

# Health Consultation

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ANALYSIS OF CANCER INCIDENCE NEAR THE FORMER  
MERCER RUBBER COMPANY SITE

HAMILTON TOWNSHIP, MERCER COUNTY, NEW JERSEY

EPA FACILITY ID: NJD002328961

APRIL 25, 2007

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 30333

## **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 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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HEALTH CONSULTATION

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Prepared By:

New Jersey Department of Health and Senior Services  
Public Health Services  
Consumer and Environmental Health Services  
Under Cooperative Agreement with the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry

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## **Purpose**

At the request of concerned citizens living near the former Mercer Rubber Company site, cancer incidence was evaluated for two census tracts near the facility in Hamilton Township, Mercer County. Total cancer incidence and 13 specific cancer types were evaluated in this investigation. The specific cancers types were selected because they represent cancer groupings that may be more sensitive to the effects of environmental exposure, though not necessarily related to potential facility contaminants.

## **Background and Statement of Issues**

The former Mercer Rubber Company was located on the east side of Mercer Street in census tract 30.07 in the Hamilton Square section of Hamilton Township, Mercer County. The small factory had been in operation on the 2.5 acre site from 1866 through 1993. The company specialized in the manufacturing of molded rubber mechanical products, rubber sheeting, conveyor belting, and rubber expansion joints.

Prior to the 1930s, rubber products were manufactured from natural rubber. Synthetic rubber first became available in the United States in the early 1930s. Given the typical raw materials and the processes used in rubber manufacturing, petroleum hydrocarbons and base-neutral compounds (associated with lubricants and fuel oils), metals (associated with catalysts and certain vulcanization processes), and solvents were likely used in former operations at the site. The most recent operations involved rubber processing for the manufacture of specialty fittings, gaskets, and hosing.

New Jersey Department of Environmental Protection's Right-To-Know reports indicate that numerous chemicals and chemical mixtures were stored on-site including, but not limited to, toluene, butadiene, benzene, petroleum hydrocarbons (from gasoline and fuel oil), and, to a lesser extent, acrylonitrile (ATSDR 2007). Past air emissions of toluene are documented (ATSDR 2007). While there are no data available on past emissions during plant operation, except for toluene, exposure to air emissions from other volatile organic compounds, particularly benzene, was likely for residents living near Mercer Rubber.

Environmental evaluations conducted for on-site contamination at the closure of Mercer Rubber concluded that certain areas of the property were subject to remedial action due to elevated soil concentrations of petroleum hydrocarbons, semi-volatile organic compounds, polychlorinated biphenyls, and metals (Environmental Liability Management 1993, 1994, 1995).

The Mercer Rubber site was remediated in 1995, and sold for residential development in 2000. Currently, there are single family homes located on the site. The area surrounding the site is primarily residential with some commercial and light industrial operators within one-half mile of the site. Directly across the street from the site is Sayen Gardens, a public park.

## **Methods**

### **Study Area and Population**

The Mercer Rubber Company Site study area for the evaluation of cancer incidence consisted of the entire population residing in two census tracts (30.06 and 30.07) in Hamilton Township, Mercer County. Population counts for the area were determined from 1980, 1990, and 2000 U.S. Census data (US Census Bureau 1980, 1990, 2000).

At the request of community members and local officials (see Appendix), a smaller study area was also evaluated and consisted of three census block groups (block groups 1 and 4 in census tract 30.06 and block group 3 in census tract 30.07). Since population data for block groups is not available for 1980, population counts for the modified area were determined from 1990 and 2000 U.S. Census data (US Census Bureau 1990, 2000).

### **Cancer Case Ascertainment and Study Period**

The New Jersey State Cancer Registry was used to determine cancer cases. The cancer registry is a population-based cancer incidence registry covering the entire state of New Jersey. By law, all cases of newly diagnosed cancer are reportable to the registry, except for certain carcinomas of the skin. In addition, the registry has reporting agreements with the states of New York, Pennsylvania, Delaware, Maryland, North Carolina, and Florida. Information on New Jersey residents who are diagnosed in those states is supplied to the New Jersey State cancer registry. The registry has been in operation since October 1, 1978.

The study period for this investigation was January 1, 1979, through December 31, 2004. A "case" was defined as an individual who was diagnosed with a new primary malignant cancer during the study period while residing in one of the two study census tracts. Registry cases identified only through search of death records were excluded from this evaluation. Information on important cancer risk factors, such as genetics, personal behaviors (e.g., diet and smoking), or occupational history, is not available from the cancer registry.

### **Data Analysis**

Analyses were completed for all malignant cancer types combined and for select cancer types for two census tracts in Hamilton Township (see Figure 1), called the census tract area. A smaller area within the initial study area, called the block group area, consisting of three block groups (see Figure 2) was evaluated separately for the same cancer types. The select cancer types analyzed include bladder, brain and central nervous system (CNS), female breast, colorectal, esophageal, pancreas, lung, leukemia, non-Hodgkin lymphoma (NHL), liver, bone, stomach, and kidney. These cancer types were evaluated because they represent cancer groupings that may be more sensitive to the effects of environmental exposures, including the Mercer Rubber site emissions. Males and females were evaluated separately. Separate data analyses were conducted for two time periods (1979-1991 and 1992-2004) and select age-specific groups (ages 30-39, 40-49, 50-59; and pre-50 and 50+ for female breast cancer).

Standardized incidence ratios (SIRs) were used for the quantitative analysis of cancer incidence in the study area (Kelsey et al. 1986; Breslow and Day 1987). The SIR is calculated by dividing the observed number of cases (from the registry) by an expected number for the surveyed population over the time period 1979 to 2004.

The expected number was derived by multiplying a comparison population's age-sex-specific cancer incidence rates and the study area age-sex-specific population figures. The comparison rates used to derive the expected number of cases were the New Jersey average annual incidence rates for 1979 to 2003. The census tract study area age-sex-specific population was determined from the 1980, 1990, and 2000 U.S. Census data (Census 1980, 1990, 2000). The block group study area age-sex-specific population was determined from the 1990 and 2000 U.S. Census data (Census 1990, 2000). Each analysis used 18 age-specific population groups.

The observed and expected numbers are evaluated by interpreting the ratio of these numbers. If the observed number of cases equals the expected number of cases, the SIR will equal 1.0. An SIR less than 1.0 indicates that fewer cases are observed than expected. An SIR greater than 1.0 indicates that more cases than expected are observed.

Random fluctuations may account for some SIRs being higher or lower than 1.0. The statistical significance of deviations from SIR equal to 1.0 was evaluated using a 95% confidence interval (CI). The 95% CI was used to evaluate the probability that the SIR may be greater or less than 1.0 due to chance alone, and was based on the Poisson distribution (Breslow and Day 1987; Checkoway et al. 1989). If the confidence interval includes 1.0, then the estimated SIR is not considered to be statistically significantly different than 1.0.

## Results

Table 1 presents demographic information for the two study areas. The census tract study area (census tracts 30.06 and 30.07) population, all races combined, dropped slightly during the study period from a high in 1980 (10,019) through 1990 (9,688) to 2000 (9,522) and represented approximately 11% to 12% of the total Hamilton Township population. Approximately 95% of the initial study area population was white, while the proportion of females was slightly higher than males. The block group study area population was slightly over 60% of the initial study area population. The block group study area's population dropped slightly (about 4%) from 1990 to 2000. Population data are not available at the block group level for 1980.

Table 2 presents the number of malignant incident cancer cases by race, sex, and age group for the two study areas. A total of 1,353 cases were diagnosed in the census tract study area population over the 26 year study period and represented approximately 11% of the total cases for Hamilton Township (11,995). A total of 219 (1.8%) of the Hamilton Township cases could not be given a census tract code due to missing/incomplete address (136) or rural route/post office (P.O.) box address only (83). There were a total of 860 malignant incident cancer cases in the block group study area during the 26 year study period, nearly 64% of the census tract study area total cases. About half of the cases in each of the study areas were male while approximately 97% of the cases were white. Nearly 90% of the cases in each of the study areas

were diagnosed from age 50 or older while less than 0.5% of the cases were diagnosed under age 20. A total of 81 cases (6% of the census tract study area and 9% of the block group study area) were residents of the Hamilton Continuing Care Center located in census tract 30.06, block group 1.

Table 3 presents cancer incidence in the each of the study areas by cancer type for all race-sex groups combined. The most frequently diagnosed cancer types include breast, colorectal, lung, and prostate, representing nearly 55% of all incident cancers in each study area. The frequency of these cancer types is consistent with New Jersey statewide cancer incidence data.

### ***Census Tract Study Area Analysis***

Table 4 presents the standardized incidence ratio (SIRs) results for the census tract study area by sex for the 26 year study period. Overall cancer incidence was found to be close to the expected based on average state rates. The only statistically significantly elevated SIR was for bladder cancer in males (SIR=1.49; 95% CI=1.18, 1.87). Brain/CNS cancer in females was elevated (SIR=1.79; 95% CI=0.98, 3.00), but was not statistically significant. None of the SIRs were statistically significantly low.

Since the study population is predominantly white and the incidence of bladder cancer is far higher in white males than any other race-sex group, male bladder cancer was reevaluated using white male state rates as a comparison. After reanalysis, the white male bladder cancer SIR remained statistically significantly elevated (SIR=1.35; 95% CI=1.06, 1.69).

Cancer incidence was evaluated for two equal-interval time periods, 1979-1991 and 1992-2004. In the earlier time period (Table 5), none of the SIRs were statistically significantly high or low. In the later time period (Table 6), bladder cancer in males was statistically significantly elevated (SIR=1.72; 95% CI=1.27, 2.28). Brain/CNS cancer in females was elevated (SIR=2.04; 95% CI=0.93, 3.87), but was not statistically significant. None of the SIRs in either time period were statistically significantly low.

Because of community concerns that younger and middle-aged adults were disproportionately diagnosed with cancer, select age-specific analyses were conducted for each of the cancer groupings. The select age-groups include 30-39, 40-49, and 50-59. In addition, female breast cancer was evaluated for two age-groups, those diagnosed before age 50 and those diagnosed from age 50 and older. None of the SIRs in these analyses were found to be statistically significantly high or low.

### ***Block Group Study Area Analysis***

Table 7 presents the SIRs results for the block group study area by sex for the 26 year study period. As in the census tract study area analysis, overall cancer incidence was found to be close to the expected based on average state rates. Statistically significantly elevated SIRs were found for bladder cancer in males (SIR=1.74; 95% CI=1.31, 2.28) and brain/CNS cancer in females (SIR=2.09; 95% CI=1.00, 3.85). None of the SIRs were statistically significantly low.

As in the census tract analysis above, bladder cancer was reevaluated using using white male state rates as a comparison. After reanalysis, the white male bladder cancer SIR remained statistically significantly elevated (SIR=1.56; 95% CI=1.16, 2.04).

Cancer incidence in the block group study area was evaluated for two time periods, 1979-1991 and 1992-2004. In the earlier time period (Table 8), none of the SIRs were statistically significantly high or low. In the later time period (Table 9), statistically significant elevations include bladder cancer in males (SIR=2.08; 95% CI=1.45, 2.90) and brain/CNS cancer in females (SIR=2.61; 95% CI=1.05, 5.38). None of the SIRs in either time period were statistically significantly low.

Select age-specific analyses were conducted for each of the cancer groupings. The select age-groups include 30-39, 40-49, and 50-59. In addition, female breast cancer was evaluated for two age-groups, those diagnosed before age 50 and those diagnosed from age 50 and older. The only statistically significant elevation was found for all cancers combined in males aged 30-39 (SIR=1.75; 95% CI=1.00, 2.85), based on 16 observed cases. None of the SIRs were statistically significantly low.

## **Discussion**

The purpose of this investigation was to evaluate cancer incidence in a population living relatively near to areas potentially contaminated by the former Mercer Rubber Company in Hamilton Township. The occurrence of cancer (all sites combined) over the 26-year observation period was similar to the expected (compared to average state rates). Bladder cancer in males in both study areas was higher than expected while brain/CNS cancer in females was elevated in both study areas and significantly higher than expected for the block group study area.

Cancer is a group of more than 100 different diseases (i.e., cancer types and subtypes), each with their own set of risk factors. Consequently, any evaluation of potential risk factors and specific cancer types is complicated since most cancer types have more than one known cause or risk factor. Documented chemical emissions from Mercer Rubber is limited to toluene, but benzene, butadiene, petroleum hydrocarbons, and, to a lesser extent, acrylonitrile are highly likely to have been emitted (ATSDR 2007). Benzene is considered to be a human carcinogen and has been associated with the development of a particular type of leukemia called acute myeloid leukemia (ATSDR 1997; NJDHSS 2001). Butadiene is a probable carcinogen in humans with evidence that it causes lymph and blood cancer in humans and has been shown to cause cancers in multiple organs in animals (EPA 2002, NJDHSS 1998). Acrylonitrile is considered to be a human carcinogen based on animal studies and may be associated with lung and prostate cancers (NTP 2005; NJDHSS 2005).

In the current analysis, bladder cancer was statistically significantly elevated in each of the study areas for males (SIR=1.5 for the census tract area and SIR=1.7 for the block group area). The risk of being diagnosed with bladder cancer for males was greater in the more recent time period (1992-2004) where statistically significant elevations were found (SIR=1.7 for both areas).

However, bladder cancer in females was not significantly elevated for either study area or time period examined. The SIR for bladder cancer in females was lower than expected in the census tract area (SIR=0.8) and met expectation in the block group area (SIR=1.0).

Brain/CNS cancer was statistically significantly elevated in females in the block group area (SIR=2.1) and elevated in females in the larger census tract area (SIR=1.8). Brain/CNS cancer was found to be slightly elevated in males (SIR=1.1 in the census tract area and SIR=1.5 in the block group area), but not statistically significant. The incidence of leukemia, a cancer type which is of particular concern due to the potential site contaminants (benzene and butadiene), was slightly elevated, though not statistically significant, for females (SIR=1.3 in the census tract area and SIR=1.5 in the block group area), and lower than expected for males in both study area.

The greatest risk factor for bladder cancer is smoking (American Cancer Society 2004b). Smokers are more than twice as likely to get bladder cancer as nonsmokers. Smoking is estimated to be responsible for 48% of bladder cancer among males and 28% among females. Certain industries have been linked with increased bladder cancer including rubber, textile, leather, and paint manufacturing (Monson 1996; American Cancer Society 2004b). An excess of bladder cancer has been clearly demonstrated in British rubber workers employed before 1950, particularly in jobs with exposures to aromatic amines, however there has been no increase in bladder cancer in British rubber employees hired after that year and no clear evidence for an excess in U.S. rubber workers (IARC 1998).

The causes of brain/CNS cancer are largely unknown, but a variety of genetic and environmental factors have been suggested (National Cancer Institute 1996). The only established environmental risk factor for brain/CNS cancer is high dose ionizing radiation (American Cancer Society 2004a). Certain occupations and industrial exposures have also been implicated as possible risk factors for brain/CNS cancer including chemists, embalmers, anatomists, precision metal workers, farmers, synthetic rubber and polyvinyl chloride manufacture, refining of crude oil and production of petroleum based chemicals, manufacture of pharmaceuticals, and the nuclear fuels and weapons industry (National Cancer Institute 1996).

A limitation of cancer studies of this type is the inability to assess past exposure levels in the population. Important information needed to assess a cause-effect relationship includes data on actual personal exposure to the contamination and other relevant risk factors over time. That is, who was exposed and who was not exposed and the magnitude of the exposure that did occur. Because personal exposure information does not exist, residential proximity to the contaminated site was used as a surrogate measure for potential past environmental exposure. This was accomplished by analyzing the population living in a relatively small geographic area (either two census tracts or three block groups) around the former facility. Although proximity to the site may be a reasonable surrogate for past environmental potential exposures at the time the study was designed, it is also unlikely that all of the residents in these areas were exposed to the contamination. This would result in misclassifying some of the study area as exposed when they are not. Additionally, the length of residence of each case is unknown, thereby potentially adding to exposure misclassification. The consequence of exposure misclassification would be

to bias the results toward not finding an association (i.e., no exposure-health outcome relationship).

Another interpretation problem is that cancer is a chronic disease that takes many years after exposure to reveal itself as a clinical disease. The information supplied by the cancer registry provides only an address at time of diagnosis for each case. No information is available on length of time an individual may have lived at the address before diagnosis. It is possible that some cases are new, short-term residents with little or no exposure to the site. Furthermore, former residents who moved out of the study area before diagnosis are not available for analysis. Population mobility cannot be accounted for in this analysis.

Additionally, when researchers independently examine statistical associations for a large number of comparisons, it is likely that some number of statistically elevated or low SIRs will occur by chance alone. While it is possible to statistically correct for this concern, opinions differ on whether such corrections are needed. In this analysis, confidence intervals are presented without adjustment for multiple comparisons.

The approach used for this descriptive cancer investigation was census-based. The population of two census tracts in Hamilton Township and the State of New Jersey were reviewed in order to calculate age standardized incidence rate ratios for the study area. This census approach (ecologic design) is a practical surveillance or screening method for cancer incidence. Although this approach is well suited for providing a picture of cancer incidence in the specific localities, cause-effect relationships cannot be evaluated. Important information on potential risk factors (such as genetics, life style, environmental factors, occupation, etc.) that might explain the results were not available for analysis using this type of study design.

## **Conclusions and Recommendations**

The overall cancer incidence (all cancers combined) was not elevated in the Mercer Rubber study areas. Bladder cancer was higher than expected in males in both study areas, but lower than expected in females. Brain/CNS cancer was higher than expected in females in the smaller block group analysis. Brain/CNS cancer in males was slightly higher than expected, although not statistically significant. Leukemia, a cancer type of particular concern due to the potential site contaminants, was found to be only slightly elevated for females, but lower than expected for males.

In this analysis, past exposures to Mercer Rubber emissions cannot be ruled out as a potential cause of the elevated brain/CNS and bladder cancers. However, the inconsistency between the SIR results for males and females for these cancers and the higher rates found for these cancers in the more recent time period argue against an environmental exposure from the site. Other plausible explanations for the elevated SIRs include other unmeasured risk factors in the community (e.g., tobacco consumption or occupational exposures) or by chance alone.

The NJDHSS and ATSDR should continue to work with community representatives to determine if there are additional health concerns in the community. Additionally, NJDHSS and ATSDR

should continue to meet with community representatives to determine the most appropriate health education materials and outreach strategies to inform the general population about the environmental issues related to the Mercer Rubber site.

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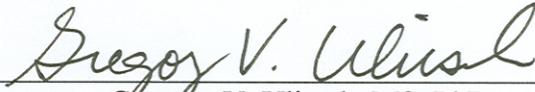
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## Certification

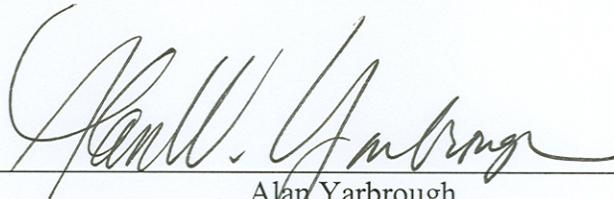
This health consultation was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. This health consultation is in accordance with approved methodology and procedures existing at the time it was initiated. Editorial review was completed by the cooperative agreement partner.



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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



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## **Tables and Figures**

**Table 1. Mercer Rubber Study Areas.  
Population by Race and Sex from the U.S. Census Bureau.**

| <b>Study Area and Characteristics</b>                                   | <b>1980</b> | <b>1990</b> | <b>2000</b> |
|---|-------------|-------------|-------------|
| <b>1. Census Tracts (CT) 30.06 and 30.07</b>                            |             |             |             |
| <b>Total Population</b>   | 10,019      | 9,688       | 9,522       |
| % of Hamilton   | 12.1%       | 11.2%       | 10.9%       |
| <b>Sex</b>  |             |             |             |
| Male  | 4,826       | 4,726       | 4,544       |
| Female  | 5,193       | 4,962       | 4,978       |
| <b>Race*</b>  |             |             |             |
| White   | ---         | 9,415       | 9,105       |
| Black   | ---         | 39          | 76          |
| Multiple Races  | ---         | ---         | 97          |
| Other/Unknown   | ---         | 234         | 244         |
| <b>2. Block Groups (BG) 1 and 4 in CT 30.06 and BG 3 in CT 30.07 **</b> |             |             |             |
| <b>Total Population</b>   | ---         | 6,009       | 5,784       |
| Male  | ---         | 2,960       | 2,740       |
| Female  | ---         | 3,049       | 3,044       |
| <b>Race*</b>  |             |             |             |
| White   | ---         | 5,799       | 5,529       |
| Black   | ---         | 32          | 59          |
| Multiple Races  | ---         | ---         | 47          |
| Other/Unknown   | ---         | 178         | 149         |

\* Race not available by census tract for 1980 population. Multiple race reporting began in the 2000 census.

\*\* Block group populations not available in 1980 census.

**Table 2. Mercer Rubber Study Areas.  
Malignant Cancer Incidence (1979-2004).  
Select Case Demographic Characteristics.**

| <b>Characteristics*</b> | <b>Census Tract Area<br/>(CTs 30.06 and 30.07)</b> | <b>Block Group Area<br/>(BGs 1 and 4 in CT<br/>30.06 and BG 3 in CT<br/>30.07)</b> |
|-------------------------|--|--|
| <b>Total Cases</b>      | 1,353  | 860  |
| <b>Sex</b>              |  |  |
| Male                    | 680  | 427  |
| Female                  | 673  | 433  |
| <b>Race</b>             |  |  |
| White                   | 1,323  | 837  |
| Black                   | 15   | 11   |
| Other/Unknown           | 15   | 12   |
| <b>Age at diagnosis</b> |  |  |
| 0 – 19                  | 6  | <5   |
| 20 – 29                 | 13   | 7  |
| 30 – 39                 | 46   | 25   |
| 40 – 49                 | 89   | 55   |
| 50 – 59                 | 228  | 163  |
| 60 – 69                 | 355  | 215  |
| 70+                     | 616  | 391  |

\* Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 3. Mercer Rubber Study Areas.  
Malignant Cancer Incidence (1979-2004) by Cancer Type, All Races Combined.**

| <b>Cancer Type*</b>  | <b>Census Tract Area<br/>(CTs 30.06 and 30.07)</b> | <b>Block Group Area<br/>(BGs 1 and 4 in CT<br/>30.06 and BG 3 in CT<br/>30.07)</b> |
|----------------------|--|--|
| Oralpharynx          | 28   | 20   |
| Esophagus            | 17   | 9  |
| Stomach              | 25   | 18   |
| Small Intestine      | <5   | 0  |
| Colorectal           | 189  | 120  |
| Liver                | 6  | <5   |
| Pancreas             | 26   | 18   |
| Other Digestive      | 10   | 5  |
| Lung                 | 182  | 105  |
| Other Respiratory    | 21   | 15   |
| Bones and Joints     | <5   | 0  |
| Soft Tissue          | <5   | <5   |
| Melanoma             | 52   | 31   |
| Other Skin           | <5   | <5   |
| Breast               | 192  | 117  |
| Cervix               | 15   | 14   |
| Uterus               | 41   | 29   |
| Ovary                | 32   | 18   |
| Other Female Genital | <5   | <5   |
| Prostate             | 173  | 113  |
| Other Male Genital   | 10   | 5  |
| Bladder              | 91   | 65   |
| Kidney               | 25   | 13   |
| Other Urinary        | <5   | <5   |
| Eye                  | <5   | <5   |
| Brain/CNS            | 25   | 19   |
| Endocrine            | 20   | 13   |
| Hodgkin Disease      | 9  | 5  |
| Non-Hodgkin Lymphoma | 51   | 30   |
| Myeloma              | 13   | 10   |
| Leukemia             | 35   | 23   |
| Miscellaneous/Other  | 42   | 29   |
| Mesothelioma         | 5  | <5   |

\* Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 4. Mercer Rubber Census Tract Area (CTs 30.06 and 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1979-2004).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 680      | 687.9    | 0.99             | 0.92   | 1.07  |
|             | Female | 673      | 653.7    | 1.03             | 0.95   | 1.11  |
| Bladder     | Male   | 76       | 50.8     | 1.49 *           | 1.18   | 1.87  |
|             | Female | 15       | 18.5     | 0.81             | 0.45   | 1.34  |
| Brain/CNS   | Male   | 11       | 9.6      | 1.14             | 0.57   | 2.04  |
|             | Female | 14       | 7.8      | 1.79             | 0.98   | 3.00  |
| Colorectal  | Male   | 96       | 94.0     | 1.02             | 0.83   | 1.25  |
|             | Female | 93       | 91.3     | 1.02             | 0.82   | 1.25  |
| Esophageal  | Male   | 12       | 10.6     | 1.13             | 0.59   | 1.98  |
|             | Female | 5        | 3.9      | 1.29             | 0.42   | 3.01  |
| Kidney      | Male   | 14       | 19.6     | 0.71             | 0.39   | 1.20  |
|             | Female | 11       | 11.9     | 0.92             | 0.46   | 1.65  |
| Leukemia    | Male   | 17       | 17.7     | 0.96             | 0.56   | 1.53  |
|             | Female | 18       | 13.7     | 1.31             | 0.78   | 2.08  |
| Liver       | Male   | 6        | 6.2      | 0.97             | 0.35   | 2.11  |
|             | Female | 0        | 2.7      | 0                | -      | -     |
| NHL         | Male   | 22       | 25.6     | 0.86             | 0.54   | 1.30  |
|             | Female | 29       | 23.1     | 1.25             | 0.84   | 1.80  |
| Stomach     | Male   | 15       | 17.6     | 0.85             | 0.48   | 1.41  |
|             | Female | 10       | 11.4     | 0.88             | 0.42   | 1.62  |
| Lung        | Male   | 102      | 114.9    | 0.89             | 0.72   | 1.08  |
|             | Female | 80       | 74.4     | 1.08             | 0.85   | 1.34  |
| Bone/joint  | Male   | <5       | NR       | 1.42             | 0.16   | 5.14  |
|             | Female | 0        | 1.2      | 0.00             | -      | -     |
| Breast      | Female | 191      | 196.9    | 0.97             | 0.84   | 1.12  |
| Pancreas    | Male   | 12       | 15.0     | 0.80             | 0.41   | 1.40  |
|             | Female | 14       | 15.8     | 0.89             | 0.48   | 1.49  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 5. Mercer Rubber Census Tract Area (CTs 30.06 and 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1979-1991).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 285      | 284.2    | 1.00             | 0.89   | 1.13  |
|             | Female | 279      | 281.6    | 0.99             | 0.88   | 1.11  |
| Bladder     | Male   | 27       | 22.5     | 1.20             | 0.79   | 1.74  |
|             | Female | <5       | NR       | 0.51             | 0.14   | 1.30  |
| Brain/CNS   | Male   | 8        | 4.5      | 1.78             | 0.76   | 3.50  |
|             | Female | 5        | 3.5      | 1.44             | 0.46   | 3.36  |
| Colorectal  | Male   | 44       | 44.9     | 0.98             | 0.71   | 1.32  |
|             | Female | 39       | 41.4     | 0.94             | 0.67   | 1.29  |
| Esophageal  | Male   | <5       | NR       | 0.62             | 0.12   | 1.81  |
|             | Female | <5       | NR       | 1.77             | 0.36   | 5.17  |
| Kidney      | Male   | 5        | 7.8      | 0.64             | 0.21   | 1.50  |
|             | Female | 6        | 4.4      | 1.35             | 0.49   | 2.94  |
| Leukemia    | Male   | 12       | 7.7      | 1.55             | 0.80   | 2.71  |
|             | Female | 6        | 5.7      | 1.05             | 0.38   | 2.28  |
| Liver       | Male   | <5       | NR       | 0.51             | 0.01   | 2.82  |
|             | Female | 0        | 0.9      | 0.00             | -      | -     |
| NHL         | Male   | 8        | 9.9      | 0.81             | 0.35   | 1.59  |
|             | Female | 11       | 8.5      | 1.29             | 0.64   | 2.30  |
| Stomach     | Male   | 8        | 8.5      | 0.94             | 0.41   | 1.86  |
|             | Female | <5       | NR       | 0.58             | 0.12   | 1.70  |
| Lung        | Male   | 51       | 56.5     | 0.90             | 0.67   | 1.19  |
|             | Female | 40       | 29.6     | 1.35             | 0.97   | 1.84  |
| Bone/joint  | Male   | <5       | NR       | 3.04             | 0.34   | 10.99 |
|             | Female | 0        | 0.5      | 0.00             | -      | -     |
| Breast      | Female | 80       | 86.3     | 0.93             | 0.74   | 1.15  |
| Pancreas    | Male   | 6        | 6.7      | 0.89             | 0.33   | 1.94  |
|             | Female | <5       | NR       | 0.63             | 0.17   | 1.61  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 6. Mercer Rubber Census Tract Area (CTs 30.06 and 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1992-2004).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 395      | 407.0    | 0.97             | 0.88   | 1.07  |
|             | Female | 394      | 375.0    | 1.05             | 0.95   | 1.16  |
| Bladder     | Male   | 49       | 28.5     | 1.72 *           | 1.27   | 2.28  |
|             | Female | 11       | 10.7     | 1.03             | 0.51   | 1.84  |
| Brain/CNS   | Male   | <5       | NR       | 0.58             | 0.12   | 1.70  |
|             | Female | 9        | 4.4      | 2.04             | 0.93   | 3.87  |
| Colorectal  | Male   | 52       | 48.5     | 1.07             | 0.80   | 1.41  |
|             | Female | 54       | 49.3     | 1.10             | 0.82   | 1.43  |
| Esophageal  | Male   | 9        | 5.8      | 1.56             | 0.71   | 2.95  |
|             | Female | <5       | NR       | 0.90             | 0.10   | 3.26  |
| Kidney      | Male   | 9        | 12.0     | 0.75             | 0.34   | 1.43  |
|             | Female | 5        | 7.6      | 0.65             | 0.21   | 1.53  |
| Leukemia    | Male   | 5        | 10.1     | 0.50             | 0.16   | 1.16  |
|             | Female | 12       | 8.1      | 1.49             | 0.77   | 2.60  |
| Liver       | Male   | 5        | 4.3      | 1.17             | 0.38   | 2.72  |
|             | Female | 0        | 1.8      | 0.00             | -      | -     |
| NHL         | Male   | 14       | 15.9     | 0.88             | 0.48   | 1.47  |
|             | Female | 18       | 14.9     | 1.21             | 0.71   | 1.90  |
| Stomach     | Male   | 7        | 9.0      | 0.78             | 0.31   | 1.60  |
|             | Female | 7        | 6.1      | 1.15             | 0.46   | 2.37  |
| Lung        | Male   | 51       | 58.5     | 0.87             | 0.65   | 1.15  |
|             | Female | 40       | 46.3     | 0.86             | 0.62   | 1.18  |
| Bone/joint  | Male   | 0        | 0.7      | 0.00             | -      | -     |
|             | Female | 0        | 0.6      | 0.00             | -      | -     |
| Breast      | Female | 111      | 111.0    | 1.00             | 0.82   | 1.20  |
| Pancreas    | Male   | 6        | 8.3      | 0.72             | 0.26   | 1.58  |
|             | Female | 10       | 9.6      | 1.04             | 0.50   | 1.92  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 7. Mercer Rubber Block Group Area (BGs 1 and 4 in CT 30.06 and BG 3 in CT 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1979-2004).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 427      | 421.1    | 1.01             | 0.92   | 1.11  |
|             | Female | 433      | 402.2    | 1.08             | 0.98   | 1.18  |
| Bladder     | Male   | 54       | 31.0     | 1.74 *           | 1.31   | 2.28  |
|             | Female | 11       | 11.4     | 0.97             | 0.48   | 1.73  |
| Brain/CNS   | Male   | 9        | 6.0      | 1.51             | 0.69   | 2.87  |
|             | Female | 10       | 4.8      | 2.09 *           | 1.00   | 3.85  |
| Colorectal  | Male   | 62       | 57.4     | 1.08             | 0.83   | 1.39  |
|             | Female | 58       | 56.2     | 1.03             | 0.78   | 1.34  |
| Esophageal  | Male   | 5        | 6.6      | 0.76             | 0.25   | 1.78  |
|             | Female | <5       | NR       | 1.68             | 0.45   | 4.29  |
| Kidney      | Male   | 10       | 12.1     | 0.82             | 0.39   | 1.52  |
|             | Female | <5       | NR       | 0.41             | 0.08   | 1.20  |
| Leukemia    | Male   | 10       | 10.9     | 0.92             | 0.44   | 1.69  |
|             | Female | 13       | 8.4      | 1.55             | 0.82   | 2.65  |
| Liver       | Male   | <5       | NR       | 1.04             | 0.28   | 2.68  |
|             | Female | 0        | 1.6      | 0.00             | -      | -     |
| NHL         | Male   | 13       | 15.8     | 0.82             | 0.44   | 1.41  |
|             | Female | 17       | 14.2     | 1.20             | 0.70   | 1.92  |
| Stomach     | Male   | 10       | 10.8     | 0.93             | 0.44   | 1.70  |
|             | Female | 8        | 7.0      | 1.14             | 0.49   | 2.24  |
| Lung        | Male   | 56       | 70.5     | 0.79             | 0.60   | 1.03  |
|             | Female | 49       | 45.4     | 1.08             | 0.80   | 1.43  |
| Bone/joint  | Male   | 0        | 0.9      | 0.00             | -      | -     |
|             | Female | 0        | 0.7      | 0.00             | -      | -     |
| Breast      | Female | 116      | 121.6    | 0.95             | 0.79   | 1.14  |
| Pancreas    | Male   | 8        | 9.2      | 0.87             | 0.37   | 1.71  |
|             | Female | 10       | 9.7      | 1.03             | 0.49   | 1.90  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 8. Mercer Rubber Block Group Area (BGs 1 and 4 in CT 30.06 and BG 3 in CT 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1979-1991).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 165      | 179.8    | 0.92             | 0.78   | 1.07  |
|             | Female | 176      | 174.2    | 1.01             | 0.87   | 1.17  |
| Bladder     | Male   | 19       | 14.3     | 1.33             | 0.80   | 2.08  |
|             | Female | <5       | NR       | 0.62             | 0.12   | 1.80  |
| Brain/CNS   | Male   | 7        | 2.8      | 2.46             | 0.99   | 5.08  |
|             | Female | <5       | NR       | 1.41             | 0.28   | 4.11  |
| Colorectal  | Male   | 24       | 28.4     | 0.84             | 0.54   | 1.26  |
|             | Female | 25       | 25.5     | 0.98             | 0.63   | 1.45  |
| Esophageal  | Male   | <5       | NR       | 0.33             | 0.00   | 1.82  |
|             | Female | <5       | NR       | 1.91             | 0.22   | 6.91  |
| Kidney      | Male   | <5       | NR       | 0.61             | 0.12   | 1.77  |
|             | Female | <5       | NR       | 0.36             | 0.00   | 2.02  |
| Leukemia    | Male   | 6        | 4.9      | 1.23             | 0.45   | 2.67  |
|             | Female | 5        | 3.5      | 1.42             | 0.46   | 3.32  |
| Liver       | Male   | 0        | 1.2      | 0.00             | -      | -     |
|             | Female | 0        | 0.6      | 0.00             | -      | -     |
| NHL         | Male   | <5       | NR       | 0.48             | 0.10   | 1.40  |
|             | Female | 9        | 5.3      | 1.71             | 0.78   | 3.24  |
| Stomach     | Male   | <5       | NR       | 0.74             | 0.20   | 1.90  |
|             | Female | <5       | NR       | 0.63             | 0.07   | 2.28  |
| Lung        | Male   | 26       | 35.7     | 0.73             | 0.48   | 1.07  |
|             | Female | 27       | 18.3     | 1.48             | 0.97   | 2.15  |
| Bone/joint  | Male   | 0        | 0.4      | 0.00             | -      | -     |
|             | Female | 0        | 0.3      | 0.00             | -      | -     |
| Breast      | Female | 46       | 53.8     | 0.86             | 0.63   | 1.14  |
| Pancreas    | Male   | <5       | NR       | 0.70             | 0.14   | 2.06  |
|             | Female | <5       | NR       | 0.51             | 0.06   | 1.84  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Table 9. Mercer Rubber Block Group Area (BGs 1 and 4 in CT 30.06 and BG 3 in CT 30.07).  
SIR Analysis by Cancer Type and Sex: All Races Combined (1992-2004).**

| Cancer Type | Sex    | Observed | Expected | SIR <sup>1</sup> | 95% CI |       |
|-------------|--------|----------|----------|------------------|--------|-------|
|             |        |          |          |                  | Lower  | Upper |
| All Cancer  | Male   | 262      | 242.8    | 1.08             | 0.95   | 1.22  |
|             | Female | 257      | 229.6    | 1.12             | 0.99   | 1.27  |
| Bladder     | Male   | 35       | 16.8     | 2.08 *           | 1.45   | 2.90  |
|             | Female | 8        | 6.5      | 1.22             | 0.53   | 2.41  |
| Brain/CNS   | Male   | <5       | NR       | 0.64             | 0.07   | 2.31  |
|             | Female | 7        | 2.7      | 2.61 *           | 1.05   | 5.38  |
| Colorectal  | Male   | 38       | 28.7     | 1.32             | 0.94   | 1.82  |
|             | Female | 33       | 30.3     | 1.09             | 0.75   | 1.53  |
| Esophageal  | Male   | <5       | NR       | 1.14             | 0.31   | 2.93  |
|             | Female | <5       | NR       | 1.46             | 0.16   | 5.28  |
| Kidney      | Male   | 7        | 7.2      | 0.96             | 0.39   | 1.99  |
|             | Female | <5       | NR       | 0.43             | 0.05   | 1.56  |
| Leukemia    | Male   | <5       | NR       | 0.66             | 0.18   | 1.70  |
|             | Female | 8        | 4.9      | 1.62             | 0.70   | 3.19  |
| Liver       | Male   | <5       | NR       | 1.55             | 0.41   | 3.96  |
|             | Female | 0        | 1.1      | 0.00             | -      | -     |
| NHL         | Male   | 10       | 9.5      | 1.05             | 0.50   | 1.93  |
|             | Female | 8        | 9.1      | 0.88             | 0.38   | 1.73  |
| Stomach     | Male   | 6        | 5.4      | 1.12             | 0.41   | 2.44  |
|             | Female | 6        | 3.8      | 1.59             | 0.58   | 3.46  |
| Lung        | Male   | 30       | 34.9     | 0.86             | 0.58   | 1.23  |
|             | Female | 22       | 28.0     | 0.79             | 0.49   | 1.19  |
| Bone/joint  | Male   | 0        | 0.5      | 0.00             | -      | -     |
|             | Female | 0        | 0.4      | 0.00             | -      | -     |
| Breast      | Female | 70       | 68.1     | 1.03             | 0.80   | 1.30  |
| Pancreas    | Male   | 5        | 4.9      | 1.01             | 0.33   | 2.37  |
|             | Female | 8        | 5.9      | 1.36             | 0.59   | 2.69  |

<sup>1</sup> Note: \*= statistically high, \*\*= statistically low, NR= not reported because observed <5.  
Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

**Figure 1. Mercer Rubber Census Tract Area (CTs 30.06 and 30.07).**

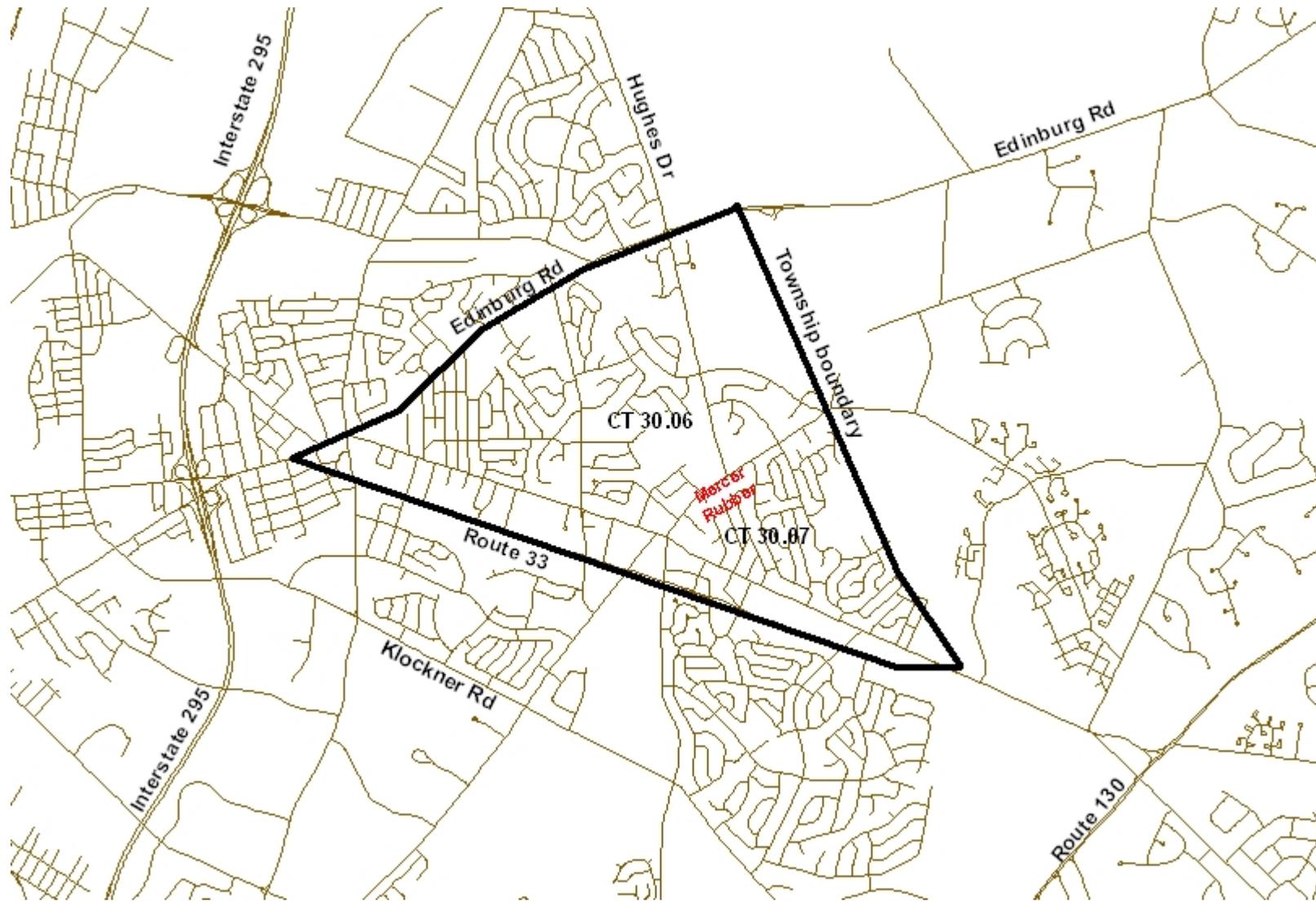
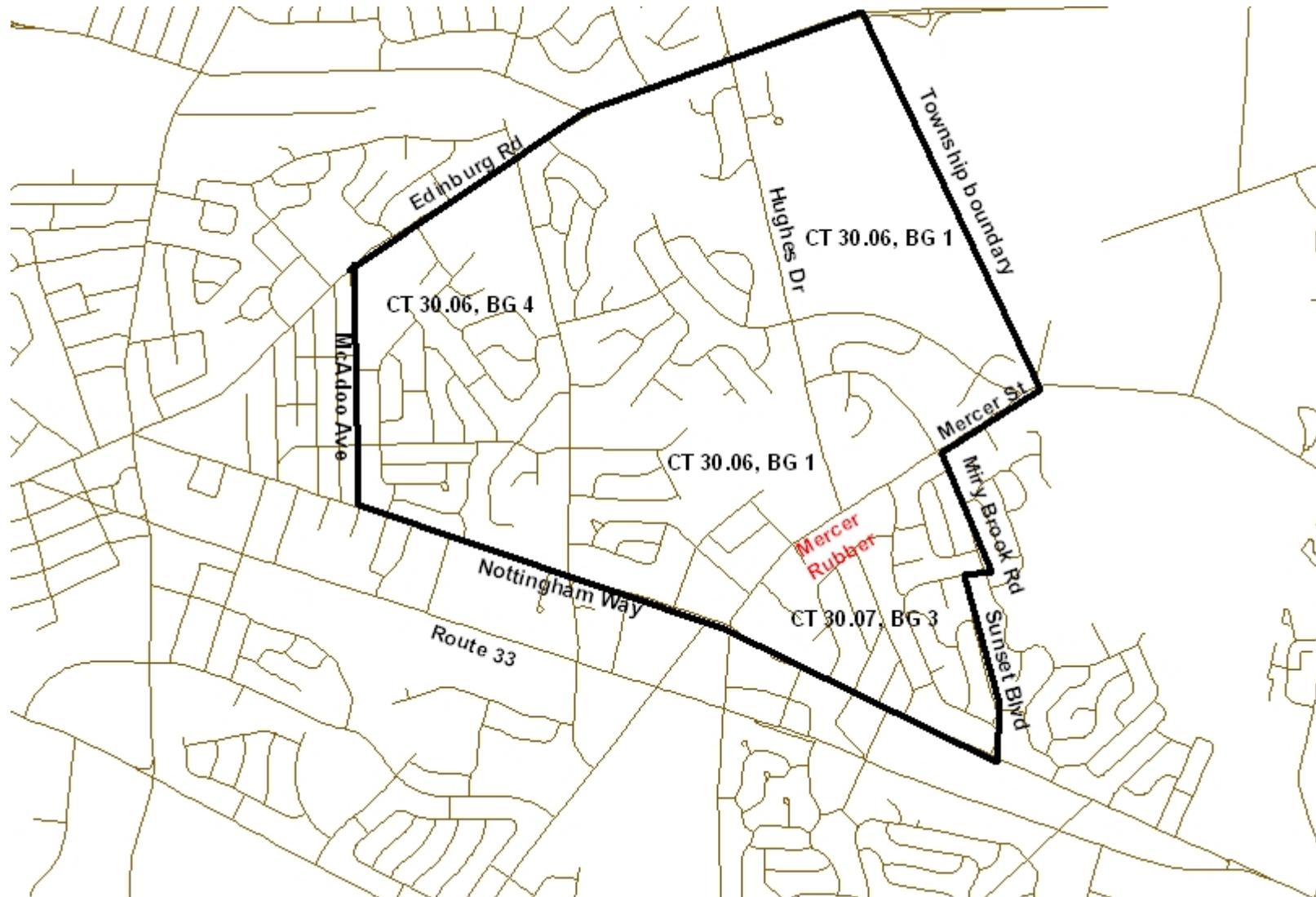


Figure 2. Mercer Rubber Block Group Area (BGs 1 and 4 in CT 30.06 and BG 3 in CT 30.07).



## Appendix

### Summary of Public Comments and Responses Mercer Rubber Company Site Health Consultation

The NJDHSS held a public comment period from August 2, 2006 through September 5, 2006 to provide interested parties an opportunity to comment on the draft Health Consultation prepared for the Mercer Rubber Company Site. This public comment period was extended until September 29, 2006. Written comments were received by the NJDHSS during the public comment period. The NJDHSS also held two public meetings to present and discuss the draft Health Consultation. Approximately 500 residents and township officials attended the meeting.

Because of numerous concerns of cancer in the area at the public meetings, the NJDHSS established a smaller citizens group of concerned local residents and local and state officials to provide input and guidance in completing this Consultation.

Questions regarding this summary or any aspect of this Health Consultation may be addressed to the NJDHSS at (609) 584-5367.

*Comment 1: Page 2 - "A 'case' was defined as an individual who was diagnosed with a new primary malignant cancer during the study period while residing in one of the two study census tracts. Left out, by definition, are all of those individuals who lived in this area at one time, but moved to other areas when diagnosed. (Pg. 5: Population mobility cannot be accounted for in this analysis). An effort needs to be made to identify as many of those individuals as possible through community outreach."*

NJDHSS Response: The New Jersey State Cancer Registry (SCR) collects only one residential address per newly diagnosed case of cancer. This address is the residence at time of diagnosis. Collection of residential address at time of diagnosis is standard cancer registry practice as recommended by the National Cancer Institute's Surveillance, Epidemiology, and End Results and the North American Association of Central Cancer Registries. While efforts could be undertaken to try to find additional cases of cancer in former residents of the area, this information would provide little additional understanding of cancer incidence without knowing the health status of all former residents. To identify the health status of all former residents would be virtually impossible. Consequently, cancer incidence is evaluated using data from the SCR in order to get a snap shot of cancer in the community. This descriptive analysis is similar to how cancer incidence is evaluated in many states with a cancer registry.

*Comment 2: Page 3 and Page 5 - "To the average citizen such as myself, the distinction drawn between 'statistically significantly elevated' and 'slightly elevated' is not clearly explained. Considering the fact that countless cancer victims may have been exposed here, but then diagnosed after they moved elsewhere, 'slightly elevated' is a serious cause for concern. As an example, the combined number of male and female cases of leukemia in the area was expected to be 26, but there were actually 32 found, not counting those that were diagnosed elsewhere. How is that 'slightly elevated'? Non-Hodgkin Lymphoma had an expectation of 19 females, with 25*

actually reported (SIR of 1.31). Bone and Joint Cancer in males was way out of range with an SIR of 1.64.” “All cancers combined were not elevated, but **those cancers of particular concern due to the potential site contaminants (benzene and butadiene) were either SIGNIFICANTLY ELEVATED or SLIGHTLY ELEVATED!!!** Brain/CNS cancer in females and bladder cancer in males were both statistically significantly elevated. Considering the potential for population mobility, the statement that they weren't found consistently among men and women seems ridiculous. Leukemia and Non-Hodgkin Lymphoma were both higher than expected in spite of the population mobility factor!”

NJDHSS Response: The 95% confidence interval is the measure used to evaluate random fluctuations of the SIR higher or lower than 1.0. The 95% confidence interval is a standard calculation in epidemiology to aid in the statistical interpretation of the SIR. For SIRs that are elevated but not statistically significant, the differences between the observed and expected numbers are within the random variability of the data and may be due to chance alone.

While population mobility cannot be factored into the analysis, the inconsistency between the SIR results for males and females for bladder and brain/CNS cancers, the higher rates found for these cancers in the more recent time period, and the lack of significant increase in leukemia, a cancer of particular concern due to potential past exposures, argue against an environmental exposure from the site.

*Comment 3: "What would the results look like if you examined the data on an annual basis instead of over 23 years? I'm wondering if looking at the cancer rates over that long time period dilute the numbers in some way."*

NJDHSS Response: Evaluating cancer incidence over the entire study period does not dilute numbers, but time trends cannot be evaluated. Consequently, we have divided the study period into two equal interval periods and evaluated them separately in order to see if cancer incidence varies between the early versus later period.

*Comment 4: "The anecdotal evidence seems to indicate that the worst clusters are in the vicinity of the unnamed creek. Is it possible to do an in-depth review of those homes to see if there is a higher than expected incidence?"*

NJDHSS Response: Since population data by age and sex is not available at the street level, we need to group areas in order to utilize U.S. Census Bureau information to determine the number of cancers that could be expected over the study period. Because of concerns raised over the size of the original study area, we have narrowed the area to include three block groups as suggested by our advisory panel. The residences near the unnamed creek area are in both the census tract analysis and the smaller block group analysis.

*Comment 5: "Are all types of cancer always reported to the Cancer Registry? If not, they may be missing significant data on cases in our town."*

NJDHSS Response: All primary invasive and in situ neoplasms are reportable to the SCR, except cervical cancer in situ diagnosed after 1995 and certain carcinomas of the skin. The SCR

is the best data source for evaluating cancer incidence in New Jersey. The North American Association of Central Cancer Registries has awarded the SCR the Gold Standard, the highest standard possible, for the quality of data since the inception of this award several years ago. The criteria used to judge the quality of the data include timeliness and completeness of cancer case ascertainment.

*Comment 6: "The public comment draft reviewed cancer data through 2001. Since the release was in 2006, couldn't additional, more recent data be included in the analysis?"*

NJDHSS Response: We have added Cancer Registry data for the years 2002 through 2004 to the analysis for a total of 26 years of cancer information. At this time, 2004 is the last complete year of data collection for the SCR.

*Comment 7: "Several community members raised concerns that cancer was elevated in younger and middle aged adults. In addition, concern was raised that pre-menopausal women seemed to be at particularly high risk of developing breast cancer. Age-specific analyses be conducted were requested."*

NJDHSS Response: We have completed age-specific analyses for the age groups 30-39, 40-49, and 50-59 for all cancers combined and the 13 site-specific cancers. Additionally, female breast cancer was analyzed for two age groups, women diagnosed before age 50 and those diagnosed from age 50 onward.