SOIL	Sep, 2001	Cs-137	659.200 ± 10.800	612.330	0.80 - 1.29
STSO-927	SOIL	Sep, 2001	K-40	737.700 ± 16.600	623.330	0.80 - 1.37

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration[b] Laboratory result	EML Result[c]	Control Limits[d]
STSO-927	SOIL	Sep, 2001	Pb-212	64.700 ± 3.800	58.330	0.74 - 1.36
STSO-927	SOIL	Sep, 2001	Pb-214	53.700 ± 7.700	39.670	0.76 - 1.53
STSO-927	SOIL	Sep, 2001	Pu-239/40	9.300 ± 2.900	8.948	0.71 - 1.33
STSO-927	SOIL	Sep, 2001	Sr-90	27.400 ± 6.300	30.596	0.61 - 3.91
STSO-927	SOIL	Sep, 2001	Uranium	155.600 ± 7.800	194.230	0.62 - 1.35
STVE-928	VEGETATION	Sep, 2001	Am-241	7.000 ± 0.300	6.915	0.72 - 2.34
STVE-928	VEGETATION	Sep, 2001	Cm-244	4.300 ± 0.800	4.308	0.61 - 1.61
STVE-928	VEGETATION	Sep, 2001	Co-60	40.200 ± 0.900	35.300	0.75 - 1.51
STVE-928	VEGETATION	Sep, 2001	Cs-137	1,184.000 ± 2.800	1,030.000	0.80 - 1.37
STVE-928	VEGETATION	Sep, 2001	K-40	1,023.000 ± 44.100	898.670	0.78 - 1.43
STVE-928	VEGETATION	Sep, 2001	Pu-239/40	8.900 ± 1.400	11.022	0.67 - 1.49
STVE-928	VEGETATION	Sep, 2001	Sr-90	1,364.000 ± 18.400	1,612.800	0.52 - 1.23
STAP-929	AIR FILTER	Sep, 2001	Am-241	0.090 ± 30.000	0.088	0.69 - 2.40
STAP-929	AIR FILTER	Sep, 2001	Co-60	16.900 ± 0.300	17.500	0.79 - 1.30
STAP-929	AIR FILTER	Sep, 2001	Cs-134	11.800 ± 0.200	12.950	0.74 - 1.21
STAP-929	AIR FILTER	Sep, 2001	Cs-137	18.300 ± 0.300	17.100	0.78 - 1.35
STAP-929	AIR FILTER	Sep, 2001	Mn-54	85.400 ± 1.300	81.150	0.80 - 1.36
STAP-929	AIR FILTER	Sep, 2001	Pu-238	0.051 ± 0.010	0.071	0.66 - 1.35
STAP-929	AIR FILTER	Sep, 2001	Pu-239/40	0.220 ± 0.020	0.229	0.69 - 1.29
STAP-929	AIR FILTER	Sep, 2001	Sr-90	3.110 ± 0.060	3.481	0.55 - 2.05
STAP-929	AIR FILTER	Sep, 2001	Uranium	0.240 ± 0.050	0.222	0.80 - 2.54
STAP-930	AIR FILTER	Sep, 2001	Gr. Alpha	6.300 ± 0.100	5.362	0.57 - 1.47
STAP-930	AIR FILTER	Sep, 2001	Gr. Beta	13.800 ± 0.100	12.770	0.76 - 1.52

[a] The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Vegetation and Water.
[b] Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.
[c] The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.
[d] Control limits are reported by EML as the ratio of Reported Value / EML value.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

s = 2s counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: <L, where L = the lower limit of detection based on 4.66s uncertainty for a background sample.

3.0. Duplicate analyses

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $<L_1$, $<L_2$ Reported result: <L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, <L Reported result: $x \pm s$ if $x \geq L$; <L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation s of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n}\sum x \qquad s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the figure following those to be retained is less than 5, the figure is dropped, and the retained figures are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the figure following those to be retained is equal to or greater than 5, the figure is dropped and the last retained figure is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Effluent Concentration Limit of

Radioactivity in Air and Water Above Natural

Background in Unrestricted Areas

Table C-1

Effluent Concentration Limit of Radioactivity in Air and Water Above Natural Background in Unrestricted Areas[a]

Air		Water	
Gross Alpha	1E-03 pCi/m^3	Strontium-89	8,000 pCi/l
Gross Beta	1 pCi/m^3	Strontium-90	500 pCi/l
Iodine-131[b]	2.86E-01 pCi/m^3	Cesium-137	1,000 pCi/l
		Barium-140	8,000 pCi/l
		Iodine-131	1,000 pCi/l
		Potassium-40[c]	4,000 pCi/l
		Gross Alpha	2 pCi/l
		Gross Beta	100 pCi/l
		Tritium	1x10^6 pCi/l

a Taken from Code of Federal Regulation Title 10, Part 20, Table II and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

b From 10 CFR 20 but adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-child pathway.

c A natural radionuclide.

APPENDIX D

REMP SAMPLING SUMMARY

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility: Davis-Besse Nuclear Power Station — Docket No. 50-346
Location of Facility: Ottawa, Ohio (County, State) — Reporting Period: January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Airborne Particulates (pCi/m3)	GB	519	0.005	0.025 (311/311) (0.009-0.067)	T-9, Oak Harbor 6.8 mi. SW	0.027 (52/52) (0.012-0.058)	0.025 (208/208) (0.006-0.064)	0
	Sr-89		0.0016	< LLD	-	-	< LLD	0
	Sr-90		0.0017	< LLD	-	-	< LLD	0
	GS	40						
	Be-7		0.015	0.069 (24/24) (0.042-0.093)	T-4, Site Boundary 0.8 mi. S	0.076 (4/4) (0.053-0.093)	0.069 (16/16) (0.047-0.107)	0
	K-40		0.039	< LLD	-	-	< LLD	0
	Nb-95		0.0014	< LLD	-	-	< LLD	0
	Zr-95		0.0017	< LLD	-	-	< LLD	0
	Ru-103		0.0014	< LLD	-	-	< LLD	0
	Ru-106		0.0102	< LLD	-	-	< LLD	0
	Cs-134		0.0140	< LLD	-	-	< LLD	0
	Cs-137		0.0011	< LLD	-	-	< LLD	0
	Ce-141		0.0023	< LLD	-	-	< LLD	0
	Ce-144		0.0075	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m3)	I-131	519	0.07	< LLD	-	-	< LLD	0
TLD (Quarterly) (mR/91 days)	Gamma	340	1.0	14.4 (294/294) (6.4-24.1)	T-45, Site Boundary 0.5 mi. WNW	20.2 (4/4) (17.4-23.2)	14.8 (46/46) (9.6-19.7)	0
TLD (Quarterly) (mR/91 days) (Shield)	Gamma	4	1.0	6.7 (4/4) (5.9-7.1)	-	-	None	0
TLD (Annual) (mR/365 days)	Gamma	85	1.0	55.6 (76/76) (31.1-79.6)	T-67, Site boundary 0.3 mi. NNW	79.6 (1/1)	58.0 (9/9) (38.6-72.6)	0
TLD (Annual) (mR/365 days) (Shield)	Gamma	1	1.0	21.9 (1/1)	-	-	None	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
					Location[d]	Mean (F)[c] Range[c]		
Milk (pCi/L)	I-131	12	0.4	none	-	-	< LLD	0
	Sr-89	12	1.7	none	-	-	< LLD	0
	Sr-90	12	1.0	none	T-24, Sandusky 21.0 mi. SE	1.2 (5/12) (1.1-1.4)	1.2 (5/12) (1.1-1.4)	0
	GS	12						
	K-40		100	none	T-24, Sandusky 21.0 mi. SE	1378 (12/12) (1.1-1.4)	1378 (12/12) (1.1-1.4)	0
	Cs-134		6.5					
	Cs-137		6.0	none	-	-	< LLD	0
	Ba-La-140		9.6	none	-	-	< LLD	0
(g/L)	Ca	12	0.50	none	T-24, Sandusky 21.0 mi. SE	0.87 (12/12) (0.79-1.00)	0.87 (12/12) (0.79-1.00)	0
(g/L)	K (stable)	12	0.10	none	T-24, Sandusky 21.0 mi. SE	1.59 (12/12) (1.45-1.91)	1.59 (12/12) (1.45-1.91)	0
(pCi/g)	Sr-90/Ca	12	0.00	none	T-24, Sandusky 21.0 mi. SE	1.37 (6/12) (1.18-1.77)	1.37 (6/12) (1.18-1.77)	0
(pCi/g)	Cs-137/K	12	0.00	none	-	-	< LLD	0
Ground Water (pCi/L)	GB (TR)	5	3.7	< LLD	-	-	< LLD	
	H-3	5	330	416 (1/1)	T-225, residence 1.55 mi. NW	-	< LLD	0
	Sr-89	5	1.1	< LLD	-	-	< LLD	0
	Sr-90	5	0.7	< LLD	-	-	< LLD	0
	GS							
	Mn-54		15	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		15	< LLD	-	-	< LLD	0
	Co-60		15	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Zr-95		15	< LLD	-	-	< LLD	0
	Cs-134		10	< LLD	-	-	< LLD	0
	Cs-137		10	< LLD	-	-	< LLD	0
	Ba-La-140		15	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility: Davis-Besse Nuclear Power Station
Location of Facility: Ottawa, Ohio (County, State)
Docket No. 50-346
Reporting Period: January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Edible Meat (pCi/g wet)	GS	4						
	K-40		0.10	2.94 (2/2) (2.73-3.15)	T-34, Offsite Roving location	3.44 (2/2) (2.84-4.03)	3.44 (2/2) (2.84-4.03)	0
	Nb-95		0.032	< LLD	-	-	< LLD	0
	Zr-95		0.033	< LLD	-	-	< LLD	0
	Ru-103		0.032	< LLD	-	-	< LLD	0
	Ru-106		0.12	< LLD	-	-	< LLD	0
	Cs-137		0.013	< LLD	-	-	< LLD	0
	Ce-141		0.072	< LLD	-	-	< LLD	0
	Ce-144		0.093	< LLD	-	-	< LLD	0
Fruits and Vegetables (pCi/g wet)	Sr-89	3	0.002	< LLD	-	-	< LLD	0
	Sr-90	3	0.001	< LLD	-	-	< LLD	0
	I-131	3	0.017	< LLD	-	-	< LLD	0
	GS	3						
	K-40		0.50	1.17 (2/2) (0.67-1.66)	T-209, Orchard 18.9 mi. W	1.34 (1/1)	1.34 (1/1)	0
	Nb-95		0.011	< LLD	-	-	< LLD	0
	Zr-95		0.030	< LLD	-	-	< LLD	0
	Cs-137		0.010	< LLD	-	-	< LLD	0
	Ce-141		0.021	< LLD	-	-	< LLD	0
	Ce-144		0.077	< LLD	-	-	< LLD	0
Broad Leaf Vegetation (pCi/g wet)	Sr-89	9	0.007	< LLD	-	-	< LLD	0
	Sr-90	9	0.004	0.008 (2/6) (0.006-0.009)	T-19, Farm 0.68 mi. W	0.009 (1/3)	< LLD	0
	I-131	9	0.025	< LLD	-	-	< LLD	0
	GS	9						
	K-40		0.50	1.90 (6/6) (1.48-2.20)	T-19, Farm 0.68 mi. W	1.95 (3/3) (1.48-2.20)	1.79 (3/3) (1.64-1.89)	0
	Nb-95		0.019	< LLD	-	-	< LLD	0
	Zr-95		0.022	< LLD	-	-	< LLD	0
	Cs-137		0.015	< LLD	-	-	< LLD	0
	Ce-141		0.029	< LLD	-	-	< LLD	0
	Ce-144		0.13	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Animal / Wildlife Feed (pCi/g wet)	GS 5						
	Be-7	0.33	0.81 (1/3)	T-31, Onsite Roving location	0.81 (1/1)	0.70 (1/2)	0
	K-40	0.10	3.15 (3/3) (1.11-7.01)	T-34, Offsite Roving location	8.05 (1/1)	6.09 (2/2) (4.13-8.05)	0
	Nb-95	0.033	< LLD	-	-	< LLD	0
	Zr-95	0.069	< LLD	-	-	< LLD	0
	Ru-103	0.028	< LLD	-	-	< LLD	0
	Ru-106	0.20	< LLD	-	-	< LLD	0
	Cs-137	0.019	< LLD	-	-	< LLD	0
	Ce-141	0.073	< LLD	-	-	< LLD	0
	Ce-144	0.19	< LLD	-	-	< LLD	0
Soil (pCi/g dry)	GS 20						
	Be-7	0.50	1.02 (5/12) (0.58-1.98)	T-4, Site Boundary 0.8 mi. S	1.98 (1/2)	0.92 (2/8) (0.82-1.02)	0
	K-40	0.10	13.35 (12/12) (4.68-23.10)	T-9, Oak Harbor 6.8 mi. SW	24.76 (2/2) (24.22-25.30)	21.28 (8/8) (18.77-25.30)	0
	Nb-95	0.083	< LLD	-	-	< LLD	0
	Zr-95	0.11	< LLD	-	-	< LLD	0
	Ru-103	0.064	< LLD	-	-	< LLD	0
	Ru-106	0.38	< LLD	-	-	< LLD	0
	Cs-137	0.050	0.13 (7/12) (0.052-0.25)	T-12, Water Treatment Plant, 23.5 mi. WNW	0.23 (2/2) (0.20-0.26)	0.18 (7/8) (0.086-0.26)	0
	Ce-141	0.12	< LLD	-	-	< LLD	0
	Ce-144	0.19	< LLD	-	-	< LLD	0

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Docket No. 50-346
Reporting Period: January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Treated Surface Water (pCi/L)	GB (TR)	48	1.0	2.5 (24/24) (1.7-3.2)	T-11, Port Clinton WTP, 9.5 mi. SE	2.7 (12/12) (2.1-3.5)	2.3 (24/24) (1.6-3.5)	0
	H-3	16	330	593 (1/8)	T-22, Carroll Twp. WTP, 3.0 mi. NW	593 (1/4)	< LLD	0
	Sr-89	16	1.7	< LLD	-	-	< LLD	0
	Sr-90	16	1.0	< LLD	-	-	< LLD	0
	GS	16						
	Mn-54		15	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		15	< LLD	-	-	< LLD	0
	Co-60		15	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Zr-Nb-95		15	< LLD	-	-	< LLD	0
	Cs-134		10	< LLD	-	-	< LLD	0
	Cs-137		10	< LLD	-	-	< LLD	0
	Ba-La-140		15	< LLD	-	-	< LLD	0
Untreated Surface Water (pCi/L)	GB (TR)	95	1.0	3.1 (50/50) (2.1-5.4)	T-137, Lake Erie 7.0 mi. WNW	4.4 (7/7) (2.1-12.7)	3.1 (45/45) (1.9-12.7)	0
	H-3	95	330 330	713 (2/50) (439-986)	T-3, Site Boundary 1.4 mi. ESE	986 (1/12)	<LLD	0
	Sr-89	20	1.6	< LLD	-	-	< LLD	0
	Sr-90	20	0.8	1.9 (1/12)	T-3, Site Boundary 1.4 mi. ESE	1.9 (1/4)	< LLD	0
	GS	95						
	Mn-54		15	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		15	< LLD	-	-	< LLD	0
	Co-60		15	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Zr-Nb-95		15	< LLD	-	-	< LLD	0
	Cs-134		10	< LLD	-	-	< LLD	0
	Cs-137		10	< LLD	-	-	< LLD	0
	Ba-La-140		15	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility: Davis-Besse Nuclear Power Station
Docket No.: 50-346
Location of Facility: Ottawa, Ohio (County, State)
Reporting Period: January-December, 2001

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
					Location[d]	Mean (F)[c] Range[c]		
Fish (pCi/g wet)	GB	6	0.1	2.97 (3/3) (2.70-3.12)	T-33, Lake Erie 1.5 mi. NE	2.97 (3/3) (2.70-3.12)	2.82 (3/3) (1.86-3.53)	0
	GS	6						
	K-40		0.10	2.48 (3/3) (1.95-3.11)	T-35, Lake Erie > 10 mi.	2.96 (3/3) (2.76-3.10)	2.96 (3/3) (2.76-3.10)	0
	Mn-54		0.013	< LLD	-	-	< LLD	0
	Fe-59		0.032	< LLD	-	-	< LLD	0
	Co-58		0.013	< LLD	-	-	< LLD	0
	Co-60		0.014	< LLD	-	-	< LLD	0
	Zn-65		0.026	< LLD	-	-	< LLD	0
	Cs-134		0.014	< LLD	-	-	< LLD	0
	Cs-137		0.020	< LLD	-	-	< LLD	0
Shoreline Sediments (pCi/g dry)	GS	8						
	K-40		0.10	10.80 (6/6) (8.06-12.82)	T-27B, Crane Creek S.P. 5.3 mi. WNW	11.87 (2/2) (10.61-13.13)	11.87 (2/2) (10.61-13.13)	0
	Mn-54		0.026	< LLD	-	-	< LLD	0
	Co-58		0.028	< LLD	-	-	< LLD	0
	Co-60		0.025	< LLD	-	-	< LLD	0
	Cs-134		0.029	< LLD	-	-	< LLD	0
	Cs-137		0.026	< LLD	-	-	< LLD	0

[a] GB = gross beta, GS = gamma scan.
[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.
[c] Mean and range are based on detectable measurements only (i.e., >LLD) Fraction of detectable measurements at specified locations is indicated in parentheses (F).
[d] Locations are specified by station code (Table 4.1) and distance (miles) and direction relative to reactor site..
[e] Non-routine results are those which exceed ten times the control station value.