

**CARROLL COLLEGE  
HELENA, MONTANA**

**ENVIRONMENTAL ASSESSMENT**

**January 17, 2006**

DOCKET: 030-00873  
LICENSE: 25-07093-01

LICENSEE: Carroll College, Helena, Montana

SUBJECT: ENVIRONMENTAL ASSESSMENT:  
REQUEST TO TERMINATE LICENSE FOR UNRESTRICTED USE  
DATED OCTOBER 10, 2005

## 1.0 BACKGROUND AND PROPOSED ACTION

### 1.1 Background

Carroll College, located in Helena, Montana, obtained a U.S. Atomic Energy Commission (AEC) license in the 1960's to use radioactive isotopes as part of the radiobiology courses taught at the college. The professor who taught the radiobiology courses, which utilized the low-level isotopes in the early 1960's, stopped teaching in 1967 to become President of Carroll College; therefore, no use of radioactive materials was made until he returned to teaching in 1979. The active docket records maintained by the NRC begin with the renewal application dated May 1979. There are no docket records for the period 1960 through 1967. However, the evaluation of license termination for unrestricted use takes into consideration the historical site assessment and thus was evaluated back to the 1960's.

The licensed byproduct materials used at Carroll College were primarily beta emitters with short half-lives. The material was used for teaching of the use of radioisotopes in biology and chemistry courses. The disposal of the byproduct material was by either: 1) decay ~ prior to disposal at a local land fill, or 2) release into the municipal sewage effluent ~ during the 14 weeks the program was in operation each year, in accordance with NRC regulations. There was one disposal by burial which was performed on June 30, 1961, as detailed in the historical site assessment, below.

The historical site assessment was based on the records maintained by the professor who taught the radiobiology courses. Additionally, the licensee submitted a report dated April 16, 1998, which was performed by *JRW Environmental Consulting*, on the history of the radioactive waste disposal on Carroll College property.

The records maintained by the Carroll College professor documented one disposal of waste materials by burial. The environmental consulting report states in part, the following:

The burial site was adjacent to the U.S. Geological Survey marker located on the northeast part of the campus near the gate in the fence that leads to the City of Helena Transfer Station. The burial site was within six feet of the marker and approximately four feet deep. According to the records, the isotopes used in the experiments on the animals buried at the site were iodine-131, gold-198 and carbon-14. The records indicate the college purchased 50 microcuries (FCi) of carbon 14 in a benzoic acid solution. The isotope was dissolved in 100 milliliters (ml) of ethylene glycol and 10 ml of this solution was utilized in the experiment. The record states the balance was disposed of by burial on June 30, 1961.

Burial of certain quantities of radioactive waste in soil by licensees without prior NRC approval was authorized on January 29, 1959 (22 FR 548). Originally, this authorization was codified in former

10 CFR 20.304. On January 28, 1981, the NRC concluded that it was inappropriate to continue generic authorizations of burials pursuant to 10 CFR 20.304 without regard to factors such as location of burial, concentrations of radioactive material, form of packaging, and notification of NRC, and therefore NRC rescinded 10 CFR 20.304 (45 FR 71761).

By letter dated July 30, 2003, Carroll College notified the NRC of their intent to decommission and terminate their NRC license. The licensee performed an inventory of their radioactive materials and by letters dated January 17, 2005, October 10, 2005, and November 7, 2005, documented the disposal of the byproduct material by either: 1) transfer to a licensed recipient, or 2) disposal by release into sanitary sewerage under 10 CFR 20.2003. The records for all disposals were reviewed and found satisfactory. Additionally, the licensee submitted a RESRAD dose modeling evaluation for the one burial of carbon-14 performed on June 30, 1961. Carbon-14 was the only isotope evaluated because the other two isotopes (iodine-131 and gold-198) have short half-lives and have since decayed.

The Region IV NRC staff performed a review of the disposal records and found them to be satisfactory. The records for disposal to the sanitary sewerage were conservative because the radioactive isotopes were not decayed to the date of disposal. Additionally, the review of the RESRAD calculation was determined to be satisfactory.

## 1.2 Purpose and Need for Proposed Action

The purpose of the proposed action is to release the Carroll College site for unrestricted use. The NRC is fulfilling its responsibilities under the Atomic Energy Act to make a decision on a proposed license amendment for termination of the NRC Byproduct Materials License. This determination ensures protection of the public health and safety and the environment.

## 1.3 Alternatives to the Proposed Action

There are no alternatives to the proposed action besides taking no action. The NRC considered the no action alternative relative to Carroll College's request for license termination. The no action alternative is not acceptable because it would conflict with NRC's requirement in 10 CFR 30.36, "Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas," of timely remediation of facilities or outdoor areas that have ceased NRC licensed operations. Therefore, the no action alternative is not considered to be reasonable and is not analyzed further in the environmental assessment.

## 2.0 FACILITY DESCRIPTION

### 2.1 Site Location and Physical Description

Carroll College is located in Lewis and Clark County, Helena, Montana. The college is almost 100 years old, founded in 1909. Carroll College is located in the center of Helena, on the slope of Mount Helena. Based on the 2000 census, Helena has a population of approximately 55,000 people and the college has approximately 1500 students enrolled. Helena is the capital of Montana, so a large percentage of the residents work for the State. Helena is situated in the western central part of Montana, at the base of the Rocky Mountains. Yellowstone National Park is a 3.5 hour drive to the South and Glacier National Park is 3.5 hours to the North. The elevation of Helena is approximately 4000 feet and is located on bedrock.

### 3.0 AFFECTED ENVIRONMENT

#### 3.1 Climatology

The average rainfall for Helena is approximately 15-20 inches a year, with the majority of rainfall occurring over the summer months. Winter conditions generally run from early November through March. Temperatures can range from 50 degrees above zero to 50 below zero. High temperature averages during the winter vary between 20 to 35 degrees, with mostly sunny skies. Average summer highs approach 70 degrees, with somewhat cooler conditions in the higher mountain elevations. Average low temperatures during the summer are near the mid-20s.

#### 3.2 Water Resources

The city of Helena, Montana, obtains its drinking water primarily from a water source approximately 12 miles away, above the city of Rimini. However, there are wells throughout Helena and the valley area which are used for domestic and irrigation purposes, as well as monitoring purposes. The shallow groundwater around Helena varies because of the hill and valley areas. The wells which are summarized on the Montana Bureau of Mines and Geology website for ground-water information in the Helena area specifies the average depth of the wells to be 100 feet below the surface, with a standard deviation of  $\pm 80$  feet. The wells are primarily either domestic or monitoring wells. There are two wells, which are identified on the respective website, that are located on the Carroll College campus. One well was constructed in 1999 for domestic use with a depth of 305 feet and a yield of 180 gallons per minute (gpm). The second well was constructed in 2002, with a depth of 180 feet and is used for irrigation purposes, with a yield of 60 gpm.

There are two wells identified on the respective website which were constructed prior to 1965. One well was constructed in 1948 for domestic use and has a depth of 60 feet and a yield of 10 gpm, while the second well was constructed in 1960 for domestic and stock water use and has a depth of 36 feet. There is no yield volume available from the website for the second well.

### 4.0 RADIOLOGICAL STATUS OF THE FACILITY

Carroll College used the biochemical laboratory to conduct the radiochemical experiments. The laboratory was located on the second floor of the Science Hall, now called Simperman Hall. Room 218 was the only room used as the radiochemical laboratory to conduct procedures and store radiochemicals during the term of courses involving the use of byproduct materials. The radiochemical laboratory is approximately 20' by 20' and contains two sinks and a fume hood. Room 219 was used as the counting room to analyze radiochemical samples. This room was located in the center of the building and measures 8' by 11'. Samples and radiochemicals were brought to the counting room for analyses. Additionally, when room 218 was not being used as the radiochemical laboratory, then the radiation monitoring equipment was stored in the counting room. Two freezers were located in rooms 220 and 316 and were used to store material for radioactive decay, prior to disposal to the local land fill.

Following is a list of radionuclides which have been authorized for Carroll College, based on the renewal application dated May 10, 1979. The majority of radionuclides were small quantities of beta emitters with short half-lives.

<b>Radionuclide</b>	<b>Quantity</b>	<b>Radionuclide</b>	<b>Quantity</b>
carbon-14	as needed	iron-59	2 mCi
cobalt-60	1 mCi	calcium-45	2 mCi
sulphur-35	5 mCi	tritium	1 mCi
phosphorus-32	10 mCi	phosphorus-42	1 mCi
strontium-85	50 F Ci	strontium-90	50 F Ci

Historical records indicate that the radioisotopes were used during four months of the year for laboratory instruction in the handling and use of radioisotopes in biology and chemistry courses. The following table identifies the radioisotopes which had been purchased prior to the license renewal in 1979.

<b>Radionuclide</b>	<b>Quantity (year obtained)</b>	<b>Radionuclide</b>	<b>Quantity (year obtained)</b>
tritium	0.5 mCi (1965)	iron-59	0.5 mCi (1961)
sulfur-35	10 mCi (1962)	cobalt-60	1 mCi (1961)
iodine-131	10 mCi (1962)		

The licensee additionally stated in the respective renewal application, that they released no more than 10 microcuries (F Ci) into municipal sewerage effluent per week during the four months the program was in operation during the year. The only documented burial was the carbon-14 on June 30, 1961.

The license renewal application dated June 20, 1984, states in part that the licensee was using only phosphorus-32 and sulfur-35. Additionally, the renewal application stated that burial of radionuclide waste had not been necessary for the past several years and the licensee did not anticipate using burial as a means of disposal in the future. By letter dated April 23, 1990, the licensee submitted a renewal application and referenced the document submitted on June 20, 1984. The NRC issued License Amendment No. 09 on January 11, 1993, which authorized phosphorus-32 and sulphur-35 for laboratory research including animal studies and teaching and training of students.

The licensee submitted an application for license renewal for possession and decommissioning activities pending termination by letters dated March 10, 2003 and September 9, 2003. The NRC authorized License Amendment No. 11 for possession and storage only on October 28, 2003. This amendment also authorized any byproduct material with atomic numbers 3 through 83 because the licensee had identified sealed and unsealed radioactive materials in storage, which were not authorized on the previous license amendment; but which had been authorized historically.

By letter dated October 10, 2005, and NRC Form 314 dated October 10, 2005, the licensee stated that all activities under the license had ceased and all radioactive materials procured and/or possessed under the license had been disposed of in accordance with the regulations.

## 5.0 DOSE MODELING EVALUATIONS

The licensee conducted dose modeling evaluations for unrestricted use based on the default parameters in RESRAD, Version 6.22. The evaluation was for the one time burial of carbon-14 on June 30, 1961, at a depth of four feet. Carbon-14 is a low-energy beta emitter with an average energy of 50 keV and a half-life of 5,730 years. Carbon-14 has a transport value of 0.0 in RESRAD, which is indicative of its high mobility such that it essentially moves with the ground water. Therefore, it is considered readily transportable.

The licensee calculated the radioactivity concentration of carbon-14 to be 0.25 F Ci/g, based on: 1) the log book record of 50 F Ci, and 2) interview with the professor who stated that a "coffee can size" was buried, which was assumed to be 200 grams. This conservative approach utilizes the resident farmer scenario, which is summed over all pathways. The projected maximum dose of 30 mrem was calculated at approximately 4 years (1965). The maximum projected dose was due to the water consumption pathway.

The NRC staff performed additional dose modeling for the specific time frame of five and seven years post disposal, based on the same concentration and default parameters. Following is a table of the projected dose over the period of 1 to 100 years.

t (years)	0.0	1.0	4.286	5.0	7.0	10.0	20.0	100.0
Date	1961	1962	1965	1966	1968	1971	1981	2061
T-dose (mrem)	0.0	5.3	29.8	25.4	5.6	0.54	0.0	0.0

The projected peak dose occurred in 1965 with a sharp decline to less than 1 mrem in 1971, which is approximately 10 years. The NRC staff recognizes that the licensee's projected dose for the burial of carbon-14 is conservative based on the volume of the animal containing the carbon-14 from the study, which was noted as being a "coffee can" size (which is variable.) Following is a table based on a buried volume of 500 grams and using the default parameters in RESRAD, Version 6.22.

t (years)	0.0	1.0	4.286	5.0	7.0	10.0	20.0	100.0
Date	1961	1962	1965	1966	1968	1971	1981	2061
T-dose (mrem)	0.0	2.8	14.0	13.7	3.0	0.30	0.0	0.0

In either scenario, the calculated value beyond year seven (1968) is below the current 25 millirem limit for unrestricted use of the site as stipulated in 10 CFR 20.1402.

## 6.0 IMPACTS

### 6.1 Water

The NRC staff considered the potential impacts of leaching of radioactive material into the shallow groundwater. In 1965, the shallow surface groundwater on the Carroll College campus was not used as a drinking water source. Additionally, local members of the public obtained municipal water from the city, as their primary source of drinking water. There were only two wells identified on the Montana Bureau of Mines and Geology website, as previously discussed, which were installed prior to 1965. The impact of potentially contaminated groundwater was considered as part of the RESRAD dose modeling program and the primary pathway of concern was the direct consumption of water by the resident farmer scenario.

### 6.2 Radiological

The Carroll College site did not require any remediation of the land, buildings or water. The historical site assessment did not identify any short or long-term impacts to human health and the environment due to radiological exposures. The licensee disposed of the remaining sealed and unsealed sources in accordance with the regulations for disposal by release into sanitary sewerage under 10 CFR 20.2003 or by transfer to an authorized recipient in accordance with 10 CFR 30.41.

The sealed source inventory was either exempt material under 10 CFR 30.70 or non-NRC licensed material. The material was transferred to the Governor's Office of Emergency Services or transferred to Montana State University under NRC License No. 25-00326-06. The unsealed material was disposed by release into the sanitary sewerage under 10 CFR 20.2003. NRC regulations in 10 CFR Part 20 specifies the maximum amounts of radioactive materials that a licensee may release from a site in the form of liquid effluents.

The onsite burial on June 30, 1961, was analyzed under the current regulatory guidance of 10 CFR 20.1402, and determined that it met the criteria for unrestricted use. The areas of the site where radioactive material had been stored and handled were surveyed by the radiation safety officer at Montana State University on April 9, 2005. The surveys were performed using Ludlum survey meter with a GM probe and a low energy gamma (NaI) probe. In addition, survey wipes were taken and analyzed on a Packard Liquid Scintillation Counter. The results were less than twice background and adequately meet the criteria for unrestricted use.

The NRC has the option, depending on the licensee's survey and extent of radioactive material that was used at the facility, on whether or not to perform a close out inspection of the facility. Based on the low-energy beta emitting radioisotopes and short half-lives of the material, as well as the length of time since the last use of radioactive material at the facility, the NRC staff determined that a close-out inspection of the facility was not justified. The licensee's independent survey was sufficient to demonstrate that the facility was suitable for unrestricted use in accordance with 10 CFR Part 20. The environmental impacts resulting from the release of this site for unrestricted use are insignificant. There were no additional activities that resulted in cumulative impacts to the environment.

### 6.3 Historical and Cultural

This site did not require any remediation activities and therefore, there was no effect on the cultural or historical environment at the site.

## 6.4 Ecological

This site did not require any remediation activities and therefore, there was no effect on any threatened or endangered species or other elements of biological significance at the site.

## 7.0 FINDING OF NO SIGNIFICANT IMPACT

The NRC staff concludes that the proposed action complies with the radiological criteria for unrestricted use as stipulated in 10 CFR 20.1402. The licensee demonstrated that any remaining residual radioactivity will not result in radiological exposures in excess of the 25 millirem total effective dose equivalent limit specified in §20.1402. Dose modeling indicates that current and future members of the public will not receive any radiological dose from the burial site. The NRC staff prepared this Environmental Assessment (EA) in support of the proposed action to amend the license. On the basis of this EA, the NRC has concluded that there are no significant environmental impacts and the license amendment does not warrant the preparation of an Environmental Impact Statement. Accordingly, it has been determined that a Finding of No Significant Impact (FONSI) is appropriate.

## 8.0 AGENCIES OR PERSONS CONTACTED

The NRC staff has determined that the proposed action is not a major construction activity and will not affect listed or proposed endangered species. Additionally, it is not an undertaking that will affect historic properties. Therefore, the U.S. Fish & Wildlife Service and the State Historic Preservation Office were not contacted.

## 9.0 REFERENCES

NRC, "Radiological Criteria for License Termination," 10 CFR Part 20, Subpart E, 62 FR 39088, July 28, 1997.

NRC, "NMSS Decommissioning Standard Review Plan," NUREG-1727, August 1991.

NRC, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG-1575, December 1997.

NRC, "Consolidated NMSS Decommissioning Guidance," NUREG-1757, Volumes 1-3, September 2003.

NRC, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," NUREG-1748, August 2003.

Carroll College letter and NRC Form 314, dated October 10, 2005 (ML053040347)

Carroll College letter dose modeling submittal, dated January 17, 2005 (ML050540533)

Environmental Assessment for Carroll College

cc: (via ADAMS distrib):

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FCDB File

Material Docket Files

SISP Review Completed: RSB ADAMS:  Yes  No Initials: RSB

Publicly Available  Non-Publicly Available  Sensitive  Non-Sensitive

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