



Department of Energy
Naval Reactors Laboratory Field Office
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June 24, 2013

MEMORANDUM FOR: Andrew Wallo III, Deputy Director
Office of Environmental Protection, Sustainability Support &
Corporate Safety Analysis
HS-20, Forrestal Building
U. S. Department of Energy
1000 Independence Ave., SW
Washington, D. C. 20585

**REPORT OF RADIONUCLIDE AIR EMISSIONS FOR CALENDAR YEAR 2012 FOR
THE DEPARTMENT OF ENERGY KNOLLS SITE**

Attached is the annual report of radionuclide air emissions for calendar year 2012 required by Title 40 Code of Federal Regulations (CFR) Part 61 for the Department of Energy (DOE) Knolls Site. Naval Reactors Laboratory Field Office - Schenectady has forwarded this report to the U.S. Environmental Protection Agency (EPA), Headquarters and EPA Region II, directly by separate correspondence.

The DOE Knolls Site report includes both Knolls Atomic Power Laboratory (KAPL) Knolls Site operations and DOE Separations Process Research Unit - Disposition Project (SPRU DP) operations data incorporated as a single facility. The dose to the maximally exposed member of the public for the DOE Knolls Site is the sum of the individually calculated doses to the maximally exposed member of the public from both KAPL Knolls Site operations and DOE SPRU DP operations. Both KAPL and DOE SPRU DP used the same central emission point and distances for the CAP88-PC calculation.

The maximally exposed off-site individual (MEOSI) from the combined emissions from the DOE Knolls Site is a residence located 450 meters in the southwest sector. The annual dose for 2012 calculated using CAP88-PC Version 3.0, issued February 2013, is 1.38E-03 mrem.

Also attached is supplemental information of interest to the DOE including information on discharges during calendar year 2012 of radon isotopes from DOE Knolls Site that are not currently regulated by EPA.

A handwritten signature in cursive script, likely belonging to D. A. Delwiche, is positioned above the typed name.

D. A. Delwiche, Project Officer
Environment, Safety, and Health

Attachments:

- (1) DOE Radionuclide Air Emission Annual Report Calendar Year 2012
- (2) DOE Knolls Site Supplemental Information for Calendar Year 2012

bcc: J. M. McKenzie, NR08U
T. J. Mueller, NR08R

(w/o Attachments)
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ebcc: J. M. Steele, NR08R
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**U. S. Department of Energy
Radionuclide Air Emissions Annual Report
(under Subpart H of 40 CFR 61)
Calendar Year 2012**

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**U. S. Department of Energy
Radionuclide Air Emissions Annual Report
(under Subpart H of 40 CFR 61)
Calendar Year 2012**

Site Name: Department of Energy - Knolls Site

Location: 2401 River Road

Niskayuna, New York 12309

EPA Region 2

Operations Office Information:

Office: Naval Reactors Laboratory Field Office - Schenectady

Address: P. O. Box 1069

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Knolls Atomic Power Laboratory Site Information

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Separations Process Research Unit – Disposition Project Site Information

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Niskayuna, NY 12309

Contact: W. P. Duggan

Phone: (914) 837-3571

Section I - Facility Information

Site Description

The Department of Energy (DOE) Knolls Site is located in the Town of Niskayuna, New York, approximately 3.2 kilometers east of the City of Schenectady. The Site is situated on 170 acres of land on the south bank of the Mohawk River. The surrounding area is a mixture of open land, light industry, small farms and suburban residential areas. The annual average temperature is about 8.7°C, and the annual average precipitation is about 100 centimeters per year from the Albany National Weather Service. The prevailing winds are from the west to the northwest with a secondary maximum from the south to the south-southeast. The population residing within 80 kilometers of the Site is about 1.36 million persons based on 2010 census data.

The principal function of the Knolls Atomic Power Laboratory (KAPL) is research and development in the design and operation of naval nuclear propulsion plants. Facilities at the KAPL Knolls Site that handle radioactive materials include chemical, metallurgical and radioactive material laboratories, and a radioactive waste management facility.

The Separations Process Research Unit – Disposition Project (SPRU DP) work area covers 3 acres within the 170 acres of land belonging to DOE Knolls Site. The SPRU DP is engaged in remediation of buildings and lands contaminated during the 1950's as part of the development of chemical separation processes for the Department of Energy's predecessor agency, the Atomic Energy Commission.

General SPRU Facility Background

SPRU DP is comprised of the H2 and G2 buildings, the G2/H2 tunnel, the tank farm vaults, the Lower Level water processing and container storage area, the Hillside Drain System, and defined soil remediation areas. The scope of SPRU DP also includes decontamination of the E1/G1 tunnels, which are under the E1 and G1 Buildings of KAPL. References in this report to SPRU DP's work area or SPRU DP's Site refer to the space occupied by the G2 and H2 buildings and the immediate surrounding fenced area on the Upper Level that is impacted by demolition work.

In 2010, most of the above grade portion of Building H2 was demolished. The major components of the east and west evaporator systems were removed. Due to an unplanned release that occurred in 2010 during demolition of H2 building, the demolition was halted and

the debris and remaining intact components were stored on the H2 pad during 2011 and 2012. In 2011, SPRU DP began to install engineered enclosures over Buildings H2 and G2. In 2012, the enclosure over Building G2 was completed and work continued on the H2 enclosure.

Source Description

Radioactive Materials Used at the Facility - KAPL:

- a. Natural, depleted, and enriched uranium (un-irradiated) is used in several different facilities including chemical and metallurgical/ceramics development laboratories, and a storage vault.
- b. Physical, chemical, and metallurgical testing of small quantities of highly radioactive irradiated fissile and non-fissile specimens is conducted in the shielded hot cells of the Radioactive Materials Laboratory. Physical, chemical, and metallurgical testing is also performed on low activity specimens in glove boxes. The specimens analyzed may contain natural, depleted, or enriched uranium, fission products (e.g., Cs-137, Sr-90, Kr-85), transuranic radionuclides, and activated corrosion and wear products (e.g., Co-60).
- c. Operations in chemistry laboratories include chemical analyses, radiochemistry analyses, and other related analytical and developmental functions. Calibration sources (e.g., Cs-137, Sr-90, Th-230, and mixed gamma standards) are used in the radiochemistry laboratories to calibrate and check alpha/beta and gamma counting systems.
- d. The small volumes of water used in radiological facilities are collected and processed with an adsorbent and shipped off site in an adsorbed form to an approved disposal facility. The processed radioactive water may contain low levels of Sr-90, Cs-137, uranium, plutonium, and tritium.
- e. Calibration and check sources are used on radiation survey equipment and dosimetry devices.
- f. Sealed sources are used in gamma densitometers (Cs-137) and other miscellaneous instruments. Infrequently a radiography source (Ir-192 or Co-60) may be utilized.

Description of the Handling and Processing that Radioactive Materials Undergo at the Facility - KAPL:

Radioactive materials are handled and processed in several types of facilities including a storage vault, hot cells, chemical and metallurgical laboratories, and as part of decontamination operations of facilities and equipment. Physical, chemical, and metallurgical testing of small quantities of highly radioactive material specimens is performed in the Radioactive Materials Laboratory hot cells. Corrosion testing, chemical analyses, radiochemistry, and other related analytical and developmental functions are conducted in chemical laboratories. Similarly, metallurgical laboratories provide support services related to the testing and development, and inspection of various materials, including radioactive material. Radioactive work is performed in appropriate containment; storage and movement of radioactive materials are under strict control.

As a result of the operations conducted at the facility, some radioactive wastes are generated. The volume of solid radioactive waste that requires disposal is minimized through the use of procedures that limit the amount of materials that become contaminated, and through waste reduction and recycling.

Radioactive Materials Used at the Facility – SPRU DP

The principal radiological hazards associated with SPRU DP are contamination within the G2 and H2 Buildings and associated tunnels and contamination within the tank farm vaults, and waste in the tank farm tanks. The primary radionuclides are Sr-90, Cs-137, Pu-239, and Am-241. Numerous evaluations have demonstrated that these four radionuclides and their decay products (Ba-137m for Cs-137, Y-90 for Sr-90) or parent (Pu-241 for Am-241) constitute at least 99% of the potential calculated radiation dose to offsite receptors.

Also, Cs-137, Sr-90, Pu-239, and Am-241 are the primary radionuclides identified in the *Nuclear Facility Historical Site Assessment for the Separations Process Research Unit (SPRU) Disposition Project*, which was prepared for the DOE's SPRU Project Office by Environmental Resource Group LLC, dated April 2006. The radionuclide characterization is further described in archived facility hazard categorization documents and radiological engineering documents. In this report, emissions of other isotopes are included for completeness and to verify the relative significance of the four primary radionuclides.

Description of the Handling and Processing that Radioactive Materials Undergo at the Facility-SPRU DP:

The nature of the work performed by SPRU DP during 2012 consisted of operating radioactive water processing systems, maintenance, contamination control and monitoring, disposal of hazardous and radioactive materials, and installation of engineered enclosures in preparation for demolition of the buildings. Removal and packaging of hazardous materials and similar radioactive work efforts were performed with appropriate containment or ventilation. The installation of the enclosures included excavation, packaging and shipment of contaminated soil and debris.

As a result of the operations conducted at the facility, radioactive wastes are generated. The volume of solid radioactive waste that requires disposal is minimized using procedures that limit the amount of materials that become contaminated, and through waste reduction and recycling.

Section II - Air Emission Data

Point Source

KAPL

Radionuclide emissions from monitored emission points were calculated based on sampling system measurement results, radiochemistry results (gross alpha, gross beta, and gamma spectrometry), and stack flow measurements. In assessing the data, zero was applied in place of the observed value if the laboratory-measured value was negative. Otherwise, the laboratory-measured value was used. Kr-85 emissions were based upon integrated data from a noble gas monitoring system. Estimated emissions from unmonitored emission points were based on annual confirmatory measurements (e.g., radioactive material usage surveys and/or representative air sampling measurements). The KAPL point source data for 2012 are shown in Table 1. The KAPL point source air emissions by radionuclide for 2012 are provided in Table 2.

Table 1 - KAPL Point Sources – 2012

Point Source	Type Control ⁽¹⁾	Efficiency (%) ⁽¹⁾	Distance to Nearest Receptors (meters) ⁽²⁾			Principal Radionuclides ⁽³⁾
			Residence	Business	Vegetable Farm	
Building F4	HEPA Filter	99.95	575	450	700	U-234, Sr-90, Cs-137
Building F2	HEPA Filter	99.95	550	450	725	U-234, Sr-90, Cs-137
Building F3 Room 23	HEPA Filter	99.95	550	450	725	U-234, U-238
Building E1	HEPA Filter ⁽⁴⁾	99.95	475	600	750	U-234, Sr-90, Cs-137
Building E4 ⁽⁵⁾	HEPA Filter ⁽⁶⁾	99.95	500	525	725	Pu-238, Sr-90, Cs-137
Building E5	HEPA Filter	99.95	500	500	725	Co-60
Building E11	HEPA Filter	99.95	410	575	800	Pu-238, Sr-90, Cs-137
Building G1	HEPA Filter ⁽⁴⁾	99.95	400	550	825	U-234, Sr-90, Cs-137
Building C6	HEPA Filter	99.95	400	600	800	U-234
Building D4	HEPA Filter ⁽⁴⁾	99.95	375	575	850	U-234
Building D4 Room 161	HEPA Filter	99.95	350	600	875	U-234
*Building E1/G1 Vents ⁽⁷⁾ (4 vents)	Static HEPA Filter	99.95	425	550	800	U-234, Sr-90, Cs-137
*Building E1/G1 Basement ⁽⁷⁾	None	-	400	550	825	U-234, Sr-90, Cs-137
*Building G1 Air Sample Pump Exhaust ⁽⁷⁾	Note 8	99.95	400	550	825	U-234, Sr-90, Cs-137
*Building A3 ⁽⁷⁾	None	-	300	650	900	U-234
Temporary Sources for 2012						
*Building G1 Insulation Blanket Removal ⁽⁷⁾	HEPA Filter	99.95	425	550	750	Sr-90, Cs-137
*Building D2, Room 124 Ventilation Duct Removal ⁽⁷⁾	None	-	320	600	800	Cs-137, Am-241, Pu-239, Pu-240

Notes for KAPL Point Sources Table 1:

- (1) The HEPA filters are tested by the manufacturer to exhibit a minimum collection efficiency of 99.97% for 0.3-micron dioctylphthalate (DOP) or equivalent aerosol particles. Exhaust filters are tested with DOP prior to installation or tested in-place after installation and re-tested in-place on an annual basis, as a minimum, to ensure continued integrity. In-place testing requires a minimum collection efficiency of 99.95% for 0.7-micron aerosol particles. Static HEPA filters are tested only prior to installation and are changed out every six years.
- (2) The nearest farm producing meat and/or milk is about 2000 meters, and the nearest school is about 1700 meters from a point, central to the main emission points between KAPL and SPRU DP. The distances for this table were determined using Arc Map GIS software.
- (3) Radionuclides that could contribute more than 10% of the potential effective dose equivalent for the release point are listed.
- (4) Air from radiological facilities (hoods and glove box containments) is exhausted through HEPA filters. Exhausts for some room air and air from non-radiological hoods are not HEPA-filtered.
- (5) Building E4 is the only emission point that has the potential to discharge radionuclides into the air in quantities such that the effective dose equivalent could be ≥ 0.1 mrem/year. The emission point is monitored with an ANSI/HPS N13.1-1999 compliant system.
- (6) Charcoal adsorbers, which contain triethylene diamine (TEDA) impregnated carbon, are also used and are tested by the manufacturer to ensure a minimum 99.9% mechanical efficiency.
- (7) The estimated emissions from the annual confirmatory measurements are included in the radionuclide total annual emissions in the Point Source KAPL- Knolls Site Air Emissions – 2012 Table. The asterisk (*) indicates that an emission point is not monitored.
- (8) The exhaust air passes through two-inch diameter glass fiber filters with typical collection efficiency, as tested by the manufacturer, of 99.98% or greater for 0.3-micron DOP or equivalent particles.

Table 2 – KAPL Knolls Site Point Source Air Emissions – 2012

Radionuclide	Annual Emissions (Ci)⁽¹⁾
H-3	1.88E-08
Kr-85	5.76E-01
Co-60	1.68E-08
Sr-90	2.20E-06
Y-90	2.20E-06
Cs-137	2.20E-06
U-234	5.77E-07
U-235	9.70E-09
U-236	1.80E-09
U-238	1.11E-11
Pu-238	9.49E-08

Note: (1) 1 Ci = 3.7E-02 TBq

Included in the above emissions table is an estimated emission contribution from the SPRU DP temporary E1 Hot Tunnel HEPA filtered ventilation system. This temporary ventilation system exhausts into the E1 Basement, which is exhausted to the environment through the E1/G1 Basement Ventilation System. No work has been done in the E1/G1 Hot Tunnels since 2010. The estimated contribution from the SPRU DP E1 Hot Tunnel HEPA filtered ventilation exhaust system to the E1 Basement, based upon KAPL fixed filter air sampling data, is Sr-90, 1.29E-07 Ci; Y-90, 1.29E-07 Ci; Cs-137, 1.29E-07 Ci; and Pu-238 7.27E-08 Ci. Additional E1/G1 Basement Ventilation System emissions are based upon results of fixed filter air sampling in the G1 Basement and evaluation of radioactive material usage surveys for the use of radioactive liquids that are vented via an inceptor tank into the G1 Basement.

The KAPL total estimated emissions in 2012 from the E1/G1 Basement Ventilation System, which are included in the Table 2 emissions above, are as follows:

Table 2A - E1/G1 Basement Ventilation System Estimated Air Emissions – 2012

Radionuclide	Estimated Emissions (Ci)⁽¹⁾
H-3	1.88E-08
Co-60	2.43E-13
Sr-90	3.23E-07
Y-90	3.23E-07
Cs-137	3.23E-07
U-234	8.82E-08
U-235	1.49E-09
U-236	2.75E-10
U-238	1.67E-12
Pu-238	7.27E-08

Note: (1) 1 Ci = 3.7E-02 TBq

SPRU DP

The point source release data were obtained from analysis of particulate air samples that were collected from permitted portable ventilation units (PVUs) and the permitted G2 Enclosure ventilation system. PVUs were placed into service during the fourth quarter of 2011. The G2 Enclosure ventilation system was placed in service in the third quarter of 2012. The air

samplers operated continuously during the periods when any point source was in operation. Glass fiber filters (47 mm) were used to capture particulate samples. Sample and exhaust flow rates are measured with continuous monitoring devices. The SPRU DP point source data for 2012 are shown in Table 3. The SPRU DP point source air emissions by radionuclide for 2012 are provided in Table 4.

Table 3 - SPRU DP Point Sources – 2012

Point Source	Type Control ⁽¹⁾	Efficiency (%) ⁽¹⁾	Distances from Point Sources to Nearest Receptors (m) ⁽²⁾			Radionuclide Measurements
			Residence	Business	Vegetable Farm	
PVUs	HEPA	99.95	550	425	775	Radiochemical analysis of quarterly composite
G2 Enclosure Ventilation	HEPA	99.95	550	425	775	Radiochemical analysis of quarterly composite

Notes for Table 3:

- (1) The HEPA filters are tested by the manufacturer to exhibit a minimum collection efficiency of 99.97% for 0.3-micron dioctylphthalate (DOP) or equivalent aerosol particles. Filtration units are tested in-place after installation. In-place testing requires a minimum collection efficiency of 99.95% for 0.7-micron aerosol particles.
- (2) The nearest farm producing meat and/or milk is about 2000 meters from a point, central to the main emission points between KAPL and SPRU DP, and the nearest school is about 1700 meters away. The distances to receptors in Table 3 are measured from the center of the SPRU DP work area. The location of the nearest receptor to the SPRU DP work area may or may not correspond to the location of the MEOSI for the KAPL site, depending on geometry, dispersion and occupancy factors. The nearest receptor for the KAPL site is 450 meters from a point, central to the main emission points between KAPL and SPRU DP.

Table 4 - SPRU DP Point Source Air Emissions – 2012

Radionuclide	Annual Emission (Ci) ⁽¹⁾
Cs-137	6.37E-09
Sr-90	1.72E-07
Pu-238	9.56E-09
Pu-239	8.20E-09
Am-241	3.11E-09
Th-228	3.02E-09
Th-230	5.98E-09
Th-232	9.12E-09
U-234	1.17E-08
U-235	1.21E-09
U-238	5.28E-08

Note: (1) 1 Ci = 3.7E-02 TBq.

Non-Point Source

KAPL

Soil Contamination

Historical soil contamination is a potential diffuse source at the DOE Knolls Site. The principal nuclide associated with the historical contamination is Cs-137. The soil was contaminated over 50 years ago as a result of various waste handling operations. Prior to 2011, the majority of these contaminated, historical soil areas was transferred to the cognizance of SPRU DP and was subsequently remediated. The areas, remaining under KAPL cognizance, with potential soil contamination are, for the most part, either paved over or are covered with vegetation or clean soil or fill and do not represent a significant source of airborne radionuclides. Conservatively these areas were evaluated for potential emissions from wind-induced soil re-suspension using the techniques presented in "Methods for Estimating Fugitive Air Emissions of Radionuclides for Diffuse Sources at DOE Facilities – Final Report, September 3, 2004."

Additionally, on September 29, 2010, a SPRU DP Site event during demolition of Building H2 resulted in airborne radiological contamination being spread to KAPL property. The majority of this contamination on the KAPL Site was cleaned up during October and November 2010. One area under KAPL cognizance for part of 2012 still contains potential residual contamination. Subsequent to the event, surveys were taken by KAPL to determine the level and the extent of the contamination on the KAPL Knolls Site. The contamination was not distributed uniformly over the area of concern and can best be characterized as spotty. These survey data and results were used as the basis of the evaluation of the contamination spread as a diffuse potential source of airborne radionuclides. Conservatively this area was also evaluated for potential emissions from wind-induced soil re-suspension using the techniques presented in "Methods for Estimating Fugitive Air Emissions of Radionuclides for Diffuse Sources at DOE Facilities – Final Report, September 3, 2004." However, because this contamination was more recently deposited, a higher and more conservative re-suspension factor was used, based on NCRP Report No. 129, "Recommended Screening Limits for Contaminated Surface Soil and Review of Factors relevant to Site-Specific Studies, 1999."

Building E2/E4 Radioactive Materials Laboratory Roof Replacement

During 2012, work on replacing the roof on the Building E2/E4 occurred. The roof contained limited areas of contamination from historical operations. A source term and potential emissions were developed based on characterization surveys and using 40 CFR 61 Appendix D.

Building F4 Full Core Physics Experiment (FCPE) Core Dolly Decontamination

During 2012, decontamination of the Building F4 FCPE Core Dolly was completed. This piece of equipment became potentially contaminated from the September 29, 2010 SPRU DP Site event. A source term and potential emissions were derived from previous characterization surveys performed subsequent to the September 29, 2010 event and using 40 CFR 61 Appendix D.

The resultant total potential diffuse air emissions for wind-induced re-suspension of contaminated soil, from work associated with the Building E2/E4 Radioactive Materials Laboratory roof replacement, and from work associated with the decontamination of the Building F4 FCPE Core Dolly are shown in Table 5.

Table 5 - KAPL Diffuse Air Emissions by Source - 2012

Radionuclide	Contaminated Soil (Ci)⁽¹⁾	Building E2/E4 Roof Replacement (Ci)⁽¹⁾	Building F4 FCPE Core Dolly Decon (Ci)⁽¹⁾	Total Diffuse Emissions (Ci)⁽¹⁾
Sr-90/Y-90	4.55E-08	1.88E-09	6.28E-09	5.37E-08
Cs-137	2.08E-07	1.78E-08	1.14E-10	2.26E-07
Am-241	3.16E-11	0	4.70E-11	7.86E-11
Pu-238	3.16E-12	0	5.00E-12	8.16E-12
Pu-239	1.27E-10	0	1.90E-10	3.17E-10
Pu-240	3.16E-11	0	4.70E-11	7.86E-11
Pu-241	6.40E-11	0	9.50E-11	1.59E-10
Pu-242	3.16E-15	0	0	3.16E-15

Note: (1) 1 Ci = 3.7E-02 TBq.

SPRU DP

The diffuse releases from SPRU DP for 2012 resulted from material handling, breathing emissions from buildings and systems, working and transfer losses from tanks, activities associated with enclosure installation, and fugitive emissions associated with maintenance actions. The diffuse emissions were calculated using methods described in the EPA document, *Methods for Estimating Fugitive Emissions of Radionuclides from Diffuse Sources at DOE Facilities* (EPA 2004) and process knowledge of physical and chemical processes. Methods and parameters are described in SPRU DP's archives of radiological and environmental engineering calculations. Diffuse emissions are summarized in Table 6.

Building G2 Loose Contamination Emissions

The generation of airborne radioactive materials occurs from the re-suspension of surface contamination incidental to performing work in the building. Following turnover of the building for demolition, parts of the external walls were removed and the contamination was exposed to the environment. The nature of the work performed by the SPRU DP during 2012 in the buildings consisted of general facility maintenance, removal of hazardous and legacy radioactive materials, removal of asbestos and hazardous material, management of storm water intrusion, installation of enclosures, and preparations for demolition of the buildings. In the third quarter of 2012, the G2 Enclosure ventilation system was placed in service.

Building H2

The generation of airborne radioactive materials occurs from the re-suspension of surface contamination from the pad and adjacent soil incidental to installing the enclosures. The work performed by the SPRU DP during 2012 consisted of general facility maintenance, response to hillside slumping, limited removal of hazardous and radioactive materials, and installation of the enclosure. Installation of the enclosure and isolation of the interior of the H2 building from the environment was approximately 90% complete at the end of 2012.

Sludge Processing

The installation of a weather protection tent over the roof of the tank vaults was completed in 2010. The sludge was consolidated in Tank 509E in 2010 and continues to be stored there. Enhancements to the tent in 2011 improved the tightness of the enclosure. In 2012, the diffuse emissions from the sludge processing area were limited to re-suspension of loose contamination.

Water Treatment

Fugitive emissions from water transfers occur when water-containing radioactivity fills a collection vessel (tank) and contaminated air is displaced ("working losses") to the environment via vessel vents. Breathing losses occur when air is displaced outward from the vessel during storage as a result of temperature or atmospheric pressure change in the vessel. Building, storage tank, and water transfer emissions were evaluated by applying conservative concentrations and vapor phase partition factors. Representative water samples were analyzed by an off-site laboratory.

In 2012, the water treatment system was moved from the upper level to the lower level. As part of this movement, an ozone treatment system was added. This water treatment system is being permitted under the State Pollutant Discharge Elimination System. Approximately 30,000 gallons of water was treated in this system as part of the demonstration test program. This treated water was sent to off-site disposal.

Soil Excavation

During 2012, some soil was excavated in the proximity of the buildings to support installation of the enclosures. Soil was also excavated or disturbed for crane pads and to support stabilization of the hillside west of H2.

Waste Shipping

In 2012, movement and storage of waste containers occurred at the SPRU DP. The containers were sealed after loading and inspection. Therefore, the interim staging of packages prior to transportation did not represent a potential source of airborne emissions and no source term is provided for the shipping actions.

Table 6 - SPRU DP Diffuse Air Emissions by Source – 2012 (Ci)⁽¹⁾

Radionuclide	Water Storage (Ci)	Water Treatment (Ci)	Building Re-suspension Emissions (Ci)	Soil/Debris (Ci)	Total Diffuse Emissions (Ci)
Cs-137	3.33E-06	2.57E-06	-	6.81E-09	5.91E-06
Sr-90	4.89E-06	3.78E-06	4.15E-06	1.74E-09	1.28E-05
Am-241	3.24E-08	2.50E-08	-	4.82E-11	5.75E-08
Pu-238	5.78E-10	4.47E-10	-	9.97E-12	1.03E-09
Pu-239	4.55E-08	3.51E-08	3.47E-07	4.90E-10	4.28E-07
Pu-241	2.20E-08	1.70E-08	-	-	3.91E-08
Th-228	1.86E-09	1.43E-09	-	-	3.29E-09
Th-230	1.30E-10	1.00E-10	-	-	2.30E-10
Th-232	0.00E+00	0.00E+00	-	1.55E-10	1.55E-10
U-234	1.62E-08	1.25E-08	-	1.73E-10	2.89E-08
U-235	9.65E-10	7.45E-10	-	1.34E-11	1.72E-09
U-238	9.51E-09	7.35E-09	-	1.84E-10	1.70E-08
C-14	4.29E-09	3.32E-09	-	-	7.61E-09
Ni-63	2.12E-09	1.63E-09	-	-	3.75E-09
Tc-99	1.35E-09	1.04E-09	-	-	2.40E-09
Cm-242	1.90E-10	1.47E-10	-	-	3.37E-10

Note: (1) 1 Ci = 3.7E-02 TBq.

SPRU DP Summary of Emissions

The emissions associated with point sources are based on off-site laboratory analysis of collected filter samples. In assessing the data, zero was applied in place of the observed value if the laboratory measurement was negative. Otherwise, the measured value was reported. In this respect, the point source emissions data are biased conservatively. Exhaust flow rates and sample flow rates were monitored and recorded.

All diffuse (non-point) emission quantities, except the debris pile emissions, are determined using process knowledge, and the EPA approved methods described in the EPA document, *Methods for Estimating Fugitive Air Emissions of Radionuclides from Diffuse Sources at DOE Facilities* (EPA2004). Emissions from the debris pile are estimated to be 10% of the emission that occurred on September 29, 2010. The Ba-137m and Y-90 decay products of Cs-137 and Sr-90 are assumed to be in full equilibrium.

Section III - Dose Assessment

Description of Dose Model

The dose model used by KAPL and SPRU DP was CAP88-PC Version 3.0, as updated on February 9, 2013.

Summary of Input Parameters

Receptor Identification and Location (KAPL, and SPRU DP)

All point source releases from both KAPL and SPRU DP were considered as originating from a single stack, central to the main emission points between both KAPL and SPRU DP. Diffuse source releases from KAPL and SPRU DP were considered as originating from an area, one meter in height, central to the main emission points between both KAPL and SPRU DP. The distance and direction to the receptor for the maximum potential dose, which is a residence, is approximately 450 meters in the southwest sector. The location was verified by inspecting the CAP88-PC results and comparing doses at the nearest occupied location in each sector. In sectors where a business location is closer than the nearest residence, both the nearest business location and the nearest residence were evaluated. For business locations, an occupancy correction is applied by dividing the doses at business locations by three to account for an occupancy factor of 8 hours per day. Plume rise was modeled as a momentum plume with zero velocity.

Values Used for all Other User-Supplied Input Parameters for the Computer Models and the Source of These Data:

Common Input Data

- a. Wind frequency data and average temperature of 10.2°C were reduced from calendar year 2012 on-site meteorological measurements of wind speed, wind direction and standard deviation of horizontal wind direction, and temperature. Data reduction was performed in accordance with EPA-454/R-99-005, "Meteorological Monitoring Guidance for Regulatory Modeling Applications." The calendar year 2012 annual rainfall of 94.0 centimeters was taken from the Albany National Weather Service.
- b. The average depth of mixing layer, LID = 1000 meters, is the average of the annual mean morning and afternoon mixing depths from George C. Holzworth, "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Through the Contiguous United States," U.S. Environmental Protection Agency Office of Air Programs report, 1972.
- c. The distances from the centrally modeled emission point to the nearest receptors were determined by KAPL with the use of Arc Map GIS software.
- d. The food sources fractions used in the assessment were those listed for rural sites in the CAP88-PC Version 3.0 program when the Rural EPA Food Source Scenario option was selected. In addition, the agricultural data (livestock densities and cultivated land fractions) were default data as specified within the CAP88-PC Version 3.0 program when New York State was selected for the site location.

KAPL Specific Input Data

- a. A stack or source height of 1 meter was used to model a ground level release but maintain stack or source height greater than zero per ORNL-5532 (AIRDOS-EPA). A stack diameter of 1.0 meters was entered into the data to ensure the use of a non-zero value as required by Version 3.0.
- b. The total radionuclide emissions from point sources were those from the KAPL Knolls Site Point Source Air Emissions – 2012, Table 2, above. Radionuclide emissions from monitored emission points were calculated based on sampling system measurement results, radiochemistry results (gross alpha, gross beta, and gamma spectrometry), and stack flow measurements. Kr-85 emissions were based upon integrated data from a noble gas monitoring system. Estimated emissions from unmonitored emission points were based on annual confirmatory measurements (e.g., radioactive material usage surveys and/or representative air sample measurements). The diffuse source emissions were those taken from Table 5 and described in the Non-Point Source Section above.
- c. With the exception of the cobalt, and uranium radionuclides, the default lung absorption types ("FGR 13 Type") were assumed. For Co-60, U-234, U-235, U-236, and U-238, "Slow" was selected. This selection was based on process knowledge and the higher dose equivalent conversion factors per unit radioactivity compared to the CAP88-PC, Version 3.0 default values, with supporting guidance provided in International Commission on Radiological Protection Publication 71, "Age-dependent Doses to Members of the Public from Intake of Radionuclides: Part 4 Inhalation Dose Coefficients; A Report of a Task Group of Committee 2 of the International Commission on Radiological Protection", September 1995.

SPRU DP Specific Input Data

- a. Diffuse (area) sources are modeled as ground releases of one meter height and zero velocity. The area for diffuse sources is assumed to be about 120 ft by 120 ft (1305 m²) or about the size of either the G2 or H2 buildings.
- b. Point source emissions were modeled at a height of 2 meters and a diameter of 1.2 meters. Both these values correspond to the G2 ventilation system. Plume rise for point sources was modeled as momentum rise with zero velocity.

KAPL Compliance Assessment - 2012

Effective Dose Equivalent	Location of Maximally Exposed Off-Site Individual (MEOSI)
3.12E-04 mrem (3.12E-03 μ Sv)*	A residence at about 450 meters in the southwest sector

* 1 mrem = 10 μ Sv

The KAPL CAP88-PC calculations and output are contained in Appendix A.

Table 7 - Summary of KAPL Dose Equivalents for Calendar Year 2012

Sector	Distance to Nearest Receptor (meters)	Point Source Dose Equivalent (mrem/year)	Diffuse Source Dose Equivalent (mrem/year)	Total Dose Equivalent (mrem/year)	Notes
N	1000	1.1E-04	1.5E-08	1.1E-04	
NNW	1300	9.8E-05	1.2E-08	9.8E-05	
NNW	550	(1.27E-04)	(2.13E-08)	(1.27E-04)	Business*
NW	2550	3.3E-05	1.3E-09	3.3E-05	
NW	700	(3.67E-05)	(5.00E-09)	(3.67E-05)	Business*
WNW	1050	5.1E-05	4.3E-09	5.1E-05	
WNW	775	(2.40E-05)	(2.63E-09)	(2.40E-05)	Business*
W	700	7.6E-05	8.8E-09	7.6E-05	
WSW	750	6.6E-05	7.0E-09	6.6E-05	
SW	450	3.12E-04	5.07E-08	3.12E-04	MEOSI
SSW	450	2.9E-04	4.8E-08	2.9E-04	
S	550	1.6E-04	2.4E-08	1.6E-04	
SSE	1650	5.0E-05	4.2E-09	5.0E-05	
SE	1650	5.1E-05	4.4E-09	5.1E-05	
ESE	1000	1.1E-04	1.5E-08	1.1E-04	
E	700	1.2E-04	1.6E-08	1.2E-04	
ENE	700	9.7E-05	1.3E-08	9.7E-05	
NE	700	8.6E-05	1.1E-08	8.6E-05	
NNE	950	6.1E-05	6.3E-09	6.1E-05	

*A correction factor of one-third has been applied to the CAP88 PC doses for the nearest receptors at business locations. The adjusted doses are enclosed in parentheses.

SPRU DP Compliance Assessment - 2012

Effective Dose Equivalent	Location of Maximally Exposed Off-Site Individual (MEOSI)
1.07E-03 mrem (0.01 μ Sv)*	A residence at about 450 meters in the southwest sector

* 1 mrem = 10 μ Sv

The SPRU DP CAP88-PC calculations and output are contained in Appendix B.

Table 8 - Summary of SPRU DP Dose Equivalents for Calendar Year 2012

Sector	Distance to Nearest Receptor (meters)	Point Source Dose Equivalent mrem/year	Diffuse Source Dose Equivalent mrem/year	Total Dose Equivalent mrem/year	Notes
N	1000	8.2E-06	4.0E-04	4.08E-04	
NNW	1300	6.8E-06	3.6E-04	3.67E-04	
NNW	550	(1.1E-05)	(4.33E-04)	(4.44E-04)	Business*
NW	2550	7.4E-07	1.5E-04	1.51E-04	
NW	700	(2.7E-06)	(1.3E-04)	(1.33E-04)	Business*
WNW	1050	2.4E-06	2.1E-04	2.12E-04	
WNW	775	(1.5E-06)	(9.0E-05)	(9.15E-05)	Business*
W	700	4.9E-06	2.9E-04	2.95E-04	
WSW	750	3.9E-06	2.6E-04	2.64E-04	
SW	450	2.75E-05	1.04E-03	1.07E-03	MEOSI
SSW	450	2.6E-05	9.7E-04	9.96E-04	
S	550	1.3E-05	5.5E-04	5.63E-04	
SSE	1650	2.4E-06	2.0E-04	2.02E-04	
SE	1650	2.5E-06	2.1E-04	2.13E-04	
ESE	1000	8.2E-06	4.1E-04	4.18E-04	
E	700	8.7E-06	4.1E-04	4.19E-04	
ENE	700	7.1E-06	3.5E-04	3.57E-04	
NE	700	6.0E-06	3.2E-04	3.26E-04	
NNE	950	3.5E-06	2.4E-04	2.44E-04	

*A correction factor of one-third has been applied to the CAP88 PC doses for the nearest receptors at business locations. The adjusted doses are enclosed in parentheses.

DOE - Knolls Site Combined Compliance Assessment - 2012

Effective Dose Equivalent	Location of Maximally Exposed Individual (MEOSI)
1.38E-03 mrem (1.38E-02 μ Sv)*	A residence at about 450 meters in the southwest sector

* 1 mrem = 10 μ Sv

Table 9 – DOE Knolls Site Combined Compliance Assessment - 2012

Sector	Distance to Nearest Receptor (meters)	KAPL Total Dose Equivalent (mrem/year)	SPRU DP Total Dose Equivalent (mrem/year)	Knolls Site Total Dose Equivalent (mrem/year)	Notes
N	1000	1.1E-04	4.08E-04	5.18E-04	
NNW	1300	9.8E-05	3.67E-04	4.65E-04	
NNW	550	(1.27E-04)	(4.44E-04)	(5.71E-04)	Business*
NW	2550	3.3E-05	1.51E-04	1.84E-04	
NW	700	(3.67E-05)	(1.33E-04)	(1.70E-04)	Business*
WNW	1050	5.1E-05	2.12E-04	2.63E-04	
WNW	775	(2.4E-05)	(9.15E-05)	(1.16E-04)	Business*
W	700	7.6E-05	2.95E-04	3.71E-04	
WSW	750	6.6E-05	2.64E-04	3.30E-04	
SW	450	3.12E-04	1.07E-03	1.38E-03	MEOSI
SSW	450	2.9E-04	9.96E-04	1.29E-03	
S	550	1.6E-04	5.63E-04	7.23E-04	
SSE	1650	5.0E-05	2.02E-04	2.52E-04	
SE	1650	5.1E-05	2.13E-04	2.64E-04	
ESE	1000	1.1E-04	4.18E-04	5.28E-04	
E	700	1.2E-04	4.19E-04	5.39E-04	
ENE	700	9.7E-05	3.57E-04	4.54E-04	
NE	700	8.6E-05	3.26E-04	4.12E-04	
NNE	950	6.1E-05	2.44E-04	3.05E-04	

*A correction factor of one-third has been applied to the CAP88 PC doses for the nearest receptors at business locations. The adjusted doses are enclosed in parentheses.

Section IV - Additional Information

In accordance with 40 CFR 61.94(b)(8), DOE sites are required to report on all construction and modifications which were completed in CY 2012 but for which the requirement to apply for approval to construct or modify was waived under 40 CFR 61.96.

KAPL

Construction projects or modifications to existing operations for which approval to construct or modify required EPA approval:

On May 31, 2011, EPA provided a draft Compliance Order on Consent to DOE regarding radionuclide NESHAPs compliance at the KAPL Knolls and SPRU DP Sites. This draft Compliance Order removed the availability of the exemption in 40 CFR 61.96 to both KAPL and SPRU DP. On November 9, 2011, the DOE Naval Reactors Laboratory Field Office submitted to EPA Region 2 for approval three applications to construct/modify stationary sources of radionuclides. These applications were for Building D2 Room 124 Ventilation Duct Removal, Building F4 Full Core Physics Core Dolly Decontamination, and Building D3 Ventilation Duct Removal. Methods detailed in Appendix D of 40 CFR 61 were used to calculate potential source terms and used as input to the CAP88-PC, Version 3.0 computer model to evaluate potential dose equivalents to the MEOSI. In the Building D2 Room 124 Ventilation Duct Removal and the Building D3 Ventilation Duct Removal evaluations, the dose equivalents to the MEOSI were 0.0 mrem/year. In the Building F4 Full Core Physics Core Dolly Decontamination, the annual effective dose equivalent to the MEOSI calculated using the EPA approved computer code was 1.98E-09 mrem. In the EPA Region 2 letter to U.S. Department of Energy, dated January 4, 2012, EPA Region 2 approved the three applications to construct or modify: KAPL-2012-001 for the Building D2 Room 124 Ventilation Duct Removal, KAPL-2012-002 for Building F4 Full Core Physics Experiment Core Dolly Decontamination and KAPL-2012-003 for the Building D3 Ventilation Duct Removal.

Startup notification for KAPL-2012-001, Building D2 Room 124 ventilation duct removal was provided to EPA on March 16, 2012 and completion of removal operations was provided to EPA on April 30, 2012.

Startup notification for KAPL-2012-002, Building F4 Full Core Physics Experiment Core Dolly Decontamination was provided to EPA on July 9, 2012 and notification of completion of decontamination operations was provided to EPA on October 24, 2012.

The start of work on KAPL-2012-003, Building D3 Ventilation Duct Removal is still pending.

Additionally, on September 9, 2011, the DOE Naval Reactors Laboratory Field Office issued to EPA Region 2 notification of anticipated startup of the Building E4 Telemannipulator Decontamination Glove Box. EPA was provided a demonstration of the operation of the glove box on a non-radiological telemannipulator on October 13, 2011. The Building E4 Telemannipulator Decontamination Glove Box began operations with radioactive materials on October 16, 2012.

On March 1, 2012, U.S. EPA Region 2 issued the signed Compliance Order on Consent #CAA-02-2012-1002.

On May 4, 2012, the DOE Naval Reactors Laboratory Field Office submitted to EPA Region 2

for approval an application to construct/modify a stationary source of radionuclides. The application was for the replacement of the roof on the Building E2/E4 Radioactive Materials Laboratory. The existing roof contained some low levels of radioactivity due to historical operations. A source term and potential emissions were derived using 40 CFR 61 Appendix D. The annual effective dose equivalent using CAP88-PC, Version 3.0 to the maximally exposed off-site individual located 550 meters in the south-southwest sector was $3.81\text{E-}10$ mrem. In the EPA Region 2 letter to U.S. Department of Energy, dated May 23, 2012, EPA Region 2 approved the application to construct or modify (KAPL-2012-004). Startup notification for the work was provided to the EPA on June 5, 2012. During the roof removal process, higher levels of contamination were found in limited areas of the roofing than found in the original characterization surveys used to develop the source term. Based on the new information a revised source term and potential emissions were calculated. The Cs-137 potential emission term increased from $9.22\text{E-}09$ to $1.78\text{E-}08$ Ci and the Sr-90 potential emission term increased from $9.72\text{E-}10$ to $1.88\text{E-}09$ Ci. The dose to the maximally exposed off-site individual based on the updated potential emissions was $1.34\text{E-}09$ mrem. The fact that higher levels of contamination were found during the roof removal was discussed with the EPA in a phone call on July 9, 2012.

On June 5, 2012, based on EPA's review of the 2010 annual compliance report submitted on June 29, 2011 and submittals made per the Consent Order (revised 2006 and 2009 annual compliance reports), the EPA stated that both KAPL and SPRU were in compliance with 40 CFR 61 Subpart H and returned the exemption under 40 CFR 61.96.

Construction projects or modifications to existing operations for which approval to construct or modify was waived under 40 CFR 61.96

There was one project completed during 2012 for which approval to construct or modify was waived under 40 CFR 61.96 after the exemption was returned on June 5, 2012:

The project was removal of asbestos insulation (duct blankets) in two locations in the Building G1 Equipment Floor on ventilation ducting that had low levels of Cs-137 contamination. A temporary HEPA filtered ventilation system was used for this project, which exhausted to the outdoors. A source term and potential emissions were derived using 40 CFR 61 Appendix D. The annual effective dose equivalent using CAP88-PC, Version 3.0 to the maximally exposed off-site individual located 450 meters in the south-southwest sector was $1.07\text{E-}09$ mrem. Because the annual dose was less than 0.1 mrem, EPA approval was not required.

Revision to the E1/G1 Basement Ventilation System Radionuclide NESHAPS Potential-to-Emit Evaluation based on the E1 Radioactive Materials Laboratory (RML) Interceptors

The Building E1 Radioactive Material Laboratory interceptors consist of two 130-gallon vessels, which were used as a collection point to pump radioactive liquid waste from the Building E2/E4 Radioactive Material Laboratory to Building H2. The interceptors are located in the Building E1 Hot Tunnel and were taken out of service before Building H2 was turned over to DOE-EM in April 2009. In January 2013, the KAPL personnel responsible for Radionuclide NESHAPS became aware of the fact that the Building E1 RML interceptors were vented into the Building E1 Hot tunnel. Since September 2010, the E1 Hot Tunnel has been ventilated to the E1 Basement via a HEPA filtered ventilation system operated by SPRU DP. When this became known, a revised source term and potential emissions for the E1/G1 Basement Ventilation were calculated based on the September 2010 sample taken by SPRU DP in one of the RML interceptors and the previous evaluation performed by SPRU DP for the Building E1/G1 Hot

Tunnels. Based on the observations made by SPRU DP during the sampling evolution of the interceptor of the physical state of the sludge and the radio-analytical results, a source term and potential air emissions were derived using 40 CFR 61 Appendix D. The unabated annual effective dose equivalent using CAP88-PC, Version 3.0 to the maximally exposed off-site individual located 450 meters in the south-southwest sector was 5.88E-02 mrem. Because the annual dose was less than 0.1 mrem, monitoring methods using EPA approved methods (i.e., ANSI/HPS N13.1-1999) are not required. A detailed summary of the revised source term calculation and potential emissions was provided to the EPA on February 21, 2013 and subsequently discussed with the EPA via a conference call on March 11, 2013. It was agreed during this discussion that EPA would be informed prior to any work being performed on the interceptors, with a radionuclide NESHAPS evaluation for the planned work also being provided to the EPA.

SPRU DP

During startup of the G2 Ventilation system, the H2/G2 tunnel was ventilated for a brief period of time. The H2/G2 tunnel was originally included as a source in the H2 Enclosure ventilation system application and not the G2 Enclosure ventilation system application. Based on the methods contained in 40 CFR 61 Appendix D, the estimated emissions due to exhausting the tunnel via the G2 ventilation system was estimated to be 9.5E-06 mrem/yr, which is well below the 40 CFR 61.96 limit of 0.1 mrem/yr.

Unplanned Releases

KAPL


There were no unplanned releases to the atmosphere.

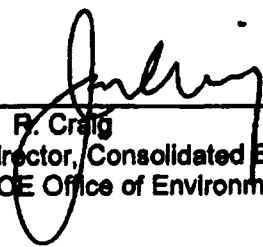
SPRU DP

There were no unplanned releases to the atmosphere.

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See, 18 U.S.C. 1001.

Signature:  Date: 6/21/13
T. E. Ketcham
Assistant Manager for Operations
Naval Reactors Laboratory Field Office - Schenectady

Signature:  Date: 6/20/13
J. R. Craig
Director, Consolidated Business Center
DOE Office of Environmental Management

APPENDIX A
Knolls Atomic Power Laboratory
(KAPL)
CAP88-PC OUTPUT REPORTS

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CAP88-PC
KAPL Point Source
Calculation

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Version 3.0

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 11, 2013 08:17 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309

Source Category: DOE FACILITY
Source Type: Stack
Emission Year: 2012

Comments: KAPL KNOLLS 2012 EMISSIONS
MAXIMALLY EXPOSED INDIVIDUAL

Effective Dose Equivalent
(mrem/year)

3.12E-04

At This Location: 450 Meters Southwest

Dataset Name: KNAMEI2012
Dataset Date: 4/11/2013 7:45:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012

Apr 11, 2013 08:17 am

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL
Location Of The Individual: 450 Meters Southwest
Lifetime Fatal Cancer Risk: 1.61E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
Adrenals	5.82E-05
B Surfac	1.38E-03
Breasts	4.99E-05
St Wall	5.70E-05
ULI Wall	7.52E-05
Kidneys	5.79E-05
Lungs	1.03E-04
Ovaries	6.01E-05
R Marrow	5.90E-04
Spleen	5.67E-05
Thymus	5.54E-05
Uterus	5.94E-05
Bld Wall	6.23E-05
Brain	5.12E-05
Esophagu	7.29E-05
SI Wall	5.93E-05
LLI Wall	1.31E-04
Liver	8.01E-05
Muscle	5.38E-05
Pancreas	5.92E-05
Skin	6.60E-04
Testes	5.54E-05
Thyroid	5.59E-05
EFFEC	3.12E-04

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SYNOPSIS
Page 2

RADIONUCLIDE EMISSIONS DURING THE YEAR 2012
Source

Nuclide	Type	Size	#1	TOTAL
			Ci/y	Ci/y
Kr-85	G	0	5.8E-01	5.8E-01
H-3	V	0	1.9E-08	1.9E-08
Co-60	S	1	1.7E-08	1.7E-08
Pu-238	M	1	9.5E-08	9.5E-08
U-238	S	1	1.1E-11	1.1E-11
U-236	S	1	1.8E-09	1.8E-09
U-235	S	1	9.7E-09	9.7E-09
U-234	S	1	5.8E-07	5.8E-07
Sr-90	M	1	2.2E-06	2.2E-06
Y-90	M	1	2.2E-06	2.2E-06
Cs-137	F	1	2.2E-06	2.2E-06
Ba-137m	M	1	2.2E-06	2.2E-06

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 94 cm/y
Humidity: 8 g/cu m
Mixing Height: 1000 m
User specified location of max exposed individual.
(ILOC, JLOC): 7, 1

Apr 11, 2013 08:17 am

SYNOPSIS
Page 3

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.00
 Diameter (m): 1.00
 Plume Rise
 Momentum (m/s): 0.00
 (Exit Velocity)

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.400	0.440
Fraction From Assessment Area:	0.300	0.600	0.560
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
 Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

450	550	700	750	775	950	1000
1050	1300	1650	2550	80000		

C A P 8 8 - P C
Version 3.0
Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S
Non-Radon Individual Assessment
Apr 11, 2013 08:17 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309
Source Category: DOE FACILITY
Source Type: Stack
Emission Year: 2012
Comments: KAPL KNOLLS 2012 EMISSIONS
MAXIMALLY EXPOSED INDIVIDUAL
Dataset Name: KNAMEI2012
Dataset Date: 4/11/2013 7:45:00 AM
Wind File: C:\Program Files\CAP88-C30\WindLib\KAPL2012.WND

Apr 11, 2013 08:17 am

SUMMARY
Page 1

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
Adrenals	5.82E-05
B Surfac	1.38E-03
Breasts	4.99E-05
St Wall	5.70E-05
ULI Wall	7.52E-05
Kidneys	5.79E-05
Lungs	1.03E-04
Ovaries	6.01E-05
R Marrow	5.90E-04
Spleen	5.67E-05
Thymus	5.54E-05
Uterus	5.94E-05
Bld Wall	6.23E-05
Brain	5.12E-05
Esophagu	7.29E-05
SI Wall	5.93E-05
LLI Wall	1.31E-04
Liver	8.01E-05
Muscle	5.38E-05
Pancreas	5.92E-05
Skin	6.60E-04
Testes	5.54E-05
Thyroid	5.59E-05
EFFEC	3.12E-04

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	1.34E-04
INHALATION	1.65E-04
AIR IMMERSION	1.08E-05
GROUND SURFACE	1.35E-06
INTERNAL	2.99E-04
EXTERNAL	1.21E-05
TOTAL	3.12E-04

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SUMMARY
Page 2

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
Kr-85	1.08E-05
H-3	8.30E-11
Co-60	8.67E-09
Pu-238	7.25E-05
U-234	0.00E+00
Th-230	0.00E+00
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
At-218	0.00E+00
U-238	0.00E+00
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-236	2.60E-07
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	0.00E+00
U-235	1.36E-06
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Fr-223	0.00E+00
U-234	9.34E-05
Sr-90	8.28E-05
Y-90	2.78E-07
Cs-137	4.90E-05
Ba-137m	1.12E-06
TOTAL	3.12E-04

Apr 11, 2013 08:17 am

SUMMARY
Page 3

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
Esophagu	6.43E-13
Stomach	2.33E-12
Colon	1.29E-11
Liver	5.39E-12
LUNG	8.07E-11
Bone	3.06E-12
Skin	6.60E-13
Breast	2.07E-12
Ovary	9.96E-13
Bladder	1.68E-12
Kidneys	4.74E-13
Thyroid	1.64E-13
Leukemia	4.13E-11
Residual	8.35E-12
Total	1.61E-10
TOTAL	3.21E-10

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	7.37E-11
INHALATION	8.31E-11
AIR IMMERSION	3.25E-12
GROUND SURFACE	6.29E-13
INTERNAL	1.57E-10
EXTERNAL	3.88E-12
TOTAL	1.61E-10

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SUMMARY
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NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
Kr-85	3.25E-12
H-3	5.14E-17
Co-60	6.52E-15
Pu-238	1.26E-11
U-234	0.00E+00
Th-230	0.00E+00
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
At-218	0.00E+00
U-238	0.00E+00
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-236	1.97E-13
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	0.00E+00
U-235	1.03E-12
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Fr-223	0.00E+00
U-234	6.94E-11
Sr-90	4.87E-11
Y-90	8.59E-14
Cs-137	2.48E-11
Ba-137m	6.03E-13
TOTAL	1.61E-10

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INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	4.2E-04	3.0E-04	1.9E-04	1.7E-04	1.6E-04	1.2E-04	1.1E-04
NNW	5.5E-04	3.8E-04*	2.5E-04	2.2E-04	2.1E-04	1.5E-04	1.4E-04
NW	2.2E-04	1.6E-04	1.1E-04*	9.9E-05	9.4E-05	7.2E-05	6.7E-05
WNW	1.6E-04	1.2E-04	8.2E-05	7.5E-05	7.2E-05*	5.6E-05	5.4E-05
W	1.5E-04	1.1E-04	7.6E-05	7.0E-05	6.7E-05	5.3E-05	5.1E-05
WSW	1.4E-04	1.0E-04	7.2E-05	6.6E-05	6.4E-05	5.1E-05	4.9E-05
SW	3.1E-04	2.2E-04	1.5E-04	1.3E-04	1.3E-04	9.3E-05	8.6E-05
SSW	2.9E-04	2.1E-04	1.4E-04	1.2E-04	1.2E-04	8.7E-05	8.1E-05
S	2.2E-04	1.6E-04	1.1E-04	9.7E-05	9.2E-05	7.0E-05	6.6E-05
SSE	3.1E-04	2.2E-04	1.4E-04	1.3E-04	1.2E-04	9.1E-05	8.4E-05
SE	3.1E-04	2.2E-04	1.5E-04	1.3E-04	1.3E-04	9.3E-05	8.7E-05
ESE	4.2E-04	3.0E-04	2.0E-04	1.8E-04	1.7E-04	1.2E-04	1.1E-04
E	2.4E-04	1.7E-04	1.2E-04	1.0E-04	9.9E-05	7.5E-05	7.0E-05
ENE	2.0E-04	1.4E-04	9.7E-05	8.8E-05	8.4E-05	6.5E-05	6.1E-05
NE	1.7E-04	1.2E-04	8.6E-05	7.9E-05	7.5E-05	5.9E-05	5.6E-05
NNE	1.8E-04	1.3E-04	9.0E-05	8.2E-05	7.9E-05	6.1E-05	5.8E-05

Direction	Distance (m)				
	1050	1300	1650	2550	80000
N	1.0E-04	7.9E-05	6.1E-05	4.2E-05	2.5E-05
NNW	1.3E-04	9.8E-05	7.3E-05	4.8E-05	2.5E-05
NW	6.4E-05	5.2E-05	4.3E-05	3.3E-05	2.5E-05
WNW	5.1E-05	4.3E-05	3.7E-05	3.1E-05	2.5E-05
W	4.9E-05	4.1E-05	3.6E-05	3.0E-05	2.5E-05
WSW	4.7E-05	4.0E-05	3.5E-05	3.0E-05	2.5E-05
SW	8.1E-05	6.4E-05	5.1E-05	3.7E-05	2.5E-05
SSW	7.6E-05	6.0E-05	4.8E-05	3.6E-05	2.5E-05
S	6.2E-05	5.1E-05	4.2E-05	3.3E-05	2.5E-05
SSE	8.0E-05	6.3E-05	5.0E-05	3.7E-05	2.5E-05
SE	8.2E-05	6.4E-05	5.1E-05	3.7E-05	2.5E-05
ESE	1.1E-04	8.1E-05	6.3E-05	4.3E-05	2.5E-05
E	6.7E-05	5.4E-05	4.4E-05	3.4E-05	2.5E-05
ENE	5.8E-05	4.8E-05	4.0E-05	3.2E-05	2.5E-05
NE	5.3E-05	4.4E-05	3.8E-05	3.1E-05	2.5E-05
NNE	5.5E-05	4.6E-05	3.9E-05	3.1E-05	2.5E-05

* For business locations, an occupancy factor of eight hours per day is used. Therefore, the calculated doses for business locations are to be divided by a factor of three.

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INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	2.2E-10	1.5E-10	1.0E-10	9.0E-11	8.5E-11	6.2E-11	5.8E-11
NNW	2.8E-10	2.0E-10	1.3E-10	1.1E-10	1.1E-10	7.8E-11	7.2E-11
NW	1.2E-10	8.3E-11	5.7E-11	5.2E-11	4.9E-11	3.8E-11	3.5E-11
WNW	8.2E-11	6.0E-11	4.3E-11	3.9E-11	3.8E-11	3.0E-11	2.8E-11
W	7.6E-11	5.6E-11	4.0E-11	3.7E-11	3.5E-11	2.8E-11	2.7E-11
WSW	7.1E-11	5.2E-11	3.8E-11	3.5E-11	3.4E-11	2.7E-11	2.6E-11
SW	1.6E-10	1.1E-10	7.6E-11	6.9E-11	6.5E-11	4.9E-11	4.5E-11
SSW	1.5E-10	1.1E-10	7.1E-11	6.4E-11	6.1E-11	4.5E-11	4.2E-11
S	1.1E-10	8.2E-11	5.6E-11	5.1E-11	4.8E-11	3.7E-11	3.5E-11
SSE	1.6E-10	1.1E-10	7.5E-11	6.7E-11	6.4E-11	4.7E-11	4.4E-11
SE	1.6E-10	1.1E-10	7.7E-11	6.9E-11	6.5E-11	4.9E-11	4.5E-11
ESE	2.2E-10	1.5E-10	1.0E-10	9.1E-11	8.7E-11	6.3E-11	5.9E-11
E	1.2E-10	8.7E-11	6.0E-11	5.4E-11	5.2E-11	3.9E-11	3.7E-11
ENE	1.0E-10	7.3E-11	5.1E-11	4.6E-11	4.4E-11	3.4E-11	3.2E-11
NE	8.8E-11	6.4E-11	4.5E-11	4.1E-11	3.9E-11	3.1E-11	2.9E-11
NNE	9.3E-11	6.7E-11	4.7E-11	4.3E-11	4.1E-11	3.2E-11	3.0E-11

Direction	Distance (m)				
	1050	1300	1650	2550	80000
N	5.4E-11	4.2E-11	3.2E-11	2.3E-11	1.4E-11
NNW	6.7E-11	5.1E-11	3.9E-11	2.6E-11	1.4E-11
NW	3.4E-11	2.7E-11	2.3E-11	1.8E-11	1.4E-11
WNW	2.7E-11	2.3E-11	2.0E-11	1.7E-11	1.4E-11
W	2.6E-11	2.2E-11	1.9E-11	1.6E-11	1.4E-11
WSW	2.5E-11	2.1E-11	1.9E-11	1.6E-11	1.4E-11
SW	4.3E-11	3.4E-11	2.7E-11	2.0E-11	1.4E-11
SSW	4.0E-11	3.2E-11	2.6E-11	1.9E-11	1.4E-11
S	3.3E-11	2.7E-11	2.2E-11	1.8E-11	1.4E-11
SSE	4.2E-11	3.3E-11	2.6E-11	2.0E-11	1.4E-11
SE	4.3E-11	3.4E-11	2.7E-11	2.0E-11	1.4E-11
ESE	5.5E-11	4.3E-11	3.3E-11	2.3E-11	1.4E-11
E	3.5E-11	2.9E-11	2.4E-11	1.8E-11	1.4E-11
ENE	3.1E-11	2.5E-11	2.1E-11	1.7E-11	1.4E-11
NE	2.8E-11	2.4E-11	2.0E-11	1.7E-11	1.4E-11
NNE	2.9E-11	2.4E-11	2.1E-11	1.7E-11	1.4E-11

C A P 8 8 - P C
Version 3.0
Clean Air Act Assessment Package - 1988

W E A T H E R D A T A
Non-Radon Individual Assessment
Apr 11, 2013 08:17 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309
Source Category: DOE FACILITY
Source Type: Stack
Emission Year: 2012
Comments: KAPL KNOLLS 2012 EMISSIONS
MAXIMALLY EXPOSED INDIVIDUAL
Dataset Name: KNAMEI2012
Dataset Date: 4/11/2013 7:45:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012.WND

Apr 11, 2013 08:17 am
WEATHER

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HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class								Wind
Dir	A	B	C	D	E	F	G	Freq
N	1.043	1.844	4.050	2.094	1.015	0.885	0.000	0.093
NNW	1.280	2.362	3.950	2.678	1.295	1.078	0.000	0.144
NW	1.005	1.027	4.968	2.756	1.246	0.819	0.000	0.044
WNW	0.865	1.070	1.432	1.377	1.056	0.815	0.000	0.036
W	0.776	0.852	0.867	0.990	0.772	0.772	0.000	0.029
WSW	0.772	0.772	0.880	1.184	0.818	0.781	0.000	0.027
SW	0.802	1.071	1.274	1.951	0.975	0.827	0.000	0.070
SSW	0.786	1.257	1.241	1.992	1.108	0.795	0.000	0.046
S	0.843	1.411	0.772	0.772	0.975	0.815	0.000	0.031
SSE	1.009	1.825	2.234	1.102	0.957	0.830	0.000	0.048
SE	1.137	2.510	3.920	2.429	1.139	0.826	0.000	0.071
ESE	1.431	2.836	4.396	3.892	1.477	0.930	0.000	0.210
E	1.243	3.165	4.565	3.818	1.142	0.884	0.000	0.070
ENE	1.061	2.790	3.712	3.289	1.065	0.869	0.000	0.032
NE	0.965	2.705	2.780	1.884	1.066	0.809	0.000	0.025
NNE	0.969	1.287	2.452	1.270	0.926	0.791	0.000	0.025

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	1.440	2.624	4.551	3.296	1.388	1.101	0.000
NNW	1.793	2.895	4.352	3.408	1.837	1.502	0.000
NW	1.369	1.473	5.205	2.863	1.806	0.919	0.000
WNW	1.049	1.551	2.930	2.270	1.465	0.908	0.000
W	0.787	1.014	1.161	1.482	0.772	0.772	0.000
WSW	0.772	0.772	1.088	2.601	0.917	0.802	0.000
SW	0.869	1.491	2.061	2.827	1.308	0.944	0.000
SSW	0.819	1.765	1.745	2.910	1.552	0.847	0.000
S	0.990	2.068	0.772	0.772	1.309	0.910	0.000
SSE	1.378	2.712	4.345	2.045	1.292	0.953	0.000
SE	1.598	3.227	4.406	3.429	1.601	0.942	0.000
ESE	1.957	3.334	4.663	4.467	2.000	1.209	0.000
E	1.747	3.391	4.778	4.461	1.606	1.098	0.000
ENE	1.473	3.252	4.372	3.960	1.480	1.060	0.000
NE	1.287	3.412	3.788	2.888	1.483	0.890	0.000
NNE	1.296	1.960	3.312	2.436	1.201	0.833	0.000

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WEATHER
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FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	0.1287	0.1275	0.0673	0.2255	0.1826	0.2684	0.0000
NNW	0.2049	0.1591	0.0506	0.1456	0.1337	0.3062	0.0000
NW	0.5014	0.0598	0.0078	0.0155	0.0675	0.3481	0.0000
WNW	0.5763	0.0726	0.0220	0.0381	0.0411	0.2499	0.0000
W	0.4412	0.1172	0.1094	0.0391	0.0470	0.2461	0.0000
WSW	0.4155	0.1355	0.0975	0.0592	0.0506	0.2416	0.0000
SW	0.2730	0.1307	0.1307	0.0899	0.1373	0.2384	0.0000
SSW	0.2797	0.0717	0.0322	0.0522	0.1484	0.4159	0.0000
S	0.3907	0.0401	0.0035	0.0074	0.0365	0.5218	0.0000
SSE	0.2399	0.0617	0.0309	0.0949	0.1473	0.4253	0.0000
SE	0.1373	0.0889	0.0953	0.2568	0.1647	0.2569	0.0000
ESE	0.0445	0.1026	0.1972	0.4677	0.0940	0.0940	0.0000
E	0.0966	0.0901	0.1784	0.3386	0.0884	0.2079	0.0000
ENE	0.1470	0.0860	0.0894	0.1467	0.0825	0.4484	0.0000
NE	0.1887	0.0583	0.0489	0.1253	0.1706	0.4082	0.0000
NNE	0.1393	0.0405	0.0535	0.1885	0.1881	0.3900	0.0000
TOTAL	0.2026	0.1030	0.0986	0.2125	0.1172	0.2662	0.0000

ADDITIONAL WEATHER INFORMATION

Average Air Temperature: 10.2 degrees C
283.36 K
Precipitation: 94.0 cm/y
Humidity: 8.0 g/cu m
Lid Height: 1000 meters
Surface Roughness Length: 0.010 meters
Height Of Wind Measurements: 10.0 meters
Average Wind Speed: 2.230 m/s
Vertical Temperature Gradients:
STABILITY E 0.073 k/m
STABILITY F 0.109 k/m
STABILITY G 0.146 k/m

C A P 8 8 - P C
Version 3.0
Clean Air Act Assessment Package - 1988

G E N E R A L D A T A
Non-Radon Individual Assessment
Apr 11, 2013 08:17 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309
Source Category: DOE FACILITY
Source Type: Stack
Emission Year: 2012
Comments: KAPL KNOLLS 2012 EMISSIONS
MAXIMALLY EXPOSED INDIVIDUAL
Dataset Name: KNOMEI2012
Dataset Date: 4/11/2013 7:45:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012.WND

Apr 11, 2013 08:17 am

GENERAL
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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	Clearance Type	Particle Size (microns)	Scavenging Coefficient (per second)	Dry Deposition Velocity (m/s)
Kr-85	G	0	0.00E+00	0.00E+00
H-3	V	0	0.00E+00	0.00E+00
Co-60	S	1	9.40E-06	1.80E-03
Pu-238	M	1	9.40E-06	1.80E-03
U-234	M	1	9.40E-06	1.80E-03
Th-230	S	1	9.40E-06	1.80E-03
Ra-226	M	1	9.40E-06	1.80E-03
Rn-222	G	0	0.00E+00	0.00E+00
Po-218	M	1	9.40E-06	1.80E-03
Pb-214	M	1	9.40E-06	1.80E-03
Bi-214	M	1	9.40E-06	1.80E-03
Po-214	M	1	9.40E-06	1.80E-03
Pb-210	M	1	9.40E-06	1.80E-03
At-218	M	1	9.40E-06	1.80E-03
U-238	S	1	9.40E-06	1.80E-03
Th-234	S	1	9.40E-06	1.80E-03
Pa-234m	M	1	9.40E-06	1.80E-03
Pa-234	M	1	9.40E-06	1.80E-03
U-236	S	1	9.40E-06	1.80E-03
Th-232	S	1	9.40E-06	1.80E-03
Ra-228	M	1	9.40E-06	1.80E-03
Ac-228	M	1	9.40E-06	1.80E-03
Th-228	S	1	9.40E-06	1.80E-03
U-235	S	1	9.40E-06	1.80E-03
Th-231	S	1	9.40E-06	1.80E-03
Pa-231	M	1	9.40E-06	1.80E-03
Ac-227	M	1	9.40E-06	1.80E-03
Th-227	S	1	9.40E-06	1.80E-03
Fr-223	M	1	9.40E-06	1.80E-03
U-234	S	1	9.40E-06	1.80E-03
Sr-90	M	1	9.40E-06	1.80E-03
Y-90	M	1	9.40E-06	1.80E-03
Cs-137	F	1	9.40E-06	1.80E-03
Ba-137m	M	1	9.40E-06	1.80E-03

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GENERAL
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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	DECAY CONSTANT (PER DAY)			TRANSFER COEFFICIENT	
	Radio- active (1)	Surface	Water	Milk (2)	Meat (3)
Kr-85	1.77E-04	5.48E-05	0.00E+00	0.00E+00	0.00E+00
H-3	1.54E-04	5.48E-05	0.00E+00	0.00E+00	0.00E+00
Co-60	3.60E-04	5.48E-05	0.00E+00	2.00E-03	3.00E-02
Pu-238	2.16E-05	5.48E-05	0.00E+00	1.00E-06	1.00E-04
U-234	7.76E-09	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-230	2.46E-08	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Ra-226	1.19E-06	5.48E-05	0.00E+00	1.00E-03	2.00E-03
Rn-222	1.81E-01	5.48E-05	0.00E+00	0.00E+00	0.00E+00
Po-218	3.27E+02	5.48E-05	0.00E+00	4.00E-04	5.00E-03
Pb-214	3.72E+01	5.48E-05	0.00E+00	3.00E-04	8.00E-04
Bi-214	5.02E+01	5.48E-05	0.00E+00	1.00E-03	2.00E-03
Po-214	3.64E+08	5.48E-05	0.00E+00	4.00E-04	5.00E-03
Pb-210	8.51E-05	5.48E-05	0.00E+00	3.00E-04	8.00E-04
At-218	2.99E+04	5.48E-05	0.00E+00	1.00E-02	1.00E-02
U-238	4.25E-13	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-234	2.88E-02	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Pa-234m	8.53E+02	5.48E-05	0.00E+00	5.00E-06	5.00E-06
Pa-234	2.48E+00	5.48E-05	0.00E+00	5.00E-06	5.00E-06
U-236	8.10E-11	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-232	1.35E-13	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Ra-228	3.30E-04	5.48E-05	0.00E+00	1.00E-03	2.00E-03
Ac-228	2.71E+00	5.48E-05	0.00E+00	2.00E-06	2.00E-05
Th-228	9.92E-04	5.48E-05	0.00E+00	5.00E-06	1.00E-04
U-235	2.70E-12	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-231	6.52E-01	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Pa-231	5.79E-08	5.48E-05	0.00E+00	5.00E-06	5.00E-06
Ac-227	8.71E-05	5.48E-05	0.00E+00	2.00E-06	2.00E-05
Th-227	3.70E-02	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Fr-223	4.58E+01	5.48E-05	0.00E+00	8.00E-03	3.00E-02
U-234	7.76E-09	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Sr-90	6.52E-05	5.48E-05	0.00E+00	2.00E-03	1.00E-02
Y-90	2.60E-01	5.48E-05	0.00E+00	6.00E-05	2.00E-03
Cs-137	6.32E-05	5.48E-05	0.00E+00	1.00E-02	5.00E-02
Ba-137m	3.91E+02	5.48E-05	0.00E+00	5.00E-04	2.00E-04

FOOTNOTES:

- (1) Fraction of animal's daily intake of nuclide which appears in each L of milk (days/L)
- (2) Fraction of animal's daily intake of nuclide which appears in each kg of meat (days/kg)

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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	CONCENTRATION UPTAKE FACTOR		GI UPTAKE FRACTION	
	Forage (1)	Edible (2)	Inhalation	Ingestion
Kr-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	0.00E+00	0.00E+00	1.00E+00	1.00E+00
Co-60	2.00E+00	8.00E-02	1.00E-01	1.00E-01
Pu-238	1.00E-01	1.00E-03	5.00E-04	5.00E-04
U-234	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-230	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Ra-226	2.00E-01	4.00E-02	2.00E-01	2.00E-01
Rn-222	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Po-218	1.00E-01	1.00E-03	1.00E-01	1.00E-01
Pb-214	1.00E-01	4.00E-03	2.00E-01	2.00E-01
Bi-214	5.00E-01	1.00E-01	5.00E-02	5.00E-02
Po-214	1.00E-01	1.00E-03	1.00E-01	1.00E-01
Pb-210	1.00E-01	4.00E-03	2.00E-01	2.00E-01
At-218	9.00E-01	2.00E-01	1.00E+00	1.00E+00
U-238	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-234	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pa-234m	1.00E-01	1.00E-02	5.00E-04	5.00E-04
Pa-234	1.00E-01	1.00E-02	5.00E-04	5.00E-04
U-236	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-232	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Ra-228	2.00E-01	4.00E-02	2.00E-01	2.00E-01
Ac-228	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Th-228	1.00E-01	1.00E-03	5.00E-04	5.00E-04
U-235	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-231	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pa-231	1.00E-01	1.00E-02	5.00E-04	5.00E-04
Ac-227	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Th-227	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Fr-223	1.00E-01	3.00E-02	1.00E+00	1.00E+00
U-234	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Sr-90	4.00E+00	3.00E-01	3.00E-01	3.00E-01
Y-90	1.00E-01	2.00E-03	1.00E-04	1.00E-04
Cs-137	1.00E+00	2.00E-01	1.00E+00	1.00E+00
Ba-137m	1.00E-01	1.00E-02	2.00E-01	2.00E-01

FOOTNOTES: (1) Concentration factor for uptake of nuclide
from soil for pasture and forage
(in pCi/kg dry weight per pCi/kg dry soil)
(2) Concentration factor for uptake of nuclide
from soil by edible parts of crops
(in pCi/kg wet weight per pCi/kg dry soil)

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DECAY CHAIN ACTIVITIES

Nuclide	Stack	Activity at 500. seconds	Activity at 100.00 years
Kr-85	1	5.7600E-01	2.6050E-01
H-3	1	1.8800E-08	0.0000E+00
Co-60	1	1.6800E-08	0.0000E+00
Pu-238	1	9.4900E-08	0.0000E+00
U-234	1	0.0000E+00	0.0000E+00
Th-230	1	0.0000E+00	0.0000E+00
Ra-226	1	0.0000E+00	0.0000E+00
Rn-222	1	0.0000E+00	0.0000E+00
Po-218	1	0.0000E+00	0.0000E+00
Pb-214	1	0.0000E+00	0.0000E+00
Bi-214	1	0.0000E+00	0.0000E+00
Po-214	1	0.0000E+00	0.0000E+00
Pb-210	1	0.0000E+00	0.0000E+00
At-218	1	0.0000E+00	0.0000E+00
U-238	1	0.0000E+00	0.0000E+00
Th-234	1	0.0000E+00	0.0000E+00
Pa-234m	1	0.0000E+00	0.0000E+00
Pa-234	1	0.0000E+00	0.0000E+00
U-236	1	1.8000E-09	0.0000E+00
Th-232	1	0.0000E+00	0.0000E+00
Ra-228	1	0.0000E+00	0.0000E+00
Ac-228	1	0.0000E+00	0.0000E+00
Th-228	1	0.0000E+00	0.0000E+00
U-235	1	9.7000E-09	0.0000E+00
Th-231	1	0.0000E+00	0.0000E+00
Pa-231	1	0.0000E+00	0.0000E+00
Ac-227	1	0.0000E+00	0.0000E+00
Th-227	1	0.0000E+00	0.0000E+00
Fr-223	1	0.0000E+00	0.0000E+00
U-234	1	5.7700E-07	2.6600E-07
Sr-90	1	2.2000E-06	1.0070E-06
Y-90	1	2.2000E-06	1.0070E-06
Cs-137	1	2.2000E-06	1.0070E-06
Ba-137m	1	2.0940E-06	9.5290E-07

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VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

HUMAN INHALATION RATE	
Cubic centimeters/hr	9.17E+05
SOIL PARAMETERS	
Effective surface density (kg/sq m, dry weight) (Assumes 15 cm plow layer)	2.15E+02
BUILDUP TIMES	
For activity in soil (years)	1.00E+02
For radionuclides deposited on ground/water (days)	3.65E+04
DELAY TIMES	
Ingestion of pasture grass by animals (hr)	0.00E+00
Ingestion of stored feed by animals (hr)	2.16E+03
Ingestion of leafy vegetables by man (hr)	3.36E+02
Ingestion of produce by man (hr)	3.36E+02
Transport time from animal feed-milk-man (day)	2.00E+00
Time from slaughter to consumption (day)	2.00E+01
WEATHERING	
Removal rate constant for physical loss (per hr)	2.90E-03
CROP EXPOSURE DURATION	
Pasture grass (hr)	7.20E+02
Crops/leafy vegetables (hr)	1.44E+03
AGRICULTURAL PRODUCTIVITY	
Grass-cow-milk-man pathway (kg/sq m)	2.80E-01
Produce/leafy veg for human consumption (kg/sq m)	7.16E-01
FALLOUT INTERCEPTION FRACTIONS	
Vegetables	2.00E-01
Pasture	5.70E-01
GRAZING PARAMETERS	
Fraction of year animals graze on pasture	4.00E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture	4.30E-01

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GENERAL
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VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

ANIMAL FEED CONSUMPTION FACTORS		
Contaminated feed/forage (kg/day, dry weight)		1.56E+01
DAIRY PRODUCTIVITY		
Milk production of cow (L/day)		1.10E+01
MEAT ANIMAL SLAUGHTER PARAMETERS		
Muscle mass of animal at slaughter (kg)		2.00E+02
Fraction of herd slaughtered (per day)		3.81E-03
DECONTAMINATION		
Fraction of radioactivity retained after washing for leafy vegetables and produce		5.00E-01
FRACTIONS GROWN IN GARDEN OF INTEREST		
Produce ingested		1.00E+00
Leafy vegetables ingested		1.00E+00
INGESTION RATIOS:		
IMMEDIATE SURROUNDING AREA/TOTAL WITHIN AREA		
Vegetables		7.00E-01
Meat		4.40E-01
Milk		4.00E-01
MINIMUM INGESTION FRACTIONS FROM OUTSIDE AREA		
(Minimum fractions of food types from outside area listed below are actual fixed values.)		
Vegetables		0.00E+00
Meat		0.00E+00
Milk		0.00E+00
HUMAN FOOD UTILIZATION FACTORS		
Produce ingestion (kg/y)		1.76E+02
Milk ingestion (L/y)		1.12E+02
Meat ingestion (kg/y)		8.50E+01
Leafy vegetable ingestion (kg/y)		1.80E+01
SWIMMING PARAMETERS		
Fraction of time spent swimming		0.00E+00
Dilution factor for water (cm)		1.00E+00

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CAP88-PC
KAPL Diffuse Source
Calculation

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C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 17, 2013 11:34 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309

Source Category: DIFFUSE SOURCE
Source Type: Area
Emission Year: 2012

Comments: KAPL KNOLLS SITE 2012 DIFFUSE
DIFFUSE SOURCE MEOSI EVALUATION

Effective Dose Equivalent
(mrem/year)

5.07E-08

At This Location: 450 Meters Southwest

Dataset Name: KNODIFMEI12
Dataset Date: 4/17/2013 11:30:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012

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SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 450 Meters Southwest
Lifetime Fatal Cancer Risk: 3.33E-14

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
Adrenals	1.84E-08
B Surfac	1.61E-07
Breasts	1.49E-08
St Wall	1.76E-08
ULI Wall	2.34E-08
Kidneys	1.77E-08
Lungs	2.05E-07
Ovaries	1.87E-08
R Marrow	7.99E-08
Spleen	1.77E-08
Thymus	1.73E-08
Uterus	1.89E-08
Bld Wall	1.93E-08
Brain	1.57E-08
Esophagu	3.68E-08
SI Wall	1.90E-08
LLI Wall	3.47E-08
Liver	1.79E-08
Muscle	1.66E-08
Pancreas	1.88E-08
Skin	1.48E-08
Testes	1.66E-08
Thyroid	1.73E-08
EFFEC	5.07E-08

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SYNOPSIS
Page 2

RADIONUCLIDE EMISSIONS DURING THE YEAR 2012

Nuclide	Type	Size	Source	TOTAL Ci/y
			#1 Ci/y	
Pu-242	M	1	3.2E-15	3.2E-15
Pu-241	M	1	1.6E-10	1.6E-10
Pu-240	M	1	7.9E-11	7.9E-11
Pu-239	M	1	3.2E-10	3.2E-10
Pu-238	M	1	8.2E-12	8.2E-12
Am-241	M	1	7.9E-11	7.9E-11
Cs-137	F	1	2.3E-07	2.3E-07
Ba-137m	M	1	2.3E-07	2.3E-07
Sr-90	M	1	5.4E-08	5.4E-08
Y-90	M	1	5.4E-08	5.4E-08

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 94 cm/y
Humidity: 8 g/cu m
Mixing Height: 1000 m

User specified location of max exposed individual.
(ILOC, JLOC): 7, 1

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SYNOPSIS
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SOURCE INFORMATION

Source Number: 1

Source Height (m): 1.00
Area (sq m): 10000.00

Plume Rise
Buoyant (cal/s): 0.00
(Heat Release Rate)

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.400	0.440
Fraction From Assessment Area:	0.300	0.600	0.560
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

450	550	700	750	775	950	1000
1050	1300	1650	2550	80000		

C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment

Apr 17, 2013 11:34 am

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309

Source Category: DIFFUSE SOURCE
Source Type: Area
Emission Year: 2012

Comments: KAPL KNOLLS SITE 2012 DIFFUSE
DIFFUSE SOURCE MEOSI EVALUATION

Dataset Name: KNODIFMEI12
Dataset Date: 4/17/2013 11:30:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012.WND

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SUMMARY
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ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
Adrenals	1.84E-08
B Surfac	1.61E-07
Breasts	1.49E-08
St Wall	1.76E-08
ULI Wall	2.34E-08
Kidneys	1.77E-08
Lungs	2.05E-07
Ovaries	1.87E-08
R Marrow	7.99E-08
Spleen	1.77E-08
Thymus	1.73E-08
Uterus	1.89E-08
Bld Wall	1.93E-08
Brain	1.57E-08
Esophagu	3.68E-08
SI Wall	1.90E-08
LLI Wall	3.47E-08
Liver	1.79E-08
Muscle	1.66E-08
Pancreas	1.88E-08
Skin	1.48E-08
Testes	1.66E-08
Thyroid	1.73E-08
EFFEC	5.07E-08

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	0.00E+00
INHALATION	5.03E-08
AIR IMMERSION	3.80E-10
GROUND SURFACE	0.00E+00
INTERNAL	5.03E-08
EXTERNAL	3.80E-10
TOTAL	5.07E-08

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SUMMARY
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NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
Pu-242	0.00E+00
U-238	0.00E+00
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-234	0.00E+00
Pu-241	0.00E+00
Am-241	0.00E+00
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
Ra-225	0.00E+00
Ac-225	0.00E+00
Fr-221	0.00E+00
At-217	0.00E+00
U-237	0.00E+00
Pu-240	0.00E+00
U-236	0.00E+00
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Pu-239	0.00E+00
U-235	0.00E+00
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Pu-238	0.00E+00
Cs-137	1.75E-08
Ba-137m	3.75E-10
Sr-90	3.16E-08
Y-90	1.24E-09
TOTAL	5.07E-08

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SUMMARY
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CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
Esophagu	1.83E-16
Stomach	6.17E-16
Colon	3.00E-15
Liver	2.60E-16
LUNG	2.09E-14
Bone	1.72E-16
Skin	1.27E-17
Breast	5.55E-16
Ovary	2.36E-16
Bladder	4.58E-16
Kidneys	8.78E-17
Thyroid	4.33E-17
Leukemia	4.51E-15
Residual	2.21E-15
Total	3.33E-14
TOTAL	6.65E-14

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	0.00E+00
INHALATION	3.31E-14
AIR IMMERSION	2.06E-16
GROUND SURFACE	0.00E+00
INTERNAL	3.31E-14
EXTERNAL	2.06E-16
TOTAL	3.33E-14

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SUMMARY
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NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
Pu-242	0.00E+00
U-238	0.00E+00
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-234	0.00E+00
Pu-241	0.00E+00
Am-241	0.00E+00
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
Ra-225	0.00E+00
Ac-225	0.00E+00
Fr-221	0.00E+00
At-217	0.00E+00
U-237	0.00E+00
Pu-240	0.00E+00
U-236	0.00E+00
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Pu-239	0.00E+00
U-235	0.00E+00
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Pu-238	0.00E+00
Cs-137	8.19E-15
Ba-137m	2.05E-16
Sr-90	2.35E-14
Y-90	1.32E-15
TOTAL	3.33E-14

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SUMMARY
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INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	7.1E-08	4.8E-08	3.0E-08	2.6E-08	2.4E-08	1.6E-08	1.5E-08
NNW	9.4E-08	6.4E-08*	4.0E-08	3.5E-08	3.2E-08	2.2E-08	2.0E-08
NW	3.6E-08	2.4E-08	1.5E-08*	1.3E-08	1.2E-08	8.0E-09	7.2E-09
WNW	2.3E-08	1.6E-08	9.7E-09	8.5E-09	7.9E-09*	5.3E-09	4.7E-09
W	2.1E-08	1.4E-08	8.8E-09	7.7E-09	7.2E-09	4.8E-09	4.3E-09
WSW	1.9E-08	1.3E-08	8.1E-09	7.0E-09	6.6E-09	4.4E-09	3.9E-09
SW	5.1E-08	3.4E-08	2.1E-08	1.8E-08	1.7E-08	1.2E-08	1.0E-08
SSW	4.8E-08	3.2E-08	2.0E-08	1.7E-08	1.6E-08	1.1E-08	9.7E-09
S	3.5E-08	2.4E-08	1.5E-08	1.3E-08	1.2E-08	7.8E-09	7.1E-09
SSE	5.1E-08	3.4E-08	2.1E-08	1.8E-08	1.7E-08	1.1E-08	1.0E-08
SE	5.2E-08	3.5E-08	2.2E-08	1.9E-08	1.8E-08	1.2E-08	1.1E-08
ESE	7.1E-08	4.8E-08	3.0E-08	2.6E-08	2.5E-08	1.7E-08	1.5E-08
E	3.8E-08	2.6E-08	1.6E-08	1.4E-08	1.3E-08	8.7E-09	7.9E-09
ENE	3.1E-08	2.1E-08	1.3E-08	1.1E-08	1.0E-08	7.0E-09	6.3E-09
NE	2.6E-08	1.8E-08	1.1E-08	9.5E-09	8.9E-09	5.9E-09	5.3E-09
NNE	2.8E-08	1.9E-08	1.2E-08	1.0E-08	9.4E-09	6.3E-09	5.7E-09

Direction	Distance (m)				
	1050	1300	1650	2550	80000
N	1.4E-08	9.3E-09	6.1E-09	2.8E-09	4.4E-12
NNW	1.8E-08	1.2E-08	8.2E-09	3.8E-09	7.7E-12
NW	6.6E-09	4.5E-09	2.9E-09	1.3E-09	1.8E-12
WNW	4.3E-09	2.9E-09	1.9E-09	8.6E-10	1.4E-12
W	3.9E-09	2.7E-09	1.7E-09	7.7E-10	1.0E-12
WSW	3.6E-09	2.4E-09	1.6E-09	7.1E-10	9.6E-13
SW	9.5E-09	6.5E-09	4.2E-09	1.9E-09	3.1E-12
SSW	8.8E-09	6.0E-09	3.9E-09	1.8E-09	2.0E-12
S	6.5E-09	4.4E-09	2.9E-09	1.3E-09	1.2E-12
SSE	9.5E-09	6.5E-09	4.2E-09	1.9E-09	2.1E-12
SE	9.8E-09	6.7E-09	4.4E-09	2.0E-09	3.2E-12
ESE	1.4E-08	9.6E-09	6.3E-09	2.9E-09	7.9E-12
E	7.2E-09	5.0E-09	3.2E-09	1.5E-09	2.6E-12
ENE	5.7E-09	3.9E-09	2.6E-09	1.2E-09	1.3E-12
NE	4.9E-09	3.3E-09	2.2E-09	1.0E-09	1.2E-12
NNE	5.2E-09	3.6E-09	2.3E-09	1.1E-09	1.1E-12

* For business locations, an occupancy factor of eight hours per day is used. Therefore, the calculated doses for business locations are to be divided by a factor of three.

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SUMMARY
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INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	4.7E-14	3.1E-14	2.0E-14	1.7E-14	1.6E-14	1.1E-14	9.7E-15
NNW	6.2E-14	4.2E-14	2.6E-14	2.3E-14	2.1E-14	1.4E-14	1.3E-14
NW	2.3E-14	1.6E-14	9.6E-15	8.4E-15	7.9E-15	5.2E-15	4.7E-15
WNW	1.5E-14	1.0E-14	6.4E-15	5.6E-15	5.2E-15	3.5E-15	3.1E-15
W	1.4E-14	9.4E-15	5.8E-15	5.0E-15	4.7E-15	3.1E-15	2.8E-15
WSW	1.3E-14	8.6E-15	5.3E-15	4.6E-15	4.3E-15	2.9E-15	2.6E-15
SW	3.3E-14	2.2E-14	1.4E-14	1.2E-14	1.1E-14	7.6E-15	6.8E-15
SSW	3.1E-14	2.1E-14	1.3E-14	1.1E-14	1.1E-14	7.0E-15	6.3E-15
S	2.3E-14	1.5E-14	9.5E-15	8.3E-15	7.8E-15	5.1E-15	4.6E-15
SSE	3.3E-14	2.2E-14	1.4E-14	1.2E-14	1.1E-14	7.5E-15	6.8E-15
SE	3.4E-14	2.3E-14	1.4E-14	1.2E-14	1.2E-14	7.8E-15	7.0E-15
ESE	4.6E-14	3.1E-14	2.0E-14	1.7E-14	1.6E-14	1.1E-14	9.9E-15
E	2.5E-14	1.7E-14	1.0E-14	9.1E-15	8.5E-15	5.7E-15	5.2E-15
ENE	2.0E-14	1.4E-14	8.4E-15	7.3E-15	6.8E-15	4.6E-15	4.1E-15
NE	1.7E-14	1.2E-14	7.1E-15	6.2E-15	5.8E-15	3.9E-15	3.5E-15
NNE	1.8E-14	1.2E-14	7.6E-15	6.6E-15	6.2E-15	4.1E-15	3.7E-15

Direction	Distance (m)				
	1050	1300	1650	2550	80000
N	8.9E-15	6.1E-15	4.0E-15	1.9E-15	2.9E-18
NNW	1.2E-14	8.2E-15	5.4E-15	2.5E-15	5.0E-18
NW	4.3E-15	2.9E-15	1.9E-15	8.6E-16	1.2E-18
WNW	2.8E-15	1.9E-15	1.2E-15	5.6E-16	9.1E-19
W	2.6E-15	1.7E-15	1.1E-15	5.1E-16	6.6E-19
WSW	2.4E-15	1.6E-15	1.0E-15	4.6E-16	6.3E-19
SW	6.3E-15	4.3E-15	2.8E-15	1.3E-15	2.0E-18
SSW	5.8E-15	4.0E-15	2.6E-15	1.2E-15	1.3E-18
S	4.2E-15	2.9E-15	1.9E-15	8.5E-16	8.0E-19
SSE	6.2E-15	4.3E-15	2.8E-15	1.3E-15	1.4E-18
SE	6.4E-15	4.4E-15	2.9E-15	1.3E-15	2.1E-18
ESE	9.1E-15	6.3E-15	4.1E-15	1.9E-15	5.2E-18
E	4.7E-15	3.3E-15	2.1E-15	9.8E-16	1.7E-18
ENE	3.8E-15	2.6E-15	1.7E-15	7.7E-16	8.2E-19
NE	3.2E-15	2.2E-15	1.4E-15	6.6E-16	7.6E-19
NNE	3.4E-15	2.3E-15	1.5E-15	7.0E-16	7.3E-19

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HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class								Wind Freq
Dir	A	B	C	D	E	F	G	
N	1.043	1.844	4.050	2.094	1.015	0.885	0.000	0.093
NNW	1.280	2.362	3.950	2.678	1.295	1.078	0.000	0.144
NW	1.005	1.027	4.968	2.756	1.246	0.819	0.000	0.044
WNW	0.865	1.070	1.432	1.377	1.056	0.815	0.000	0.036
W	0.776	0.852	0.867	0.990	0.772	0.772	0.000	0.029
WSW	0.772	0.772	0.880	1.184	0.818	0.781	0.000	0.027
SW	0.802	1.071	1.274	1.951	0.975	0.827	0.000	0.070
SSW	0.786	1.257	1.241	1.992	1.108	0.795	0.000	0.046
S	0.843	1.411	0.772	0.772	0.975	0.815	0.000	0.031
SSE	1.009	1.825	2.234	1.102	0.957	0.830	0.000	0.048
SE	1.137	2.510	3.920	2.429	1.139	0.826	0.000	0.071
ESE	1.431	2.836	4.396	3.892	1.477	0.930	0.000	0.210
E	1.243	3.165	4.565	3.818	1.142	0.884	0.000	0.070
ENE	1.061	2.790	3.712	3.289	1.065	0.869	0.000	0.032
NE	0.965	2.705	2.780	1.884	1.066	0.809	0.000	0.025
NNE	0.969	1.287	2.452	1.270	0.926	0.791	0.000	0.025

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	1.440	2.624	4.551	3.296	1.388	1.101	0.000
NNW	1.793	2.895	4.352	3.408	1.837	1.502	0.000
NW	1.369	1.473	5.205	2.863	1.806	0.919	0.000
WNW	1.049	1.551	2.930	2.270	1.465	0.908	0.000
W	0.787	1.014	1.161	1.482	0.772	0.772	0.000
WSW	0.772	0.772	1.088	2.601	0.917	0.802	0.000
SW	0.869	1.491	2.061	2.827	1.308	0.944	0.000
SSW	0.819	1.765	1.745	2.910	1.552	0.847	0.000
S	0.990	2.068	0.772	0.772	1.309	0.910	0.000
SSE	1.378	2.712	4.345	2.045	1.292	0.953	0.000
SE	1.598	3.227	4.406	3.429	1.601	0.942	0.000
ESE	1.957	3.334	4.663	4.467	2.000	1.209	0.000
E	1.747	3.391	4.778	4.461	1.606	1.098	0.000
ENE	1.473	3.252	4.372	3.960	1.480	1.060	0.000
NE	1.287	3.412	3.788	2.888	1.483	0.890	0.000
NNE	1.296	1.960	3.312	2.436	1.201	0.833	0.000

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FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	0.1287	0.1275	0.0673	0.2255	0.1826	0.2684	0.0000
NNW	0.2049	0.1591	0.0506	0.1456	0.1337	0.3062	0.0000
NW	0.5014	0.0598	0.0078	0.0155	0.0675	0.3481	0.0000
WNW	0.5763	0.0726	0.0220	0.0381	0.0411	0.2499	0.0000
W	0.4412	0.1172	0.1094	0.0391	0.0470	0.2461	0.0000
WSW	0.4155	0.1355	0.0975	0.0592	0.0506	0.2416	0.0000
SW	0.2730	0.1307	0.1307	0.0899	0.1373	0.2384	0.0000
SSW	0.2797	0.0717	0.0322	0.0522	0.1484	0.4159	0.0000
S	0.3907	0.0401	0.0035	0.0074	0.0365	0.5218	0.0000
SSE	0.2399	0.0617	0.0309	0.0949	0.1473	0.4253	0.0000
SE	0.1373	0.0889	0.0953	0.2568	0.1647	0.2569	0.0000
ESE	0.0445	0.1026	0.1972	0.4677	0.0940	0.0940	0.0000
E	0.0966	0.0901	0.1784	0.3386	0.0884	0.2079	0.0000
ENE	0.1470	0.0860	0.0894	0.1467	0.0825	0.4484	0.0000
NE	0.1887	0.0583	0.0489	0.1253	0.1706	0.4082	0.0000
NNE	0.1393	0.0405	0.0535	0.1885	0.1881	0.3900	0.0000
TOTAL	0.2026	0.1030	0.0986	0.2125	0.1172	0.2662	0.0000

ADDITIONAL WEATHER INFORMATION

Average Air Temperature: 10.2 degrees C
283.36 K
Precipitation: 94.0 cm/y
Humidity: 8.0 g/cu m
Lid Height: 1000 meters
Surface Roughness Length: 0.010 meters
Height Of Wind Measurements: 10.0 meters
Average Wind Speed: 2.230 m/s

Vertical Temperature Gradients:
STABILITY E 0.073 k/m
STABILITY F 0.109 k/m
STABILITY G 0.146 k/m

Version 3.0

GENERAL DATA

Facility: KAPL - KNOLLS SITE
Address: 2401 RIVER ROAD
City: NISKAYUNA
State: NY Zip: 12309

Comments: KAPL KNOLLS SITE 2012 DIFFUSE
DIFFUSE SOURCE MEOSI EVALUATION

Dataset Name: KNODIFMEI12
Dataset Date: 4/17/2013 11:30:00 AM
Wind File: C:\Program Files\CAP88-PC30\WindLib\KAPL2012.WND

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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	Clearance Type	Particle Size (microns)	Scavenging Coefficient (per second)	Dry Deposition Velocity (m/s)
Pu-242	M	1	9.40E-06	1.80E-03
U-238	M	1	9.40E-06	1.80E-03
Th-234	S	1	9.40E-06	1.80E-03
Pa-234m	M	1	9.40E-06	1.80E-03
Pa-234	M	1	9.40E-06	1.80E-03
U-234	M	1	9.40E-06	1.80E-03
Pu-241	M	1	9.40E-06	1.80E-03
Am-241	M	1	9.40E-06	1.80E-03
Np-237	M	1	9.40E-06	1.80E-03
Pa-233	M	1	9.40E-06	1.80E-03
U-233	M	1	9.40E-06	1.80E-03
Th-229	S	1	9.40E-06	1.80E-03
Ra-225	M	1	9.40E-06	1.80E-03
Ac-225	M	1	9.40E-06	1.80E-03
Fr-221	M	1	9.40E-06	1.80E-03
At-217	M	1	9.40E-06	1.80E-03
U-237	M	1	9.40E-06	1.80E-03
Pu-240	M	1	9.40E-06	1.80E-03
U-236	M	1	9.40E-06	1.80E-03
Th-232	S	1	9.40E-06	1.80E-03
Ra-228	M	1	9.40E-06	1.80E-03
Ac-228	M	1	9.40E-06	1.80E-03
Pu-239	M	1	9.40E-06	1.80E-03
U-235	M	1	9.40E-06	1.80E-03
Th-231	S	1	9.40E-06	1.80E-03
Pa-231	M	1	9.40E-06	1.80E-03
Ac-227	M	1	9.40E-06	1.80E-03
Pu-238	M	1	9.40E-06	1.80E-03
Cs-137	F	1	9.40E-06	1.80E-03
Ba-137m	M	1	9.40E-06	1.80E-03
Sr-90	M	1	9.40E-06	1.80E-03
Y-90	M	1	9.40E-06	1.80E-03

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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	DECAY CONSTANT (PER DAY)			TRANSFER COEFFICIENT	
	Radio- active (1)	Surface	Water	Milk (2)	Meat (3)
Pu-242	5.04E-09	5.48E-05	0.00E+00	1.00E-06	1.00E-04
U-238	4.25E-13	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-234	2.88E-02	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Pa-234m	8.53E+02	5.48E-05	0.00E+00	5.00E-06	5.00E-06
Pa-234	2.48E+00	5.48E-05	0.00E+00	5.00E-06	5.00E-06
U-234	7.76E-09	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Pu-241	1.32E-04	5.48E-05	0.00E+00	1.00E-06	1.00E-04
Am-241	4.39E-06	5.48E-05	0.00E+00	2.00E-06	5.00E-05
Np-237	8.87E-10	5.48E-05	0.00E+00	1.00E-05	1.00E-03
Pa-233	2.57E-02	5.48E-05	0.00E+00	5.00E-06	5.00E-06
U-233	1.20E-08	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-229	2.58E-07	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Ra-225	4.68E-02	5.48E-05	0.00E+00	1.00E-03	2.00E-03
Ac-225	6.93E-02	5.48E-05	0.00E+00	2.00E-06	2.00E-05
Fr-221	2.08E+02	5.48E-05	0.00E+00	8.00E-03	3.00E-02
At-217	1.85E+06	5.48E-05	0.00E+00	1.00E-02	1.00E-02
U-237	1.03E-01	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Pu-240	2.90E-07	5.48E-05	0.00E+00	1.00E-06	1.00E-04
U-236	8.10E-11	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-232	1.35E-13	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Ra-228	3.30E-04	5.48E-05	0.00E+00	1.00E-03	2.00E-03
Ac-228	2.71E+00	5.48E-05	0.00E+00	2.00E-06	2.00E-05
Pu-239	7.88E-08	5.48E-05	0.00E+00	1.00E-06	1.00E-04
U-235	2.70E-12	5.48E-05	0.00E+00	4.00E-04	8.00E-04
Th-231	6.52E-01	5.48E-05	0.00E+00	5.00E-06	1.00E-04
Pa-231	5.79E-08	5.48E-05	0.00E+00	5.00E-06	5.00E-06
Ac-227	8.71E-05	5.48E-05	0.00E+00	2.00E-06	2.00E-05
Pu-238	2.16E-05	5.48E-05	0.00E+00	1.00E-06	1.00E-04
Cs-137	6.32E-05	5.48E-05	0.00E+00	1.00E-02	5.00E-02
Ba-137m	3.91E+02	5.48E-05	0.00E+00	5.00E-04	2.00E-04
Sr-90	6.52E-05	5.48E-05	0.00E+00	2.00E-03	1.00E-02
Y-90	2.60E-01	5.48E-05	0.00E+00	6.00E-05	2.00E-03

FOOTNOTES:

- (1) Fraction of animal's daily intake of nuclide which appears in each L of milk (days/L)
- (2) Fraction of animal's daily intake of nuclide which appears in each kg of meat (days/kg)

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VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	CONCENTRATION UPTAKE FACTOR		GI UPTAKE FRACTION	
	Forage (1)	Edible (2)	Inhalation	Ingestion
Pu-242	1.00E-01	1.00E-03	5.00E-04	5.00E-04
U-238	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-234	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pa-234m	1.00E-01	1.00E-02	5.00E-04	5.00E-04
Pa-234	1.00E-01	1.00E-02	5.00E-04	5.00E-04
U-234	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Pu-241	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Am-241	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Np-237	1.00E-01	2.00E-02	5.00E-04	5.00E-04
Pa-233	1.00E-01	1.00E-02	5.00E-04	5.00E-04
U-233	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-229	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Ra-225	2.00E-01	4.00E-02	2.00E-01	2.00E-01
Ac-225	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Fr-221	1.00E-01	3.00E-02	1.00E+00	1.00E+00
At-217	9.00E-01	2.00E-01	1.00E+00	1.00E+00
U-237	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Pu-240	1.00E-01	1.00E-03	5.00E-04	5.00E-04
U-236	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-232	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Ra-228	2.00E-01	4.00E-02	2.00E-01	2.00E-01
Ac-228	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pu-239	1.00E-01	1.00E-03	5.00E-04	5.00E-04
U-235	1.00E-01	2.00E-03	2.00E-02	2.00E-02
Th-231	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pa-231	1.00E-01	1.00E-02	5.00E-04	5.00E-04
Ac-227	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Pu-238	1.00E-01	1.00E-03	5.00E-04	5.00E-04
Cs-137	1.00E+00	2.00E-01	1.00E+00	1.00E+00
Ba-137m	1.00E-01	1.00E-02	2.00E-01	2.00E-01
Sr-90	4.00E+00	3.00E-01	3.00E-01	3.00E-01
Y-90	1.00E-01	2.00E-03	1.00E-04	1.00E-04

FOOTNOTES: (1) Concentration factor for uptake of nuclide
from soil for pasture and forage
(in pCi/kg dry weight per pCi/kg dry soil)

(2) Concentration factor for uptake of nuclide
from soil by edible parts of crops
(in pCi/kg wet weight per pCi/kg dry soil)

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DECAY CHAIN ACTIVITIES

Nuclide	Stack	Activity at 500. seconds	Activity at 100.00 years
Pu-242	1	0.0000E+00	0.0000E+00
U-238	1	0.0000E+00	0.0000E+00
Th-234	1	0.0000E+00	0.0000E+00
Pa-234m	1	0.0000E+00	0.0000E+00
Pa-234	1	0.0000E+00	0.0000E+00
U-234	1	0.0000E+00	0.0000E+00
Pu-241	1	0.0000E+00	0.0000E+00
Am-241	1	0.0000E+00	0.0000E+00
Np-237	1	0.0000E+00	0.0000E+00
Pa-233	1	0.0000E+00	0.0000E+00
U-233	1	0.0000E+00	0.0000E+00
Th-229	1	0.0000E+00	0.0000E+00
Ra-225	1	0.0000E+00	0.0000E+00
Ac-225	1	0.0000E+00	0.0000E+00
Fr-221	1	0.0000E+00	0.0000E+00
At-217	1	0.0000E+00	0.0000E+00
U-237	1	0.0000E+00	0.0000E+00
Pu-240	1	0.0000E+00	0.0000E+00
U-236	1	0.0000E+00	0.0000E+00
Th-232	1	0.0000E+00	0.0000E+00
Ra-228	1	0.0000E+00	0.0000E+00
Ac-228	1	0.0000E+00	0.0000E+00
Pu-239	1	0.0000E+00	0.0000E+00
U-235	1	0.0000E+00	0.0000E+00
Th-231	1	0.0000E+00	0.0000E+00
Pa-231	1	0.0000E+00	0.0000E+00
Ac-227	1	0.0000E+00	0.0000E+00
Pu-238	1	0.0000E+00	0.0000E+00
Cs-137	1	2.2600E-07	0.0000E+00
Ba-137m	1	2.1510E-07	0.0000E+00
Sr-90	1	5.3700E-08	0.0000E+00
Y-90	1	5.3700E-08	0.0000E+00

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GENERAL
Page 5

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

HUMAN INHALATION RATE

Cubic centimeters/hr	9.17E+05
----------------------	----------

SOIL PARAMETERS

Effective surface density (kg/sq m, dry weight) (Assumes 15 cm plow layer)	2.15E+02
---	----------

BUILDUP TIMES

For activity in soil (years)	1.00E+02
For radionuclides deposited on ground/water (days)	3.65E+04

DELAY TIMES

Ingestion of pasture grass by animals (hr)	0.00E+00
Ingestion of stored feed by animals (hr)	2.16E+03
Ingestion of leafy vegetables by man (hr)	3.36E+02
Ingestion of produce by man (hr)	3.36E+02
Transport time from animal feed-milk-man (day)	2.00E+00
Time from slaughter to consumption (day)	2.00E+01

WEATHERING

Removal rate constant for physical loss (per hr)	2.90E-03
--	----------

CROP EXPOSURE DURATION

Pasture grass (hr)	7.20E+02
Crops/leafy vegetables (hr)	1.44E+03

AGRICULTURAL PRODUCTIVITY

Grass-cow-milk-man pathway (kg/sq m)	2.80E-01
Produce/leafy veg for human consumption (kg/sq m)	7.16E-01

FALLOUT INTERCEPTION FRACTIONS

Vegetables	2.00E-01
Pasture	5.70E-01

GRAZING PARAMETERS

Fraction of year animals graze on pasture	4.00E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture	4.30E-01

Apr 17, 2013 11:34 am

GENERAL
Page 6

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

ANIMAL FEED CONSUMPTION FACTORS

Contaminated feed/forage (kg/day, dry weight) 1.56E+01

DAIRY PRODUCTIVITY

Milk production of cow (L/day) 1.10E+01

MEAT ANIMAL SLAUGHTER PARAMETERS

Muscle mass of animal at slaughter (kg) 2.00E+02

Fraction of herd slaughtered (per day) 3.81E-03

DECONTAMINATION

Fraction of radioactivity retained after washing
for leafy vegetables and produce 5.00E-01

FRACTIONS GROWN IN GARDEN OF INTEREST

Produce ingested 1.00E+00

Leafy vegetables ingested 1.00E+00

INGESTION RATIOS:

IMMEDIATE SURROUNDING AREA/TOTAL WITHIN AREA

Vegetables 7.00E-01

Meat 4.40E-01

Milk 4.00E-01

MINIMUM INGESTION FRACTIONS FROM OUTSIDE AREA

(Minimum fractions of food types from outside
area listed below are actual fixed values.)

Vegetables 0.00E+00

Meat 0.00E+00

Milk 0.00E+00

HUMAN FOOD UTILIZATION FACTORS

Produce ingestion (kg/y) 1.76E+02

Milk ingestion (L/y) 1.12E+02

Meat ingestion (kg/y) 8.50E+01

Leafy vegetable ingestion (kg/y) 1.80E+01

SWIMMING PARAMETERS

Fraction of time spent swimming 0.00E+00

Dilution factor for water (cm) 1.00E+00

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Appendix B

Separations Process Research Unit – Disposition Project

(SPRU DP)

CAP88-PC OUTPUT REPORTS

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CAP88-PC OUTPUT

SPRU

Point Sources

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C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
May 2, 2013 09:39 amn

Facility: SPRU DP
Address: 2425 River Road
City: Niskayuna
State: NY Zip: 12309

Source Category: Point Sources
Source Type: Stack
Emission Year: 2012

Comments: CY12 Annual Report - SPRU
Point Sources

Effective Dose Equivalent
(mrem/year)

2.75E-05

At This Location: 450 Meters Southwest

Dataset Name: SPRU12_Point
Dataset Date: 5/2/2013 9:21:00 AM
Wind File: C:\Program Files (x86)\CAP88-PC30\WndFiles\K

May 2, 2013 09:39 amm

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 450 Meters Southwest
Lifetime Fatal Cancer Risk: 9.82E-12

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
Adrenals	6.27E-08
B Surfac	3.11E-05
Breasts	6.26E-08
St Wall	6.36E-08
ULI Wall	7.83E-08
Kidneys	2.51E-07
Lungs	5.01E-06
Ovaries	4.19E-07
R Marrow	1.61E-06
Spleen	6.27E-08
Thymus	6.27E-08
Uterus	6.27E-08
Bld Wall	6.40E-08
Brain	6.26E-08
Esophagu	1.33E-06
SI Wall	6.50E-08
LLI Wall	1.08E-07
Liver	5.03E-06
Muscle	6.27E-08
Pancreas	6.27E-08
Skin	6.34E-08
Testes	4.24E-07
Thyroid	6.27E-08
EFFEC	2.75E-05

May 2, 2013 09:39 amm

SYNOPSIS
Page 2

RADIONUCLIDE EMISSIONS DURING THE YEAR 2012

Nuclide	Type	Size	Source	TOTAL
			#1 Ci/y	Ci/y
Cs-137	F	1	6.4E-09	6.4E-09
Ba-137m	M	1	6.4E-09	6.4E-09
Sr-90	M	1	1.7E-07	1.7E-07
Y-90	M	1	1.7E-07	1.7E-07
Am-241	M	1	3.1E-09	3.1E-09
Pu-238	M	1	9.6E-09	9.6E-09
Pu-239	M	1	8.2E-09	8.2E-09
Pu-241	M	1	0.0E+00	0.0E+00
Th-228	S	1	3.0E-09	3.0E-09
Th-230	S	1	6.0E-09	6.0E-09
Th-232	S	1	9.1E-09	9.1E-09
U-234	M	1	1.2E-08	1.2E-08
U-235	M	1	1.2E-09	1.2E-09
U-238	M	1	5.3E-08	5.3E-08

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 94 cm/y
Humidity: 8 g/cu m
Mixing Height: 1000 m

User specified location of max exposed individual.
(ILOC, JLOC): 7, 1

May 2, 2013 09:39 amm

SYNOPSIS
Page 3

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 2.00
Diameter (m): 1.20

Plume Rise
Momentum (m/s): 0.00
(Exit Velocity)

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.400	0.440
Fraction From Assessment Area:	0.300	0.600	0.560
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

450	550	700	750	775	950	1000
1050	1300	1650	2550			

C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment
May 2, 2013 09:39 amm

Facility: SPRU DP
Address: 2425 River Road
City: Niskayuna
State: NY Zip: 12309

Source Category: Point Sources
Source Type: Stack
Emission Year: 2012

Comments: CY12 Annual Report - SPRU
Point Sources

Dataset Name: SPRU12_Point
Dataset Date: 5/2/2013 9:21:00 AM
Wind File: . C:\Program Files (x86)\CAP88-
PC30\WndFiles\KAPL2012.WND

May 2, 2013 09:39 amm

SUMMARY
Page 1

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
Adrenals	6.27E-08
B Surfac	3.11E-05
Breasts	6.26E-08
St Wall	6.36E-08
ULI Wall	7.83E-08
Kidneys	2.51E-07
Lungs	5.01E-06
Ovaries	4.19E-07
R Marrow	1.61E-06
Spleen	6.27E-08
Thymus	6.27E-08
Uterus	6.27E-08
Bld Wall	6.40E-08
Brain	6.26E-08
Esophagu	1.33E-06
SI Wall	6.50E-08
LLI Wall	1.08E-07
Liver	5.03E-06
Muscle	6.27E-08
Pancreas	6.27E-08
Skin	6.34E-08
Testes	4.24E-07
Thyroid	6.27E-08
EFFEC	2.75E-05

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	0.00E+00
INHALATION	2.75E-05
AIR IMMERSION	2.19E-11
GROUND SURFACE	0.00E+00
INTERNAL	2.75E-05
EXTERNAL	2.19E-11
TOTAL	2.75E-05

May 2, 2013 09:39 amm

SUMMARY
Page 2

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
Cs-137	5.07E-10
Ba-137m	1.09E-11
Sr-90	1.04E-07
Y-90	4.09E-09
Pu-238	7.52E-06
U-234	6.93E-07
Th-230	1.42E-06
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
Bi-210	0.00E+00
Po-210	0.00E+00
At-218	0.00E+00
Pu-239	7.01E-06
U-235	6.36E-08
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Ra-223	0.00E+00
Rn-219	0.00E+00
Po-215	0.00E+00
Pb-211	0.00E+00
Fr-223	0.00E+00
Pu-241	0.00E+00
Am-241	2.21E-06
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
U-237	0.00E+00
Th-232	3.85E-06
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	2.04E-06
Ra-224	0.00E+00
Rn-220	0.00E+00
Po-216	0.00E+00
Pb-212	0.00E+00
U-238	2.57E-06
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
TOTAL	2.75E-05

May 2, 2013 09:39 am

SUMMARY
Page 3

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
Esophagu	8.79E-15
Stomach	2.12E-14
Colon	5.17E-14
Liver	9.53E-13
LUNG	8.18E-12
Bone	3.30E-13
Skin	5.95E-16
Breast	1.20E-14
Ovary	7.13E-14
Bladder	2.06E-14
Kidneys	2.12E-14
Thyroid	1.69E-15
Leukemia	7.18E-14
Residual	7.32E-14
Total	9.82E-12
TOTAL	1.96E-11

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	0.00E+00
INHALATION	9.82E-12
AIR IMMERSION	8.23E-18
GROUND SURFACE	0.00E+00
INTERNAL	9.82E-12
EXTERNAL	8.23E-18
TOTAL	9.82E-12

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SUMMARY
Page 4

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
Cs-137	2.38E-16
Ba-137m	5.95E-18
Sr-90	7.77E-14
Y-90	4.34E-15
Pu-238	1.31E-12
U-234	5.78E-13
Th-230	7.37E-13
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
Bi-210	0.00E+00
Po-210	0.00E+00
At-218	0.00E+00
Pu-239	1.11E-12
U-235	5.30E-14
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Ra-223	0.00E+00
Rn-219	0.00E+00
Po-215	0.00E+00
Pb-211	0.00E+00
Fr-223	0.00E+00
Pu-241	0.00E+00
Am-241	3.49E-13
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
U-237	0.00E+00
Th-232	1.71E-12
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	1.75E-12
Ra-224	0.00E+00
Rn-220	0.00E+00
Po-216	0.00E+00
Pb-212	0.00E+00
U-238	2.14E-12
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
TOTAL	9.82E-12

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SUMMARY
Page 5

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	3.8E-05	2.6E-05	1.6E-05	1.4E-05	1.3E-05	9.0E-06	8.2E-06
NNW	5.0E-05	3.4E-05*	2.2E-05	1.9E-05	1.8E-05	1.2E-05	1.1E-05
NW	1.9E-05	1.3E-05	8.2E-06*	7.1E-06	6.7E-06	4.5E-06	4.0E-06
WNW	1.3E-05	8.6E-06	5.4E-06	4.7E-06	4.4E-06*	2.9E-06	2.6E-06
W	1.2E-05	7.8E-06	4.9E-06	4.3E-06	4.0E-06	2.7E-06	2.4E-06
WSW	1.1E-05	7.2E-06	4.5E-06	3.9E-06	3.6E-06	2.4E-06	2.2E-06
SW	2.7E-05	1.9E-05	1.2E-05	1.0E-05	9.5E-06	6.4E-06	5.8E-06
SSW	2.6E-05	1.8E-05	1.1E-05	9.6E-06	9.0E-06	6.0E-06	5.4E-06
S	1.9E-05	1.3E-05	8.1E-06	7.1E-06	6.6E-06	4.4E-06	4.0E-06
SSE	2.8E-05	1.9E-05	1.2E-05	1.0E-05	9.6E-06	6.4E-06	5.8E-06
SE	2.8E-05	1.9E-05	1.2E-05	1.0E-05	9.8E-06	6.6E-06	5.9E-06
ESE	3.8E-05	2.6E-05	1.6E-05	1.4E-05	1.3E-05	9.1E-06	8.2E-06
E	2.0E-05	1.4E-05	8.7E-06	7.6E-06	7.2E-06	4.8E-06	4.3E-06
ENE	1.7E-05	1.1E-05	7.1E-06	6.2E-06	5.8E-06	3.9E-06	3.5E-06
NE	1.4E-05	9.7E-06	6.0E-06	5.3E-06	4.9E-06	3.3E-06	3.0E-06
NNE	1.5E-05	1.0E-05	6.4E-06	5.6E-06	5.2E-06	3.5E-06	3.2E-06

Direction	Distance (m)			
	1050	1300	1650	2550
N	7.5E-06	5.2E-06	3.4E-06	1.6E-06
NNW	9.9E-06	6.8E-06	4.5E-06	2.1E-06
NW	3.7E-06	2.5E-06	1.6E-06	7.4E-07
WNW	2.4E-06	1.6E-06	1.1E-06	4.8E-07
W	2.2E-06	1.5E-06	9.6E-07	4.3E-07
WSW	2.0E-06	1.4E-06	8.8E-07	4.0E-07
SW	5.3E-06	3.6E-06	2.4E-06	1.1E-06
SSW	4.9E-06	3.4E-06	2.2E-06	1.0E-06
S	3.6E-06	2.5E-06	1.6E-06	7.3E-07
SSE	5.3E-06	3.6E-06	2.4E-06	1.1E-06
SE	5.4E-06	3.7E-06	2.5E-06	1.1E-06
ESE	7.6E-06	5.2E-06	3.4E-06	1.6E-06
E	4.0E-06	2.7E-06	1.8E-06	8.3E-07
ENE	3.2E-06	2.2E-06	1.4E-06	6.6E-07
NE	2.7E-06	1.9E-06	1.2E-06	5.6E-07
NNE	2.9E-06	2.0E-06	1.3E-06	6.0E-07

* For business locations, an occupancy factor of eight hours per day is used. Therefore, the calculated doses for business locations are to be divided by a factor of three.

May 2, 2013 09:39 am

SUMMARY
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INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	450	550	700	750	775	950	1000
N	1.4E-11	9.3E-12	5.9E-12	5.1E-12	4.8E-12	3.2E-12	2.9E-12
NNW	1.8E-11	1.2E-11	7.7E-12	6.8E-12	6.3E-12	4.3E-12	3.9E-12
NW	6.9E-12	4.7E-12	2.9E-12	2.5E-12	2.4E-12	1.6E-12	1.4E-12
WNW	4.6E-12	3.1E-12	1.9E-12	1.7E-12	1.6E-12	1.0E-12	9.4E-13
W	4.1E-12	2.8E-12	1.7E-12	1.5E-12	1.4E-12	9.5E-13	8.5E-13
WSW	3.8E-12	2.6E-12	1.6E-12	1.4E-12	1.3E-12	8.7E-13	7.8E-13
SW	9.8E-12	6.7E-12	4.2E-12	3.6E-12	3.4E-12	2.3E-12	2.1E-12
SSW	9.3E-12	6.3E-12	3.9E-12	3.4E-12	3.2E-12	2.1E-12	1.9E-12
S	6.8E-12	4.6E-12	2.9E-12	2.5E-12	2.4E-12	1.6E-12	1.4E-12
SSE	9.8E-12	6.7E-12	4.2E-12	3.6E-12	3.4E-12	2.3E-12	2.1E-12
SE	1.0E-11	6.8E-12	4.3E-12	3.7E-12	3.5E-12	2.3E-12	2.1E-12
ESE	1.3E-11	9.2E-12	5.8E-12	5.1E-12	4.8E-12	3.2E-12	2.9E-12
E	7.3E-12	5.0E-12	3.1E-12	2.7E-12	2.6E-12	1.7E-12	1.6E-12
ENE	6.0E-12	4.0E-12	2.5E-12	2.2E-12	2.1E-12	1.4E-12	1.2E-12
NE	5.1E-12	3.4E-12	2.2E-12	1.9E-12	1.8E-12	1.2E-12	1.1E-12
NNE	5.4E-12	3.7E-12	2.3E-12	2.0E-12	1.9E-12	1.3E-12	1.1E-12

Direction	Distance (m)			
	1050	1300	1650	2550
N	2.7E-12	1.8E-12	1.2E-12	5.6E-13
NNW	3.5E-12	2.4E-12	1.6E-12	7.5E-13
NW	1.3E-12	9.0E-13	5.8E-13	2.6E-13
WNW	8.6E-13	5.9E-13	3.8E-13	1.7E-13
W	7.8E-13	5.3E-13	3.4E-13	1.5E-13
WSW	7.1E-13	4.9E-13	3.1E-13	1.4E-13
SW	1.9E-12	1.3E-12	8.4E-13	3.8E-13
SSW	1.8E-12	1.2E-12	7.9E-13	3.6E-13
S	1.3E-12	8.9E-13	5.8E-13	2.6E-13
SSE	1.9E-12	1.3E-12	8.5E-13	3.9E-13
SE	1.9E-12	1.3E-12	8.8E-13	4.0E-13
ESE	2.7E-12	1.9E-12	1.2E-12	5.7E-13
E	1.4E-12	9.8E-13	6.4E-13	3.0E-13
ENE	1.1E-12	7.9E-13	5.1E-13	2.4E-13
NE	9.7E-13	6.7E-13	4.4E-13	2.0E-13
NNE	1.0E-12	7.1E-13	4.6E-13	2.1E-13

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CAP88-PC OUTPUT

SPRU

Diffuse Sources

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C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment

May 2, 2013 10:13 am

Facility: SPRU DP
Address: 2425 River Road
City: Niskayuna
State: NY Zip: 12309

Source Category: Diffuse Sources
Source Type: Area
Emission Year: 2012

Comments: CY12 Annual Report - SPRU
Diffuse Sources

Effective Dose Equivalent
(mrem/year)

1.04E-03

At This Location: 450 Meters Southwest

Dataset Name: SPRU12_Diffuse
Dataset Date: 5/2/2013 9:51:00 AM
Wind File: C:\Program Files (x86)\CAP88-PC30\WndFiles\K

May 2, 2013 10:13 am

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 450 Meters Southwest
Lifetime Fatal Cancer Risk: 4.26E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
Adrenals	1.54E-04
B Surfac	7.94E-03
Breasts	1.27E-04
St Wall	1.52E-04
ULI Wall	2.50E-04
Kidneys	1.51E-04
Lungs	2.00E-04
Ovaries	1.65E-04
R Marrow	3.30E-03
Spleen	1.49E-04
Thymus	1.45E-04
Uterus	1.58E-04
Bld Wall	1.73E-04
Brain	1.32E-04
Esophagu	1.50E-04
SI Wall	1.63E-04
LLI Wall	5.54E-04
Liver	2.74E-04
Muscle	1.40E-04
Pancreas	1.58E-04
Skin	2.55E-04
Testes	1.48E-04
Thyroid	1.45E-04
EFFEC	1.04E-03

May 2, 2013 10:13 amm

SYNOPSIS
Page 2

RADIONUCLIDE EMISSIONS DURING THE YEAR 2012

Nuclide	Type	Size	Source	TOTAL
			#1 Ci/y	Ci/y
Cs-137	F	1	5.9E-06	5.9E-06
Ba-137m	M	1	5.9E-06	5.9E-06
Sr-90	M	1	1.3E-05	1.3E-05
Y-90	M	1	1.3E-05	1.3E-05
Am-241	M	1	5.7E-08	5.7E-08
Pu-238	M	1	1.0E-09	1.0E-09
Pu-239	M	1	4.3E-07	4.3E-07
Pu-241	M	1	3.9E-08	3.9E-08
Th-228	S	1	3.3E-09	3.3E-09
Th-230	S	1	2.3E-10	2.3E-10
Th-232	S	1	1.5E-10	1.5E-10
U-234	M	1	2.9E-08	2.9E-08
U-235	M	1	1.7E-09	1.7E-09
U-238	M	1	1.7E-08	1.7E-08
C-14	M	1	7.6E-09	7.6E-09
Ni-63	M	1	3.7E-09	3.7E-09
Tc-99	M	1	2.4E-09	2.4E-09
Cm-242	M	1	3.4E-10	3.4E-10

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 94 cm/y
Humidity: 8 g/cu m
Mixing Height: 1000 m

User specified location of max exposed individual.
(ILOC, JLOC): 7, 1

May 2, 2013 10:13 am

SYNOPSIS
Page 3

SOURCE INFORMATION

Source Number: 1

Source Height (m): 1.00
Area (sq m): 1305.00

Plume Rise
Momentum (m/s): 0.00
(Exit Velocity)

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.400	0.440
Fraction From Assessment Area:	0.300	0.600	0.560
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

450	550	700	750	775	950	1000
1050	1300	1650	2550			

C A P 8 8 - P C

Version 3.0

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment

May 2, 2013 10:13 am

Facility: SPRU DP
Address: 2425 River Road
City: Niskayuna
State: NY Zip: 12309

Source Category: Diffuse Sources
Source Type: Area
Emission Year: 2012

Comments: CY12 Annual Report - SPRU
Diffuse Sources

Dataset Name: SPRU12_Diffuse
Dataset Date: 5/2/2013 9:51:00 AM
Wind File: . C:\Program Files (x86)\CAP88-
PC30\WndFiles\KAPL2012.WND

May 2, 2013 10:13 amm

SUMMARY
Page 1

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
Adrenals	1.54E-04
B Surfac	7.94E-03
Breasts	1.27E-04
St Wall	1.52E-04
ULI Wall	2.50E-04
Kidneys	1.51E-04
Lungs	2.00E-04
Ovaries	1.65E-04
R Marrow	3.30E-03
Spleen	1.49E-04
Thymus	1.45E-04
Uterus	1.58E-04
Bld Wall	1.73E-04
Brain	1.32E-04
Esophagu	1.50E-04
SI Wall	1.63E-04
LLI Wall	5.54E-04
Liver	2.74E-04
Muscle	1.40E-04
Pancreas	1.58E-04
Skin	2.55E-04
Testes	1.48E-04
Thyroid	1.45E-04
EFFEC	1.04E-03

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	6.28E-04
INHALATION	4.09E-04
AIR IMMERSION	1.06E-08
GROUND SURFACE	4.33E-06
INTERNAL	1.04E-03
EXTERNAL	4.34E-06
TOTAL	1.04E-03

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SUMMARY
Page 2

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
Cs-137	1.34E-04
Ba-137m	3.00E-06
Sr-90	4.90E-04
Y-90	1.62E-06
Pu-239	3.67E-04
U-235	8.78E-08
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Ra-223	0.00E+00
Rn-219	0.00E+00
Po-215	0.00E+00
Pb-211	0.00E+00
Fr-223	0.00E+00
Pu-241	5.83E-07
Am-241	3.97E-05
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
U-237	0.00E+00
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	2.16E-06
Ra-224	0.00E+00
Rn-220	0.00E+00
Po-216	0.00E+00
Pb-212	0.00E+00
U-238	8.04E-07
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-234	1.66E-06
Th-230	0.00E+00
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
Bi-210	0.00E+00
Po-210	0.00E+00
At-218	0.00E+00
C-14	1.41E-09
Ni-63	2.93E-11
Tc-99	1.60E-10
Cm-242	0.00E+00

Pu-238
TOTAL

7.87E-07
1.04E-03

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SUMMARY
Page 3

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
Esophagu	1.77E-12
Stomach	6.51E-12
Colon	5.44E-11
Liver	2.56E-11
LUNG	4.85E-11
Bone	1.73E-11
Skin	2.63E-13
Breast	5.43E-12
Ovary	3.49E-12
Bladder	4.89E-12
Kidneys	1.04E-12
Thyroid	4.45E-13
Leukemia	2.34E-10
Residual	2.30E-11
Total	4.26E-10
TOTAL	8.53E-10

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	3.52E-10
INHALATION	7.28E-11
AIR IMMERSION	5.51E-15
GROUND SURFACE	1.78E-12
INTERNAL	4.25E-10
EXTERNAL	1.78E-12
TOTAL	4.26E-10

May 2, 2013 10:13 am

SUMMARY
Page 4

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
<hr/>	
Cs-137	6.80E-11
Ba-137m	1.62E-12
Sr-90	2.88E-10
Y-90	5.00E-13
Pu-239	5.80E-11
U-235	7.32E-14
Th-231	0.00E+00
Pa-231	0.00E+00
Ac-227	0.00E+00
Th-227	0.00E+00
Ra-223	0.00E+00
Rn-219	0.00E+00
Po-215	0.00E+00
Pb-211	0.00E+00
Fr-223	0.00E+00
Pu-241	4.96E-14
Am-241	6.27E-12
Np-237	0.00E+00
Pa-233	0.00E+00
U-233	0.00E+00
Th-229	0.00E+00
U-237	0.00E+00
Th-232	0.00E+00
Ra-228	0.00E+00
Ac-228	0.00E+00
Th-228	1.85E-12
Ra-224	0.00E+00
Rn-220	0.00E+00
Po-216	0.00E+00
Pb-212	0.00E+00
U-238	6.70E-13
Th-234	0.00E+00
Pa-234m	0.00E+00
Pa-234	0.00E+00
U-234	1.39E-12
Th-230	0.00E+00
Ra-226	0.00E+00
Rn-222	0.00E+00
Po-218	0.00E+00
Pb-214	0.00E+00
Bi-214	0.00E+00
Po-214	0.00E+00
Pb-210	0.00E+00
Bi-210	0.00E+00
Po-210	0.00E+00
At-218	0.00E+00

C-14	9.54E-16
Ni-63	2.28E-17
Tc-99	1.39E-16
Cm-242	0.00E+00
Pu-238	1.37E-13
TOTAL	4.26E-10

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SUMMARY
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INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Distance (m)							
Direction	450	550	700	750	775	950	1000
N	1.4E-03	9.9E-04	6.7E-04	6.0E-04	5.7E-04	4.3E-04	4.0E-04
NNW	1.8E-03	1.3E-03*	8.4E-04	7.6E-04	7.2E-04	5.3E-04	4.9E-04
NW	7.6E-04	5.6E-04	3.9E-04*	3.6E-04	3.4E-04	2.7E-04	2.6E-04
WNW	5.5E-04	4.1E-04	3.1E-04	2.8E-04	2.7E-04*	2.3E-04	2.2E-04
W	5.1E-04	3.9E-04	2.9E-04	2.7E-04	2.6E-04	2.2E-04	2.1E-04
WSW	4.8E-04	3.6E-04	2.7E-04	2.6E-04	2.5E-04	2.1E-04	2.0E-04
SW	1.0E-03	7.5E-04	5.2E-04	4.7E-04	4.5E-04	3.4E-04	3.2E-04
SSW	9.7E-04	7.0E-04	4.8E-04	4.4E-04	4.2E-04	3.2E-04	3.0E-04
S	7.5E-04	5.5E-04	3.9E-04	3.5E-04	3.4E-04	2.7E-04	2.5E-04
SSE	1.0E-03	7.3E-04	5.0E-04	4.6E-04	4.4E-04	3.3E-04	3.1E-04
SE	1.0E-03	7.5E-04	5.2E-04	4.7E-04	4.5E-04	3.4E-04	3.2E-04
ESE	1.4E-03	9.9E-04	6.8E-04	6.1E-04	5.8E-04	4.4E-04	4.1E-04
E	8.0E-04	5.8E-04	4.1E-04	3.8E-04	3.6E-04	2.8E-04	2.7E-04
ENE	6.7E-04	4.9E-04	3.5E-04	3.2E-04	3.1E-04	2.5E-04	2.4E-04
NE	5.9E-04	4.4E-04	3.2E-04	2.9E-04	2.8E-04	2.3E-04	2.2E-04
NNE	6.1E-04	4.6E-04	3.3E-04	3.0E-04	2.9E-04	2.4E-04	2.3E-04

Distance (m)				
Direction	1050	1300	1650	2550
N	3.8E-04	3.0E-04	2.4E-04	1.8E-04
NNW	4.6E-04	3.6E-04	2.8E-04	2.0E-04
NW	2.5E-04	2.1E-04	1.8E-04	1.5E-04
WNW	2.1E-04	1.8E-04	1.6E-04	1.4E-04
W	2.0E-04	1.8E-04	1.6E-04	1.4E-04
WSW	1.9E-04	1.7E-04	1.5E-04	1.4E-04
SW	3.1E-04	2.5E-04	2.1E-04	1.6E-04
SSW	2.9E-04	2.4E-04	2.0E-04	1.6E-04
S	2.4E-04	2.1E-04	1.8E-04	1.5E-04
SSE	3.0E-04	2.4E-04	2.0E-04	1.6E-04
SE	3.0E-04	2.5E-04	2.1E-04	1.6E-04
ESE	3.8E-04	3.1E-04	2.5E-04	1.8E-04
E	2.6E-04	2.2E-04	1.8E-04	1.5E-04
ENE	2.3E-04	1.9E-04	1.7E-04	1.4E-04
NE	2.1E-04	1.8E-04	1.6E-04	1.4E-04
NNE	2.2E-04	1.9E-04	1.7E-04	1.4E-04

* For business locations, an occupancy factor of eight hours per day is used. Therefore, the calculated doses for business locations are to be divided by a factor of three.

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SUMMARY
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INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Distance (m)							
Direction	450	550	700	750	775	950	1000
N	5.6E-10	4.0E-10	2.8E-10	2.5E-10	2.4E-10	1.9E-10	1.8E-10
NNW	7.2E-10	5.1E-10	3.5E-10	3.2E-10	3.0E-10	2.3E-10	2.1E-10
NW	3.2E-10	2.4E-10	1.8E-10	1.6E-10	1.6E-10	1.3E-10	1.2E-10
WNW	2.4E-10	1.8E-10	1.4E-10	1.3E-10	1.3E-10	1.1E-10	1.1E-10
W	2.2E-10	1.7E-10	1.3E-10	1.3E-10	1.2E-10	1.1E-10	1.0E-10
WSW	2.1E-10	1.6E-10	1.3E-10	1.2E-10	1.2E-10	1.0E-10	1.0E-10
SW	4.3E-10	3.1E-10	2.2E-10	2.0E-10	2.0E-10	1.6E-10	1.5E-10
SSW	4.0E-10	2.9E-10	2.1E-10	1.9E-10	1.8E-10	1.5E-10	1.4E-10
S	3.1E-10	2.3E-10	1.7E-10	1.6E-10	1.5E-10	1.3E-10	1.2E-10
SSE	4.2E-10	3.0E-10	2.2E-10	2.0E-10	1.9E-10	1.5E-10	1.4E-10
SE	4.2E-10	3.1E-10	2.2E-10	2.0E-10	1.9E-10	1.5E-10	1.5E-10
ESE	5.6E-10	4.1E-10	2.9E-10	2.6E-10	2.5E-10	1.9E-10	1.8E-10
E	3.3E-10	2.5E-10	1.8E-10	1.7E-10	1.6E-10	1.3E-10	1.3E-10
ENE	2.8E-10	2.1E-10	1.6E-10	1.5E-10	1.4E-10	1.2E-10	1.1E-10
NE	2.5E-10	1.9E-10	1.4E-10	1.4E-10	1.3E-10	1.1E-10	1.1E-10
NNE	2.6E-10	2.0E-10	1.5E-10	1.4E-10	1.4E-10	1.1E-10	1.1E-10

Distance (m)				
Direction	1050	1300	1650	2550
N	1.7E-10	1.4E-10	1.2E-10	9.1E-11
NNW	2.0E-10	1.6E-10	1.3E-10	9.9E-11
NW	1.2E-10	1.0E-10	9.2E-11	8.0E-11
WNW	1.0E-10	9.3E-11	8.5E-11	7.7E-11
W	1.0E-10	9.0E-11	8.3E-11	7.6E-11
WSW	9.7E-11	8.9E-11	8.2E-11	7.5E-11
SW	1.4E-10	1.2E-10	1.0E-10	8.6E-11
SSW	1.3E-10	1.1E-10	9.9E-11	8.3E-11
S	1.2E-10	1.0E-10	9.0E-11	7.9E-11
SSE	1.4E-10	1.2E-10	1.0E-10	8.4E-11
SE	1.4E-10	1.2E-10	1.0E-10	8.5E-11
ESE	1.7E-10	1.4E-10	1.2E-10	9.3E-11
E	1.2E-10	1.1E-10	9.3E-11	8.1E-11
ENE	1.1E-10	9.7E-11	8.8E-11	7.8E-11
NE	1.0E-10	9.3E-11	8.5E-11	7.6E-11
NNE	1.1E-10	9.5E-11	8.6E-11	7.7E-11

```

Dataset Name:  SPRU12_All
Dataset Date:  5/2/2013 10:26:00 AM
Wind File:     C:\Program Files (x86)\CAP88-
PC30\WndFiles\KAPL2012.WND

```

May 2, 2013 10:45 am

WEATHER
Page 1

HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class								
Dir	A	B	C	D	E	F	G	Wind Freq
N	1.043	1.844	4.050	2.094	1.015	0.885	0.000	0.093
NNW	1.280	2.362	3.950	2.678	1.295	1.078	0.000	0.144
NW	1.005	1.027	4.968	2.756	1.246	0.819	0.000	0.044
WNW	0.865	1.070	1.432	1.377	1.056	0.815	0.000	0.036
W	0.776	0.852	0.867	0.990	0.772	0.772	0.000	0.029
WSW	0.772	0.772	0.880	1.184	0.818	0.781	0.000	0.027
SW	0.802	1.071	1.274	1.951	0.975	0.827	0.000	0.070
SSW	0.786	1.257	1.241	1.992	1.108	0.795	0.000	0.046
S	0.843	1.411	0.772	0.772	0.975	0.815	0.000	0.031
SSE	1.009	1.825	2.234	1.102	0.957	0.830	0.000	0.048
SE	1.137	2.510	3.920	2.429	1.139	0.826	0.000	0.071
ESE	1.431	2.836	4.396	3.892	1.477	0.930	0.000	0.210
E	1.243	3.165	4.565	3.818	1.142	0.884	0.000	0.070
ENE	1.061	2.790	3.712	3.289	1.065	0.869	0.000	0.032
NE	0.965	2.705	2.780	1.884	1.066	0.809	0.000	0.025
NNE	0.969	1.287	2.452	1.270	0.926	0.791	0.000	0.025

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	1.440	2.624	4.551	3.296	1.388	1.101	0.000
NNW	1.793	2.895	4.352	3.408	1.837	1.502	0.000
NW	1.369	1.473	5.205	2.863	1.806	0.919	0.000
WNW	1.049	1.551	2.930	2.270	1.465	0.908	0.000
W	0.787	1.014	1.161	1.482	0.772	0.772	0.000
WSW	0.772	0.772	1.088	2.601	0.917	0.802	0.000
SW	0.869	1.491	2.061	2.827	1.308	0.944	0.000
SSW	0.819	1.765	1.745	2.910	1.552	0.847	0.000
S	0.990	2.068	0.772	0.772	1.309	0.910	0.000
SSE	1.378	2.712	4.345	2.045	1.292	0.953	0.000
SE	1.598	3.227	4.406	3.429	1.601	0.942	0.000
ESE	1.957	3.334	4.663	4.467	2.000	1.209	0.000
E	1.747	3.391	4.778	4.461	1.606	1.098	0.000
ENE	1.473	3.252	4.372	3.960	1.480	1.060	0.000
NE	1.287	3.412	3.788	2.888	1.483	0.890	0.000
NNE	1.296	1.960	3.312	2.436	1.201	0.833	0.000

May 2, 2013 10:45 amm

WEATHER
Page 2

FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

Pasquill Stability Class							
Dir	A	B	C	D	E	F	G
N	0.1287	0.1275	0.0673	0.2255	0.1826	0.2684	0.0000
NNW	0.2049	0.1591	0.0506	0.1456	0.1337	0.3062	0.0000
NW	0.5014	0.0598	0.0078	0.0155	0.0675	0.3481	0.0000
WNW	0.5763	0.0726	0.0220	0.0381	0.0411	0.2499	0.0000
W	0.4412	0.1172	0.1094	0.0391	0.0470	0.2461	0.0000
WSW	0.4155	0.1355	0.0975	0.0592	0.0506	0.2416	0.0000
SW	0.2730	0.1307	0.1307	0.0899	0.1373	0.2384	0.0000
SSW	0.2797	0.0717	0.0322	0.0522	0.1484	0.4159	0.0000
S	0.3907	0.0401	0.0035	0.0074	0.0365	0.5218	0.0000
SSE	0.2399	0.0617	0.0309	0.0949	0.1473	0.4253	0.0000
SE	0.1373	0.0889	0.0953	0.2568	0.1647	0.2569	0.0000
ESE	0.0445	0.1026	0.1972	0.4677	0.0940	0.0940	0.0000
E	0.0966	0.0901	0.1784	0.3386	0.0884	0.2079	0.0000
ENE	0.1470	0.0860	0.0894	0.1467	0.0825	0.4484	0.0000
NE	0.1887	0.0583	0.0489	0.1253	0.1706	0.4082	0.0000
NNE	0.1393	0.0405	0.0535	0.1885	0.1881	0.3900	0.0000
TOTAL	0.2026	0.1030	0.0986	0.2125	0.1172	0.2662	0.0000

ADDITIONAL WEATHER INFORMATION

Average Air Temperature: 10.2 degrees C
283.36 K
Precipitation: 94.0 cm/y
Humidity: 8.0 g/cu m
Lid Height: 1000 meters
Surface Roughness Length: 0.010 meters
Height Of Wind Measurements: 10.0 meters
Average Wind Speed: 2.230 m/s
Vertical Temperature Gradients:
STABILITY E 0.073 k/m
STABILITY F 0.109 k/m
STABILITY G 0.146 k/m

DOE Knolls Site Supplemental Information for Calendar Year 2012

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DOE Knolls Site Supplemental Information for Calendar Year 2012

As requested by the DOE in a Memorandum dated March 22, 1994, the following additional supplemental information to the Radionuclide Air Emission Report for Calendar Year 2012 is provided to DOE Headquarters for guidance development and future interactions with the EPA.

- 1. Provide an estimate of the collective effective dose equivalent (person-rem/yr) for the calendar year releases.**

Using CAP88-PC Version 3.0, the collective effective dose equivalents for calendar year 2012 releases are:

KAPL Knolls Site:	6.14E-04 person-rem (6.14E-06 person-sievert)
SPRU Site:	2.70E-03 person-rem (2.70E-05 person-sievert)
DOE Knolls Site (Total):	3.31E-03 person-rem (3.31E-05 person-sievert)

- 2. Provide information on the status of compliance with Subparts Q and T of 40 CFR 61.**

Subpart Q applies to DOE facilities that store or dispose of waste radium-containing materials in sufficient concentration to exceed the standard, and Subpart T to the disposal of uranium mill tailings. There are no known applications of these subparts at the KAPL Knolls Site or SPRU Site. Therefore, the provisions of Subparts Q and T of 40 CFR 61 are not applicable to the DOE Knolls Site.

- 3. Although exempt from Subpart H, provide information on Rn-220 emission from sources containing U-232 and Th-232 where emissions potentially can exceed 0.1 mrem/yr to the public or 10% of the non-radon dose to the public.**

The DOE Knolls Site does not have sources of U-232 or Th-232 which produce Rn-220 emissions that potentially can exceed 0.1 mrem/yr to the public or 10% of the non-radon dose.

- 4. Provide information on non-disposal/non-storage sources of Rn-222 emissions where emissions potentially can exceed 0.1 mrem/yr to the public or 10% of the non-radon dose.**

The DOE Knolls Site does not have non-disposal/non-storage sources of Rn-222 emissions that potentially can exceed 0.1 mrem/yr to the public or 10% of the non-radon dose.

- 5. For the purposes of assessing facility compliance of Subpart H under 61.93(b), give the number of emission points subject to the continuous monitoring requirements, the number of emission points that do not comply with the Section 61.93(b) requirements, and if possible, the cost for upgrades. Describe site periodic confirmatory measurement plans. Indicate the status of the QA program described by Appendix B, Method 114.**

KAPL Knolls Site: There is one emission point at the KAPL Knolls Site subject to the continuous monitoring requirements of 61.93(b) or 61.93(c). This emission point is Building E4. Continuous monitoring is required for gross alpha and gross beta

radioactivity. In October 2008, this emission point became subject to the requirements of 40 CFR 61.93(c). Additionally, voluntary continuous monitoring is also performed on the E4 emission point for Kr-85, I-131, and Sb-125.

The above emission point complies with the Section 61.93(c) requirements. The KAPL Knolls Site periodic confirmatory measurement plans consist of continuous monitoring of the emission points (not subject to the Section 61.93(b) or 61.93(c) requirements) for particulate radioactivity and annual confirmatory radionuclide inventory/measurements and calculations on minor emission points; such as, drain system and tank vents, air sample pump exhausts, facilities with historical fixed contamination, and facilities where non-intrusive characterization measurements are made. The KAPL Knolls Site periodic confirmatory measurement plan (PCM) was submitted to EPA on May 29, 2012.

The KAPL Knolls Site has an established QA program that meets the performance requirements described in ANSI/HPS N13.1- 1999, as required by 61.93(c)(2)(iv).

SPRU Site: The SPRU site is currently in compliance with 40 CFR 61 Subpart H. In 2012, there were 6 sources that were subject to the continuous monitoring requirements of 61.93(b). All sources are currently in compliance with 61.93(b). No upgrades are planned.

The SPRU periodic confirmatory measurement plan (PCM) was submitted to EPA on May 29, 2012. The PCM uses a graded approach based on the four-tier Potential Impact Category (PIC) presented in ANSI N13.1- 1999.

The SPRU Site has an established QA program that meets the performance requirements described in ANSI/HPS N13.1 – 1999, as required by 61.93(c)(2)(iv). This QA program also meets all of the requirements in Method 114 of Appendix B.