DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

May 9, 2003

Mr. George C. Pangburn, Director, DNMS
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Dear Mr. Pangburn:

Enclosed please find a copy of the petitioned health consultation for the American Chain and Cable Cabot Corporation (a/k/a American Chain Cable), Reading, Berks County, Pennsylvania, dated May 6, 2003. This health consultation is in response to the request for the Agency for Toxic Substances and Disease Registry Region III Office to review the radiological data associated with the Cabot Corporation's American Chain and Cable (ACC) site in Reading, Pennsylvania and evaluate the impact on the public's health resulting from the potential exposure to radiological material known to have been disposed of at the ACC location.

Please address correspondence to the Chief, Program Evaluation, Records, and Information Services Branch, Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, ATTN: American Chain and Cable Cabot Corporation, 1600 Clifton Road, NE (E60), Atlanta, Georgia 30333.

If there are any questions, please direct them to Paul Charp, health assessor, at (404) 498-0365.

Sincerely yours,

Max M. Howie, Jr.
Chief, Program Evaluation, Records,
and Information Services Branch
Division of Health Assessment
and Consultation

Enclosure

You May Contact ATSDR TOLL FREE at
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Petitioned Health Consultation

EXPOSURE INVESTIGATION

AMERICAN CHAIN AND CABLE CABOT CORPORATION
(a/k/a AMERICAN CHAIN CABLE)

READING, BERKS COUNTY, PENNSYLVANIA

MAY 6, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members.

This document has previously been released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The health consultation has now been reissued. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PETITIONED HEALTH CONSULTATION

EXPOSURE INVESTIGATION

AMERICAN CHAIN AND CABLE CABOT CORPORATION
(a/k/a AMERICAN CHAIN CABLE)

READING, BERKS COUNTY, PENNSYLVANIA

Prepared by:

Federal Facilities Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

INTRODUCTION TO THE ADDENDUM

The Agency for Toxic Substances and Disease Registry (ATSDR) Region III office requested a review of radiological data associated with the Cabot Corporation's American Chain and Cable site (ACC) in Reading, Pennsylvania. The request was in support of a petition for a public health assessment ATSDR received on March 6, 2002 [1]. In the petition, ATSDR was asked to evaluate the impact on the public's health resulting from the potential exposure to radiological material known to have been disposed of at the ACC location. To address the issues associated with the radiological data, ATSDR reviewed the available information and determined that an exposure investigation was warranted. With ATSDR at the exposure investigation activity were the Nuclear Regulatory Commission (NRC), the Environmental Protection Agency (EPA), and the Pennsylvania Department of Environmental Protection (PaDEP).

As a result of that exposure investigation, ATSDR prepared and released a public health consultation in July 2002. ATSDR later received comments from several sources and met with the Nuclear Regulatory Commission (NRC), the Pennsylvania Department of Environmental Protection (PaDER), and the site owner in January 2003 at the NRC offices in King of Prussia. In response to those discussions at the meeting and the comments received, the agency determined that an addendum to the previously released document was needed.

ATSDR has reviewed its data, dose calculations, and related assumptions and methodologies. Also, as a result of discussions with regulatory agencies and the owner of the site, the agency is release this addendum with an reevaluation of exposures from this site.

BACKGROUND AND STATEMENT OF ISSUES

American Chain and Cable (ACC), and its predecessor owners and operators have been in Reading from 1904. When the site was active, it operated under license SMC-1562 with the Atomic Energy Commission (now the NRC) to possess naturally occurring radioactive materials (source materials). Previous operators held other licenses to use radioactive materials. The facility received Malaysian ores containing tantalum and trace amounts of uranium and thorium [2]. Through the electric arc process used at ACC, the tantalum concentrations increased from 2% to 15%. In the processing, uranium and thorium were segmented and concentrated into waste material (slag). The slag was cooled and reportedly broken into fragments and disposed within the site's slag dump area [3]. The ACC site is associated with a Brownfields pilot project in Reading[1]. The EPA has defined Brownfields as abandoned, idled or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.

The company decided to halt tantalum production in 1968. Between 1969 and 1983, decontamination activities were undertaken. In 1985, a confirmatory survey in support of the NRC license termination, identified areas of radiological contamination in the buildings and

[1] EPA Brownfields Assessment Demonstration Pilot fact sheet dated July 1998. The fact sheet can be located on the internet at http://www.epa.gov/brownfields/html-doc/reading.htm.

grounds above the prescribed NRC release criteria. This required addition decontamination activities that occurred between 1988 and 1989. A second confirmatory survey in 1993 continued to find elevated levels of contamination [3]. In the 1990s, Cabot decided to decommission the facility and develop plans to raze the buildings on site. The decommissioning plans included radiation surveys in the buildings and the surrounding property, ultimately leading to site remediation. At that time, the NRC informed Cabot that the site did not meet the guidelines of the NRC and until meeting these guidelines for contamination levels, no demolition could occur at the site [4]. Additional work by Cabot cleaned the buildings to NRC guidelines and the NRC confirmed the clean up, releasing the buildings for unrestricted use [5] and demolition. Therefore, the remaining issue at the site, portions of which are now owned by the City of Reading, is the status of the old radioactive slag dump used during the ore processing.

ATSDR addressed the radiation levels associated with the slag pile and in the surrounding neighborhood in a previous public health consultation and exposure investigation released in July 2002. We based our recommendations on various data sources: the 1993 confirmatory survey; the second confirmatory survey performed in 1995 [6]; recent radiation exposure readings performed by ATSDR Region III staff and the EPA during a visit to the site in March 2002 and; the current radiation readings collected during the exposure investigation.

DISCUSSION

Review of data previously collected during visits by ATSDR and the regulatory agencies

In March 2002, ATSDR and the EPA visited the ACC site and measured gamma radiation exposures at the site perimeter. These measurements estimated the exposure rate to residents who may be near the site. The only location where the dose rate was elevated was along the fenced slag pile near a jogging trail. At that time, the observed dose rate was 30 microrem per hour (μrem/h, 0.3 microsieverts[2]/h; μSv/h). The EPA informed ATSDR that the background rate for this area was less than 0.1 μSv/h, equivalent to 10 μrem/h [7].

PaDEP previously visited the site and reported to ATSDR Region III that the highest radiation reading found was 60 microroentgens per hour (μR/h)[3] on a walking path. PaDEP also reported they found radiation readings at other locations around the site perimeter that were 4 to 5 times higher than background [8].

Review of data previously collected during site characterizations

In 1993, the Oak Ridge Institute for Science and Education (ORISE), under a contract with the NRC performed a confirmatory survey at the site to evaluate conditions at the site [3]. For the

[2] In the SI system of measurements, the Sievert has replaced the REM. One Sievert (Sv) is equal to 100 rem.
[3] The term exposure (roentgen) and dose (rem or Sievert) when used in radiological safety and health physics refer to different methods of measurement. In general, when discussing gamma radiation, the units of rem, Sievert (Sv), and roentgen (R) can be considered identical.

exterior soil sampling locations, ORISE selected areas near previous sampling points as well as locations at a distance from the site for determination of background levels of uranium, thorium, and the radiation exposure rate. The measured backgrounds were 2.67 picocuries per gram (pCi/g, 0.098 becquerels/g; Bq/g) and 2.52 pCi/g (0.093 Bq/g) for uranium and thorium. The measured background exposure rate was 11 μR/h. ORISE collected and analyzed soil samples for uranium and thorium from most of the ACC site; however, samples were not collected from the slag pile/slope on the site. The results showed that most of the samples from the main area of the site were indistinguishable from these background readings. However, samples collected from those areas where the exposure rate was elevated showed significant variation from background. In these samples, the uranium concentration in surface soils ranged from approximately background to a maximum of 78 pCi/g (2.9 Bq/g). Thorium concentrations ranged from approximately background to a maximum of 51 pCi/g (1.89 Bq/g).

In the 1995 report [6], and based on 10 soil samples from exterior areas around the site, ORISE reported that the soil concentrations of uranium were below the detection limits selected for the confirmatory survey. These samples may not have been collected from those areas where elevated levels of radioactive contamination were detected in the 1993 survey. The 1995 results reported the thorium concentrations, corrected for the thorium background, ranged from 0.8 pCi/g to 9.2 pCi/g (0.03 to 0.34 Bq/g). The NRC has established that thorium should not exceed 10 pCi/g (0.37 Bq/g) as a cleanup level [6]. Recently, the state has corresponded with the NRC with serious concerns regarding the findings of the 1995 report by pointing out large inconsistencies in the waste manifests, soil radioactivity determinations, radiation readings, and potential problems with the dose assessment performed by the NRC [9]. Additional concerns from the state were highlighted during the January 2003 meeting with the NRC.

Exposure Investigation

ATSDR defines an Exposure Investigation (EI) as "the collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances." Because of the discrepancy of the radiation exposure readings collected by the state and the federal agencies, the purpose of ATSDR's exposure investigation was not to characterize the site for the purposes of remediation or release to the public but to determine if the readings collected by the NRC, EPA, and the PaDEP were representative of the contamination at the site. If the readings collected by the other federal and state agencies were verifiable, ATSDR would develop realistic exposure and dose scenarios for the site. ATSDR would also determine if the variation in the radiation readings collected at the site could be explained by the characterization at this location. The exposure investigation would also determine if any migration of contaminants into the surrounding neighborhood, based on radiation exposure readings, had occurred.

Site Observations

The area surrounding ACC is industrial with residential areas across the street from numerous abandoned structures. There are many physical hazards associated with these buildings including

rusted metals, construction debris, and dilapidated roofs. The area around the slag pile is heavily vegetated and a locked fenced surrounds the pile, as well as the entire ACC site. The area immediately around the pile is fenced and locked with appropriate radiation warning sites in clear view. The bank of the pile, with an estimated 60° slope, leads to the Schuylkill River.

During the measurements collected inside the slag pile fence, no materials indicative of slag were observed; however, construction debris, asphalt, tires, and similar materials were seen. Outside this fence, ATSDR observed piles of construction debris, bricks, overgrowth of vegetation, rusting metal, and similar materials.

Radiation Exposure Readings

For the exposure investigation, ATSDR used a calibrated handheld sodium iodide scintillation system coupled to a spectrometer to obtain a gamma radiation spectrum and to collect dose rate measurements. The purpose of the spectrum was an attempt to identify radiological contaminants present at the site. The agency collected radiation exposure readings along the fence line at the top of the slag pile, as well as the foot of the pile near the river. Exposure readings were also taken at random locations on the pile and on city-owned sidewalks along Tulpehocken Street. ATSDR also collected exposure readings in an area on the site thought to be representative of background. All radiation readings were stored in the scintillation system and later transferred to a spreadsheet for data reduction and analysis.

The background exposure rates, collected at the property boundaries are shown in Table I. The data indicate that the background does not vary significantly at the edges of the site. For the readings collected around the site during this exposure investigation, the appropriate background reading was subtracted from the measured exposure rate to obtain a corrected exposure.

Table I. Background exposure rates for American Chain and Cable

Exposure Reading Locations	Exposure rate ± Standard Deviation (μR/h)
Outside slag pile fence; ground contact	5.1 ± 1.2
Railroad tracks at bottom of pile; ground contact	5.9 ± 1.4
Gravel lot adjacent to Tulpehocken Street; ground contact	5.7 ± 1.1

ATSDR collected exposure readings at the top of the slag pile and lower portions of the pile. The exposure readings were not uniform; the results suggested the slag is heterogeneous in its composition or randomly dumped. For example, the exposure rates found on the slag pile, corrected for background, ranged from background to a maximum exposure rate of over 100 μR/h. Other agencies with ATSDR observed comparable readings using their radiation detection equipment.

Outside the upper fence bounding the slag pile, ATSDR also collected readings approximately every 9 feet for a distance of over 120 feet. After this distance, the vegetation prevented additional exposure measurements. The exposure rate (corrected for background) along the fence ranged from background to a maximum reading of 7 μR/h. Measurements collected along the fence at the bottom of the pile near the river, however, were much different. During these measurements, ATSDR, as well as the EPA and the NRC, found exposures ranging from background to 54 μR/h. The maximum reading was found at a location where it appears that erosion from the pile has extended beyond the fence.

ATSDR also collected radiation exposure rates in the middle of Tulpehocken Street and on the city sidewalks along Tulpehocken Street. The exposure rates, corrected for background, ranged from background to less than 3 μR/h.

Dose Assessment Scenarios

For the estimation of radiation dose received from an inadvertent intruder, ATSDR computed the mean and standard deviation for all readings in each of the following locations: top area of the pile; lower edge of pile near the river, upper fence line and; along Tulpehocken Street. These data are presented in Table II.

In this table, the locations are where ATSDR collected the values and how those measurements varied. The confidence level is a measure of how sure we are of the measured value. For example, in the case of the upper fenceline, we believe that if 100 readings were collected, 95 of those readings (95%) will between 7.5 and 9.5 μrem/h.

Table II. Statistical Evaluation of the measured dose rate at selected locations.*

Parameter	Pile	Upper Fenceline	Lower Fenceline	Tulpehocken Street
Average	31	8.5	26.4	6.8
95% Confidence Level	14.7	1.0	14.4	1.1
Minimum	5.1	4.6	5.9	4.9
Maximum	113.7	12.1	59.6	8.8

* Values are expressed in microrem per hour. The dose was estimated from the exposure rate using the estimated relationship of 1 to 1 for gamma radiation exposure to dose. The values are not corrected for background.

With respect to the radiation dose estimates for the pile, if one removes the hot spots[4] that were located within the area, the average dose is reduced to 18 μrem/h with a 95% confidence level ± 5 μrem/h. This still indicates that the radiation associated with the slag pile is about twice the

[4] The term "hot spot" can have several meanings. For the purposes of this public health consultation, ATSDR is defining a hot spot as an area where the reading was 3 times or more higher than the measured background.

dose rate as other areas around ACC and about 3 times higher than the typical backgrounds as measured by ATSDR.

Selection of an appropriate scenario

The selection of an appropriate exposure and dose scenario is paramount at this site as the selection of the scenario can drive the health-based recommendations. The data suggest that the pile has significant spots of elevated radiation exposure. If one were to be extremely conservative, then the use of these hot spots would be the driving force for public health actions. However, these elevated readings not only are difficult to localize, but the time an inadvertent intruder would have to spend on these exact locations may not be realistic. After visiting the site, evaluating the surrounding neighborhood, ATSDR selected the following scenario as representative of the area.

Associated with this scenario, ATSDR performed a statistical analysis, called a Monte Carlo simulation, of the estimated radiation dose, the estimated time at that dose level, and the estimated time one might spend at that particular dose level. The parameters used for this stimulation are given in Table III. This simulation takes into all values measured by ATSDR at the site, along the fencelines and on the pile itself. The simulation essentially evaluates the probabilities of dose and time at each location producing a range of statistical values associated with the distribution of the variables.

Table III. Values and distributions used in Monte Carlo Simulations*

Simulation value	Pile (analysis includes all measured values)	Lower Fence
Lowest dose value	0	0
Average dose	31	26.4
Highest dose value	114	59.6
Lower time limit‡	1	1
Average time	8	2
Upper time limit	12	8
Distribution type§	Extreme value	Extreme value

* The values in the table are expressed as microrems per hour (μrem/h) and are corrected for background.
‡ The time limits are expressed in hours at a particular location
§ The distribution type was determined by the software automatically fitting the data to the appropriate distribution.

Exposure Scenario

A scenario developed by ATSDR is one in which an individual would have limited access to the site because of the locked fence, security patrols, and planned Brownfields city activities. However, for our worst-case evaluation, we chose a scenario where an individual gains access to the site and over the course of a year would be exposed to the range of measured dose rates from 1 to 8 hours per day for 200 days near the bottom fence line of the pile and 1 to 12 hours per day

on the pile for 200 days. Using the lowest of values, the annual estimated dose is about 9 mrem/y above background. Using all values recorded by ATSDR, the maximum annual estimated dose is about 115 mrem/y above the ambient background radiation. The Monte Carlo procedure uses the lowest readings as well as the highest readings during the evaluation to estimate the most probable doses.

Results of Monte Carlo Simulations

The Monte Carlo estimations ran for 10,000 simulation cycles to achieve the most probable statistical estimate of the radiation dose an inadvertent intruder would receive at the site. For estimations of time on site, we set the time frames from 1 to 12 hours per day on the pile and 1 to 8 hours along the bottom fenceline. The reason for this time difference between the pile and the lower fenceline is that there is more shelter from the elements on the pile than along the fenceline. The results of the simulations are given in Table IV that shows the dose ranges from background to over 115 mrem/y above background, if the locations with the highest detected readings are used. It is important to note, however, that the variation in the estimated doses is quite large, as represented by the standard deviation of the average estimated dose.

Table IV. Results of Monte Carlo simulations for the American Chain and Cable Site*

Statistic	Dose
Minimum value	background
Average (most probable dose)	63
Standard deviation	34
Most commonly occurring value (mode)	57
Maximum value	115

* The dose is reported as millirem per year based on 200 days per year and varying the radiation dose and the time spent in the contaminated areas. All values include a background reading of approximately 45 millirem per year.

Because of the wide range of doses generated by the Monte Carlo software, the percentile breakdowns were also calculated. The percentile value, on a scale of 100, indicates the percent of a distribution that is equal to or below that value. The simulation performed at the American Chain and Cable site generated percentile ranking of the doses. Table V shows the percentile ranking. For example, 90% of the estimated doses were less than 108 mrem/y for the pile.

Table V. Percentile rankings for the estimated radiation doses*.

Percentile	Dose
10	27
50	57
90	108

- The percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below its value. The radiation dose is expressed in millirems per year.

The results of the exposure scenario can be compared to a number of different radiation dose guidelines and regulations established by the EPA, NRC, and ATSDR. These dose values are

based either on the program goals for clean up or health. Health based guidelines or regulations are based on peer-reviewed scientific literature and on evaluations by expert panels. Table VI gives the guidelines and regulations on which ATSDR is basing its conclusions of the exposure investigation.

Table VI. Regulatory limits or guidelines for radiation exposure.

Agency	Dose Limit	Type*	Basis for Dose Limit†	ATSDR finding‡
EPA	15 mrem/y	Guideline	Remediation	Below
NRC	25 mrem/y	**Regulatory**	Decommissioning	Below
ATSDR	100 mrem/y	Guideline	Health (non-cancer)	Below
EPA	100 mrem/y	Regulatory	Health	Below
NRC	100 mrem/y	Regulatory	Health	Below

* A guideline is a principle or procedure used to assist in the interpretation of regulations. Regulations are laws into effect by formal public announcements by government agencies to enforce particular statutes under their jurisdiction. Many regulations undergo a public review before adoption by the agency.
† The basis for the dose limits vary with respect to purpose of the program.
‡ The ATSDR finding is based on the average estimated dose of 19 mrem per year; that is, average reading of 63 mrem/y less background of 44 mrem/y.

EVALUATION

This addendum to ATSDR's previous public health consultation contains a re-evaluation of data based on information received at a public meeting held at the Nuclear Regulatory Commission Region I office in January 2003. Based on this new information, ATSDR has determined there are no public health issues associated with the American Chain and Cable site for which ATSDR must take additional actions.

ATSDR developed an exposure scenario and performed a simulation of potential exposures for individuals living around the American Chain and Cable site in Reading, Pennsylvania. This scenario suggested that the lowest dose was less than 10 millirem per year, the most probable potential annual exposure was less than 36 mrem/y and maximum dose, assuming someone knew the exact locations of the most elevated exposures was about 115 millirem per year. Therefore, our evaluation showed the range of potential doses, taking into account the uncertainties in the measurements, occupancy factors, and intangible factors, ranged from background to about 100 millirem per year, equal to the ATSDR Minimum Risk Level (MRL) of 100 mrem/y [10].

The gamma exposure rates found by ATSDR in this exposure investigation are similar to the results previously obtained by the EPA, the NRC, and the Pennsylvania Department of Environmental Protection. That is, the readings vary greatly depending on the location; nonetheless, the data indicate that the site may be suitable for unrestricted release. Based on these data and discussions with the regulatory agencies and site owners, under current and planned conditions which restrict access, ATSDR believes the gamma radiation exposure rates associated with the slag pile are not at a level of public health concern for either short-term exposures or long term exposures. ATSDR bases this conclusion using its MRL for short term,

non-cancerous health effects. Long term exposure are not expected to occur. In order for a member of the public to exceed the MRL, they would have to: 1) locate the most radioactive area of the pile and 2) stay in that exact location for 200 days to approach the ATSDR MRL. In order for a member of the public to approach a long-term dose, first the MRL would have to be exceeded and the agency does not believe this type of exposure could occur based on current site conditions.

The ATSDR exposure investigation did not collect soil samples to estimate the extent of contamination within the slag pile. However, based on the review of the available information, ATSDR does not consider the contamination in the soils to be a public health concern. ATSDR, however, is concerned with possible soil disturbing activities that might occur on the pile, especially along the slope. This includes additional site characterization and/or remediation that that result in the generation of large amounts of dust. The agency believes this could lead to potential public health issues. This is especially true since one of the radiological contaminants, thorium, if present in the air, is very restrictive with respect to public exposure (Code of Federal Regulations, Title 10, Chapter 20; 10CFR20, Table II). This regulation limits the thorium concentration in air to 4 pCi/L, an amount if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 mrem, one half of the ATSDR MRL.

ATSDR radiation measurements collected along Tulpehocken Street did not find significantly elevated radiation readings. In general, the readings were representative of the background readings we observed prior to collecting the measurements. Therefore, no evidence that radiological materials from the site are present in the residential areas.

CONCLUSIONS

1. The gamma radiation exposure rates associated with the slag pile are not at a level of public health concern for either short term exposures or long term exposures, under current and planned conditions, which restrict or limits access to site.

2. Radiation levels along Tulpehocken Street are not a public health hazard.

3. Soil disturbing activities that result in large amounts of dust may increase public exposures to radiological contaminants. Of greatest concern is exposure to thorium, which has very restrictive public exposure limits for air (Code of Federal Regulations, Title 10, Chapter 20; 10CFR20, Table II.. The limit is 4 pCi/L of thorium in air, an amount if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 mrem, one half of the ATSDR MRL.

RECOMMENDATIONS

If the site is further developed under the auspices of the Brownfields program, ATSDR recommends that dust control measures be established and that air monitoring during these activities occur to evaluate potentially large amounts of dust to insure that the federal guidelines for public exposure to thorium in air are not exceeded.

Paul A. Charp, Ph.D.
Senior Health Physicist

REFERENCES

1. Request for a public health assessment (2002). Letter transmitted to ATSDR from resident in Reading, Pennsylvania.

2. Craig K and DW Reisenweaver (1994). Decommissioning plan for the main processing building and surrounding area at the Reading, Pennsylvania site. Prepared by NES Inc. for the Cabot Corporation. NES Inc. Danbury, Connecticut.

3. Berger JD and BM Smith (1993). Confirmatory radiological survey for portions of the Cabot Corporation Reading Facility. Reading, Pennsylvania. Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee. June 1993.

4. Letter from John Austin, Division of Waste Management, US Nuclear Regulatory Commission to R.S. Barron, Cabot Corporation dated November 17, 1994.

5. Letter from Michael Weber, Division of Waste Management, US Nuclear Regulatory Commission to A. Campitelli, Cabot Corporation dated February 17, 1995.

6. Abelquist EW and JL Payne (1995). Confirmatory survey of the main processing building and adjacent exterior area. Cabot Corporation, Reading, Pennsylvania. Final Report. Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee. April 1995.

7. Electronic mail from Jennifer Hubbard to Paul Charp dated March 11, 2002. Subject: FYI: Update on Reading, PA sites.

8. Agency for Toxic Substances and Disease Registry (2002). ATSDR Record of Activity from Jennifer Hubbard to Paul Charp dated February 1, 2002.

9. Letter from David J. Allard, Director, Bureau of Radiation Protection, Pennsylvania Department of Environmental Protection to Larry Camper, Chief, Decommissioning Branch, Office of Nuclear Materials Safety and Safeguards, US Nuclear Regulatory Commission dated May 2, 2002.

10. Agency for Toxic Substances and Disease Registry (1999). Toxicological Profile for Ionizing Radiation. Atlanta, Georgia: ATSDR.

Appendix I

Response to Comments

1. *ATSDR review of available information – did not consider a number of existing studies and reports.*

ATSDR did not locate the documents referenced by the commenting group. The documents reviewed by ATSDR and cited in the public health consultation (HC) were cited for informational purposes only. The purpose of the EI was to evaluate potential exposures present at that time, not retrospective exposures. The EI would then attempt to project future exposures based on the current exposure parameters. ATSDR was aware that previous dose assessments had been performed based on correspondence in our possession as well as discussions with representatives of the EPA, NRC and PADEP.

During the evaluation of radiological dose, ATSDR is aware that many regulatory methodologies use standard or default value approach for dose assessment. For example, these could include using the defaults in various federal guidance reports, inhalation, and ingestion parameters. Although this is an acceptable approach, the purpose of the EI is to attempt to use realistic scenarios based on ATSDR visits to the location, discussions with residents in the area, the individual who petitioned ATSDR, and related sources of information. Therefore, our exposure scenarios, we believe, are more realistic than default variables used in standardized assessments.

2. *ATSDR report contains a number of errors, ATSDR does not understand a number of factual considerations which led to erroneous and inappropriate conclusions in its evaluation of the potential public health concerns.*

The commentor stated, correctly, that the ATSDR scenario was established assuming an hour exposure at each location, a total of two hours. What is unclear in the ATSDR HC is that the value was used as a minimum time during establishment of the Monte Carlo parameters. The results presented in the HC was the result of 10,000 estimations. Because the ATSDR dose estimates are below the agency MRL, no further actions are planned by ATSDR other than the recommendations made by the agency to the regulatory agencies.

ATSDR appreciates being called attention to the unclarified statements in the HC. We also appreciate the explanation of how the slag material apparently was outside the lower fence.

With respect to our statements that no remediation had occurred, we recognized the site as being two distinct areas; that is, the buildings and slag pile. However, we were under the impression that portions of the slag pile had been remediated based on information included in our references number 2 and 6. In our references, the authors stated their survey included exterior adjacent locations to the main building. In our reference number 3, Figure 1 in that report shows

areas on the slag pile that were measured for residual radioactivity in the 1985 surveys. We have modified the text according to indicate the more correct remediation history.

3. *the report does not contain sufficient detail to allow for third party critical review and evaluation. The report is being used by regulatory agencies to form positions and without this information, proper review is not possible.*

Although ATSDR did not include a map of locations where measurements were taken, field notes that were transcribed into a spreadsheet are available by request. The spreadsheet contains the approximate locations, field measurements, any spectra collected using our handheld spectrometer and a comparison of those spectra with a thorium-containing lantern mantel. Our data has been supplied to the commentor as they requested.

ATSDR staff did visit the site on two occasions; however, only one of those visits included an ATSDR health physicist who collected the data used in preparation of the HC. In those instances where there was no indication of how the measurements were collected, such as distance from the ground, the measurements were made at one meter.

With respect to instrument calibration, those documents are available. These calibration documents were available at the time of the survey for the regulatory agencies review.

4. *The ATSDR screening assessment did not consult extensive body of previous assessments at the site, especially as it pertains to the "average member of critical group" methodology.*

In ICRP 60, the critical group concept is used to describe future individual doses and "can be limited by the use of the dose commitment" (ICRP 60 paragraph 185). ICRP further states that "if a limit is set to the effective dose commitment to a critical group from each year of practice that continues at a constant annual level, the average annual effective dose will never exceed that limit." The ICRP believes that to optimally protect the public from exposure to radioactive materials, practical restrictions need to be implemented, such as "restrictions on the release of radioactive waste to the environment" (ICRP 60 paragraph 187). The purpose of the ATSDR EI was not to derive a critical group exposure and effective dose but to determine if additional dose characterizations would be necessary to ensure protection of the public. As our results indicate, the doses are below the ATSDR MRL of 100 mrem/y and ATSDR sees no further public health issues as it pertains to the American Chain and Cable site. Any additional activities will be determined by the regulatory agencies.

5. *ATSDR conclusions and recommendations are erroneous based on these comments.*

As correctly pointed out, ATSDR did not collect and evaluate air emissions from the site. Our concern as it relates to airborne releases arises from any future remediations of the slag pile and the potential for inadequate dust control measures. The HC released in July 2002 specifically states "ATSDR is concerned, **in the case of additional site characterization and/or**

remediation, that activities resulting in soil disturbances could lead to potential public health issues. This is especially true since one of the radiological contaminants, **thorium, if present** in the air, is very restrictive with respect to public exposure (Code of Federal Regulations, Title 10, Chapter 20; 10CFR20, Table II). This regulation limits the thorium concentration in air to 4 pCi/L, an amount if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 mrem, one half of the ATSDR MRL." (emphasis added).

ATSDR agrees with the comment regarding the need for additional dose assessments and site characterizations as it pertains to the buildings and immediately adjacent grounds. However, as has been pointed out, all the characterizations of the site that have occurred have not pertained to the slag pile. Our statement for additional characterization pertains to the slag pile as it currently exists. We did receive a copy of the slag pile characterization from the state and believe it contains technical errors pertaining to the gamma spectroscopy evaluations of the soil borings as discussed on page 13. These errors are listed below.

1. There is no accounting for radon loss as this can affect secular equilibrium, especially during sample preparation.
2. There is apparently is no understanding of the thorium 232 (Th 232) decay chain as the discussion incorrectly states that thallium 208 (Tl 208) can be used to represent thorium 228 (Th 228).
3. Unless stringent quality controls are in place during gamma spectroscopic analysis, any radium 226 from the uranium 238 decay chain can interfere with the analysis for U 234.
4. The use of single peak gamma spectroscopic identification is possible; however, a more precise evaluation should have included multipeak analysis.