Cancer

# HEALTH CONSULTATION

## WINGATE ROAD MUNICIPAL INCINERATOR AND LANDFILL

## FORT LAUDERDALE, BROWARD COUNTY, FLORIDA

## CERCLIS NO. FLD981021470

March 18, 1996

Prepared by

The Florida Department of Health and Rehabilitative Services
Under Cooperative Agreement With the
Agency for Toxic Substances and Disease Registry

## Background and Statement of Issues

The purpose of this health consultation is to a) examine existing cancer incidence data for the community living around the Wingate Road Municipal Incinerator and Landfill Superfund site in Fort Lauderdale, Broward County, Florida (Figure 1), and b) evaluate the need for follow-up health studies at this site. This health consultation addresses past exposure to suspected carcinogens only.

The Wingate Road Municipal Incinerator and Landfill operated from 1954 to 1978. A chain-linked fence divides this 60-acre site into two portions (Figure 2). The northern portion is a 40-acre landfill, 25 feet above the surrounding grade, and densely covered by vegetation. Although the landfill contains mostly bottom ash, the City of Fort Lauderdale also disposed of sludges containing a variety of substances in the landfill. The 20-acre southern portion is a process area including two inactive incinerator buildings, cooling water treatment structures, a vehicle maintenance area, various other buildings, and an old percolation pond. Because of fine ash buildup, this percolation pond lost its permeability and became known as Lake Stupid. The City periodically removed the ash from the bottom of Lake Stupid and deposited it in the landfill and along the banks of the pond. Eventually, the City connected Lake Stupid to Rock Pit Lake, an old borrow pit adjacent to the northeast corner of the site, by an overflow ditch running along the eastern edge of the site. In 1990, the U.S. Environmental Protection Agency (EPA) added this site to the Superfund National Priorities List. A film production company currently leases the site from the City (1, 2). The site is in a well-populated area (Figure 3). There is a commercial area immediately west of the site, a junk yard north of the site, and residential areas east and south of the site (1, 3).

In 1990, the Florida Department of Health and Rehabilitative Services (FHRS), under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), published a public health assessment for this site. This assessment evaluated ground water, soil, sediment, and surface water data. Based on available information, the public health assessment found the site was not of public health concern from current exposure conditions (4).

In 1991, the City of Fort Lauderdale entered into an Administrative Order on Consent with EPA to conduct a Remedial Investigation/Feasibility Study (RI/FS). In general, four phases of field investigation detected heavy metals, polynuclear aromatic hydrocarbons, pesticides, dioxins, and furans in ash residue, soil and sediment; heavy metals and pesticides in surface waters; heavy metals, volatile organic compounds, and phthalates in groundwater; and dioxins in fish (1, 2). Under EPA's selected cleanup proposal, most of the current site area will be covered by a landfill cap and a storm water retention pond (1).

EPA's 1994 Baseline Risk Assessment (BRA) estimated the present-day increased cancer risk to workers and child trespassers to be within the limits EPA considers protective (1). EPA estimated the present-day increased risk of noncancer illnesses is negligible. For hypothetical residents living on-site in the future, EPA estimated the increased cancer risk to be within their

protective range; however, they estimated there could be an increased risk of noncancer illnesses to children and, in some circumstances, to adults (1, 3).

On February 24, 1994, FHRS staff attended an EPA-held public meeting concerning the results of the RI. During this meeting, several residents asked about the potential health effects from past exposure to incinerator emissions. Residents reported ash from the incinerator used to fall in their yards and on their homes. An ATSDR representative answered no one knew what the likely health effects might be from past exposure because there are no environmental data from the time of the facility's operation to use in exposure estimation. Residents asked if a health survey could be performed, or if there were some other method of investigating past exposures. A few residents expressed concern about cancer incidence in the community, and the possibility the cancers were site-related. FHRS staff said the department could examine an existing database to find out if there were unusual cancer rates in the community (5). After this meeting, FHRS staff talked to several residents about their specific health concerns and possible exposure pathways. FHRS staff performed windshield surveys of the site and the surrounding neighborhood on February 25 and June 22, 1994. During both visits, the site was open to visitors in the daytime (5, 6).

## Methodology

To evaluate the incidence of cancer near the site, we asked staff from FHRS' Environmental Epidemiology Section to examine the incidence of cancer recorded in the Florida Cancer Data System (FCDS). FCDS is an FHRS program operated under contract by the University of Miami School of Medicine. FCDS records all cancer occurrences, except basal cell and squamous cell skin cancers, reported by Florida hospitals from 1981 - present. However, the time required for FCDS data verification procedures causes delays in the availability of reliable data. Consequently, FHRS epidemiologists analyzed FCDS data for 1981-1990 for this health consultation.

FCDS stores cancer data by census tract. Prior to the database search, we needed to identify the census tracts within an area around the site where incinerator ash likely fell. Because we did not have information about the incinerator's stack operation (height, diameter, flow rate, etc.) needed to model ash dispersal, we estimated the ash deposition area based on predominant wind direction (2) and the professional judgements of staff in the Florida Department of Environmental Protection's (FDEP) Air Modeling Program. FDEP staff stated that although individual ash particles could have traveled many miles, a one kilometer (0.6 mile) radius around the site likely would include the areas most heavily affected by ash settlement (7). To be conservative, FHRS epidemiologists enlarged this area of interest to a one mile radius around the site. They then selected census tracts for FCDS analysis if they lay, in whole or in part, within the one mile radius boundary. The eight selected census tracts were: 409, 410, 411, 412, 413, 414, 503.04, and 508 (Figure 4) (8). We assumed people in these tracts were at risk of exposure to site contaminants; however, we do not know the exposure concentrations or durations because there are no environmental data from the time of facility operation.

FCDS records cancer incidence by cancer site, the place in the human body where cancer occurs. To identify the cancer sites relevant for study, we employed a selection technique that identified the maximum number of cancer sites potentially related to the Wingate Road site. In our analysis, we used environmental data reported in FHRS' 1990 public health assessment, EPA's preliminary site characterization report, and EPA's 1994 baseline risk assessment (3, 4, 9) for all media except groundwater and subsurface soil. We assumed residents were unlikely to be exposed to significant quantities of contaminants in either of these media. From the remaining environmental media (surface soil as defined by EPA, ash residue, sediment, surface water, and fish), we chose detected chemicals considered known or suspected cancer-causing agents (3, 10) in humans or in animals by any exposure route (ingestion, inhalation, or skin absorption). We used contaminant detection, rather than contaminant concentration, as a selection criterion because we do not know what contaminant concentrations people may have been exposed to in the past. We then identified cancer sites based on information in EPA's Integrated Risk Information System database (11) or ATSDR toxicological profiles (12-21) for each potential cancer-causing agent. We gave the list of cancer sites to FHRS epidemiologists for evaluation in FCDS (Table 1).

There is uncertainty associated with our selection of cancer sites. Because we included information from all animal studies and from all exposure routes, we may have selected more cancer sites for evaluation than can be associated with site-related contaminants (e.g., cancers associated with dioxin exposure). In addition, because we did not have past concentrations for contaminants found at the site, we were not able to screen the data and eliminate from further analysis those contaminants with a negligible increase in cancer risk. This data deficiency may have caused us to select cancer sites unlikely to be associated with contaminants at the site. In contrast, because we had only 1990-1994 environmental data to review, only those chemicals that were persistent in the environment were likely to be detected and hence evaluated for their cancer-causing potential. It is possible nearby residents were exposed to other, nonpersistent cancer-causing chemicals in the past. This lack of data may have prevented us from identifying all of the cancer sites potentially associated with contaminants found at the site. In addition, because FCDS does not record the incidence of basal and squamous cell skin cancers, we could not evaluate the possible incidence of arsenic-induced skin cancer in the community.

Appendix I of the attached memo from FHRS' Environmental Epidemiology Section describes other assumptions of the data analysis.

## Discussion

The attached memo presents FHRS' findings of the cancer incidence near the Wingate Road site (22). This analysis uses the standardized incidence ratio (SIR) to examine 41 cancer sites, as well as all cancer sites combined. The analysis compares reported cases of cancer in the eight census tracts of interest (the observed population) with reported cancer cases for all census tracts in Florida (the reference population). The ratio of (the observed cases X 100) to (the reference population) is the SIR number used in the analysis. SIR numbers greater than 100 mean there are more cancer cases in the observed population than in the reference population; SIR numbers

less than 100 mean there are fewer cancer cases in the observed population than in the reference population. From the SIR numbers, FHRS epidemiologists calculated a 95% confidence interval for the distribution of SIR numbers at each cancer site; this interval is the quantity of interest for determining statistical significance. When the SIR number and the lower bound of the 95% confidence are both greater than 100, the cancer incidence is significantly higher in the observed in population than in the reference population. Appendix I of the attached memo has more details about the SIR analysis.

Appendices II-V of the attached memo show the SIR results for four different gender-race groups. The overall incidence of cancer (all sites) in each gender-race group is significantly higher in the selected census tracts than for the rest of Florida. Some specific cancer sites have significantly higher incidence in more than one gender-race group: pancreas cancer is higher for white men and women (Appendices II and III); kidney cancer is higher in white females and nonwhite males (Appendices III and IV); prostate cancer is higher in both male groups (Appendices II and IV), and breast cancer is higher in both female groups (Appendices III and V). Eye cancers, which normally have rare incidence, are significantly higher in white males and are elevated in nonwhite males (Appendices II and IV).

After obtaining these results, FHRS epidemiologists examined cancer incidence for the significantly higher cancer sites by age group within each gender-race group (Appendices VI-IX of the attached memo). The general trend seen is for cancer incidence to increase as age increases. This is not unusual. However, there are unusual cancer incidence in some age groups. Eye cancer incidence is unusually high in 35-44 year old white males and in 0-4 year old nonwhite males (Appendices VI and VII). Breast cancer is unusually high in 25-34 year old white females (Appendix VII). In addition, pancreas cancer is quite elevated in 55-64 year old white males (Appendix VI), and kidney cancer also is quite elevated in 45-54 and 65-74 year old white females (Appendix VII). Nonwhite females have elevated cancer incidence for most of the older age groups.

The FCDS results suggest there might be an association between living in census tracts near the site and an increased incidence of some cancers. To further examine this possibility, we reviewed relevant toxicological and epidemiological studies. Toxicological studies examine the harmful effects chemicals have on humans and animals. For people, the strongest evidence of association between chemical exposure and disease occurs when studies of humans indicate there is an increased incidence of disease. Animal studies usually present limited evidence of association between chemical exposure and human disease because animals can respond differently from humans to chemical exposure. Epidemiological studies examine disease rates in groups of people. For residential communities, these studies often compare disease rates in a community exposed to one or more chemicals with disease rates in a similar, unexposed community.

We first reviewed the human and animal studies related to kidney, breast, and pancreatic cancer as summarized in pertinent ATSDR toxicological profiles:

- *Kidney Cancer* - Studies suggest there may be an association between kidney cancer and exposure to arsenic, lead, 1,4-dichlorobenzene, and hexachlorobenzene. The strongest evidence of an association between chemical exposure and kidney cancer is found in studies of people exposed to inorganic arsenic. There are a number of case reports and epidemiological studies indicating arsenic ingestion increases the risk of kidney and other internal cancers in people (23). The evidence supporting an association between the other three chemicals and kidney cancer is weaker. Although there is sufficient evidence to conclude lead ingestion can cause kidney cancer in laboratory animals, there is limited evidence of this association in people (11, 18). Similarly, there is animal evidence that 1,4-dichlorobenzene is associated with kidney cancer in some animals. However, this evidence may not apply to humans because a protein found in male rats and believed to make the kidney susceptible to cancer is not found at significant levels in people (15). The animal evidence suggesting hexachlorobenzene exposure might be associated with kidney cancer is very weak. One study of rats found a significant increase in kidney adenomas after ingestion of hexachlorobenzene (11, 24). However, adenomas normally are benign (not cancerous) tumors (25).

- *Breast Cancer* - There are no studies examining cancer development in people exposed to dibenz[a,h]anthracene. Based on animal studies, there is some evidence suggesting an association between dibenz[a,h]anthracene exposure and breast cancer. This evidence comes from only a few studies of female mice, and each of the studies is limited by having no control group, using small numbers of animals, or failing to statistically evaluate the data (11, 14).

- *Pancreatic Cancer* - There are no studies examining cancer development in people exposed to bis(2-ethylhexyl)phthalate. Animal studies suggest there may be an association between bis(2-ethylhexyl)phthalate exposure and pancreatic cancer. The scientific evidence for this association is very weak. One study of rats found an increase in pancreatic islet adenomas (26). These pancreatic tumors normally are not cancerous (25, 27).

We also reviewed epidemiological studies of health effects associated with municipal solid waste incineration. Most of these studies only have limited information for residential communities. Many studies examine the effects of incineration on healthy male workers rather than on a residential population with sick and healthy people of both sexes ranging in age from infancy to elderly. Other studies do not have measurements of exposure concentrations, and therefore cannot evaluate the association between exposure to incinerator emissions and illness. However, we found three epidemiological studies attempting to evaluate the health of residential populations around municipal solid wast incinerators:

- A French study examined how respiratory medication purchases differed by distance from an incinerator in a small village (population 3,800). The three resident groups studied were well-matched; there were no demographic or socio-professional differences among them. Although the authors found residents living closest to the incinerator

purchased more respiratory medications than the other two groups, the study found the group farthest away from the incinerator purchased more medications than the in between-located group, thus failing to show a dose-response relationship between the number of medications purchased and distance from the incinerator. The study had several other limitations. The small percentage (7%) of participants may have introduced exclusion bias into the results. In addition, the study did not demonstrate medication purchase was associated with a documented increase in respiratory ailments. Furthermore, the study did not show that the purchased medications were used by residents in the study (28).

- A cross-sectional study of self-reported illnesses in a community near a North Carolina municipal incinerator found reported illnesses did not differ from that of a control community. However, the study and control communities differed in age, educational level, and tobacco smoke exposure. The educational level was lower and the age, smoking prevalence, and passive exposure to tobacco smoke were higher in the control population (29). These differences suggest the control population may have been relatively less healthy, making the authors' findings less certain.

Only one study examined cancer risk. This study was based on stack emissions of polychlorinated dioxins and furans for a hypothetically exposed population. The authors estimated the worst-case cancer risk from dioxin (2,3,7,8-TCDD) equivalents to be negligible ($7 \times 10^{-6}$) (28). However, we do not know how stack emissions from this incinerator would compare with emissions from the Wingate incinerator. Furthermore, the cancer-causing potential of dioxin in humans is questionable.

None of these three studies gave us sufficient information to examine the likelihood of an association between illness and exposure to emissions from the Wingate Road municipal incinerator.

Some residents have expressed an interest in having a health study performed on the community to determine if exposure to site-related contaminants has caused cancer in the community. A health study consisting of personal interviews might be able to eliminate some of the confounding factors inherent in the FCDS data, including: dates of residence in the community, cancer diagnosis date, exposure to chemicals from other sources, migration of people with cancer into the area, effects of lifestyle habits and genetics, and identification of random disease clusters. However, removing confounding factors will not enable epidemiologists to prove cause and effect because there is no exposure information. At most, a health study may strengthen the suspicion that there is an association between exposure to site-related chemicals and cancer.

Even though we cannot answer the community's question about the cause of the increased cancer incidence, we can use our findings in a few ways. First, FHRS and the Broward County Public Health Unit can inform the community and their physicians of the increased cancer incidence in the area so that proper cancer screening measures can be taken. Second, FHRS and the Broward County Public Health Unit can educate residents about the importance of limiting

exposure by staying off the site. Both agencies can work with EPA and the community to develop better ways to keep children from playing on the site. Third, FHRS can further support the community by meeting with residents to identify and address their other health concerns. Fourth, FHRS can use the findings to support EPA's efforts to clean up the site. We can also support EPA by reviewing and commenting on site-related documents.

It is noteworthy that FHRS epidemiologists found increased incidence of prostate and eye cancer. The information in Table 1 suggests these cancers are not likely to be associated with exposure to site-related chemicals. However, because of the lack of environmental data, we cannot be certain we have identified all of the potential cancer-causing chemicals residents may have been exposed to during facility operation. Therefore, we cannot determine if the increased incidence of these cancers has the potential to be site-related.

Some cancers take many years to develop. Because the facility closed in 1978 and FCDS data were available only through 1990, we were likely to identify cancers with latency periods of 12 years or less. This is not enough time for cancers with longer latency periods to have developed and been reported in FCDS. Therefore, the FCDS data should be re-examined after it is updated.

## Conclusions

The interpretation and conclusions in this health consultation are based upon the referenced data and information, and are specific to FHRS' 1995-6 review of the FCDS cancer data for the area around the Wingate Road Municipal Incinerator and Landfill Superfund Site. Additional data could alter the conclusions presented.

Based on the FCDS data and other information we reviewed and cited in this health consultation, FHRS concludes the following:

1. Between 1981 and 1990, the incidence of some cancers was higher in the Wingate Road community when compared with the rest of Florida. Toxicological studies support the possibility that some Wingate Road site-related contaminants might be associated with the increased occurrence of specific cancers. Nevertheless, these findings do not prove the contaminants at the site caused cancer.

2. Residents are concerned exposure to site-related contaminants may have caused cancer in the Wingate Road community. Residents have asked a follow-up health study be performed to investigate this issue. However, a health study will not be able to demonstrate cause and effect because there are no exposure data from the time of facility operation.

3. Some cancers may have a longer latency than the 12 years examined for this health consultation. Incidence of cancers with longer latency periods will not be found in FCDS until it is updated.

4. Some community members need assistance in understanding the findings of this health consultation and how to use these findings in making decisions about their health care.

5. Area physicians and other health care professionals need information about the increased cancer incidence in the community.

## Recommendations

1 FHRS should explain the findings in this health consultation to the community.

2. Because a health study is not able to answer the community's question about the cause of the increased cancer incidence, FHRS does not recommend a health study of the community be performed. However, FHRS should continue to gather and address community health concerns.

3 Because of the latency of some cancers, FHRS epidemiologists should re-examine the FCDS data periodically to determine if new incidences of cancer have appeared in the Wingate Road community.

Health Activities Recommendation Panel (HARP) Recommendations

The Comprehensive Environmental Response Compensation and Liability Act of 1980, as amended, requires ATSDR to perform public actions needed at hazardous waste sites. To determine if public health actions are needed, ATSDR's Health Activities Recommendation Panel (HARP) has evaluated the data and information developed in the Wingate Road Municipal Incinerator and Landfill Health Consultation.

The Panel has determined that the following actions are needed at this site:

1 FHRS should develop a public education program to help community residents understand the findings in this health consultation and to enable them to bring this information to the attention of their health care providers.

2. FHRS should work with residents to identify health care providers who serve community members. FHRS should provide local physicians and other health care professionals with the cancer incidence information presented in this health consultation.

Public Health Action Plan

1. FHRS will explain the findings in this health consultation to the community residents and enable them to bring this information to the attention of their health care providers.

2. FHRS will work with residents to identify health care providers who serve community members, and provide local physicians and other health care professionals with the cancer incidence information presented in this health consultation.

If clarification is necessary, please call Carolyn Voyles in FHRS' Environmental Toxicology Section at (904) 488-3385. When indicated by public health needs, and as resources permit, FHRS will evaluate additional, relevant data or respond to additional requests.

## CERTIFICATION

This Wingate Road Municipal Incinerator and Landfill site Health Consultation was prepared by the Florida Department of Health and Rehabilitative Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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Superfund Site Assessment Branch (SSAB)
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

Richard E. Gillig, M.C.P.
Chief, SPS, SSAB, DHAC, ATSDR

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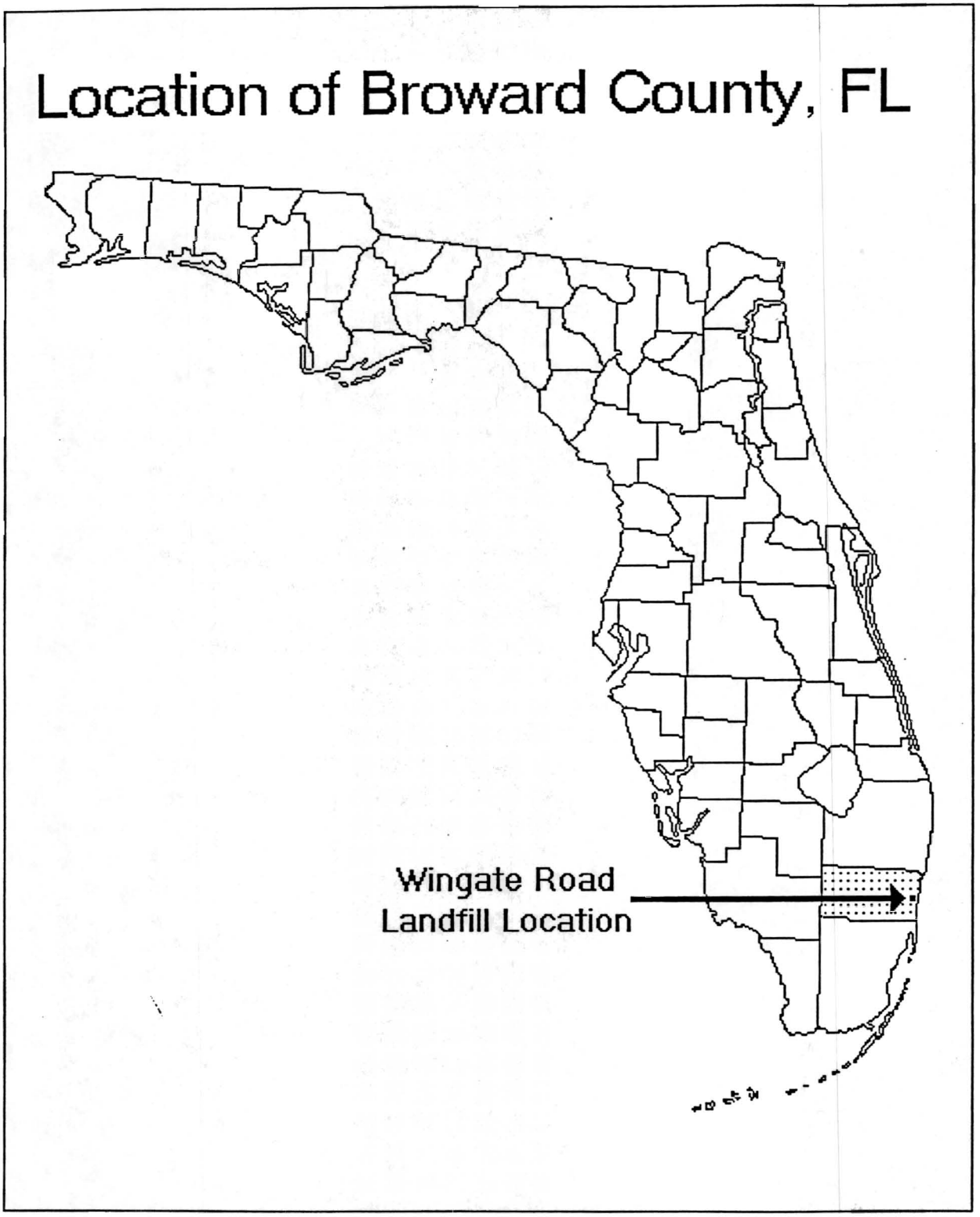



**Figure 1**. Location of Wingate Road Incinerator and Landfill in Broward County, FL.

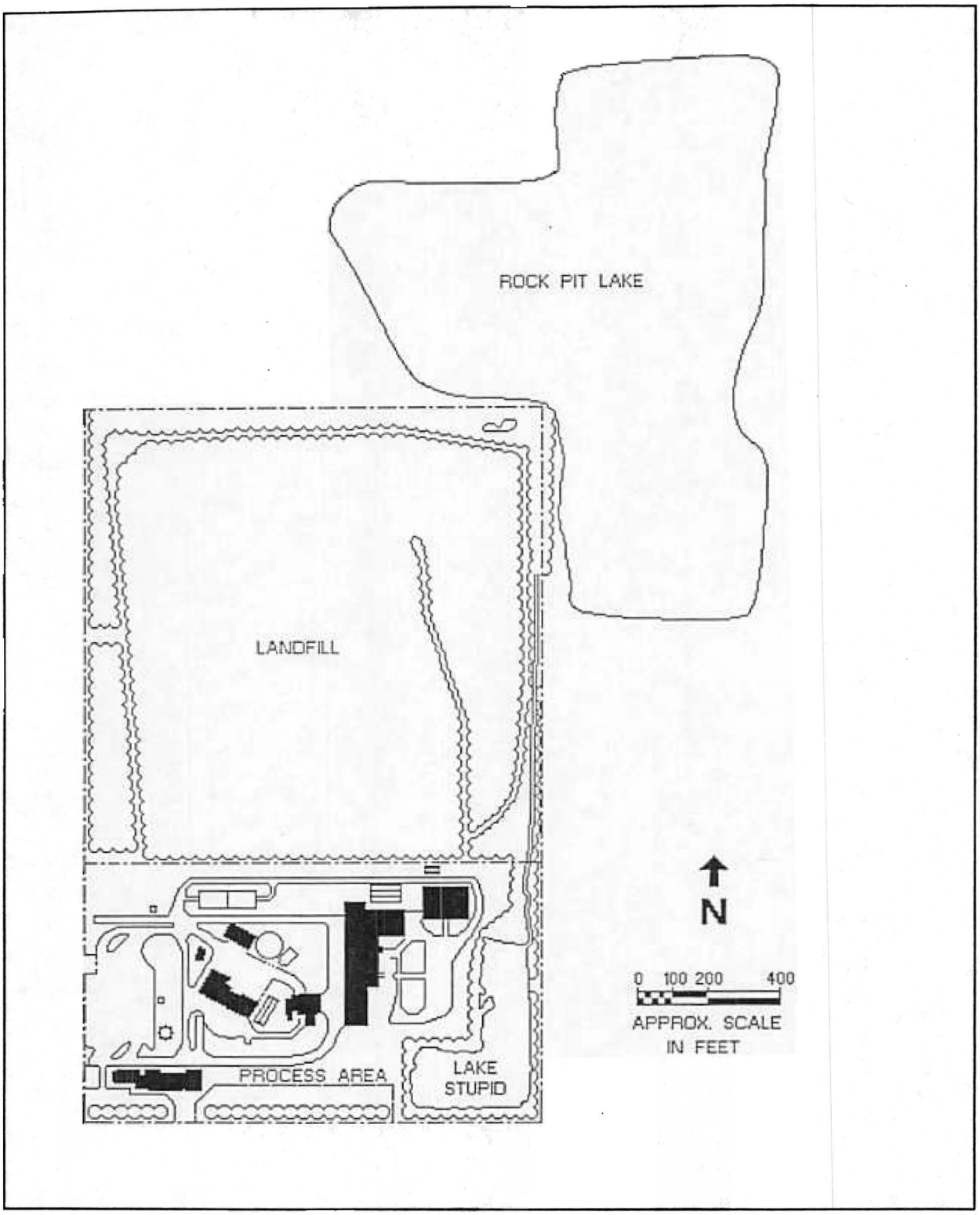
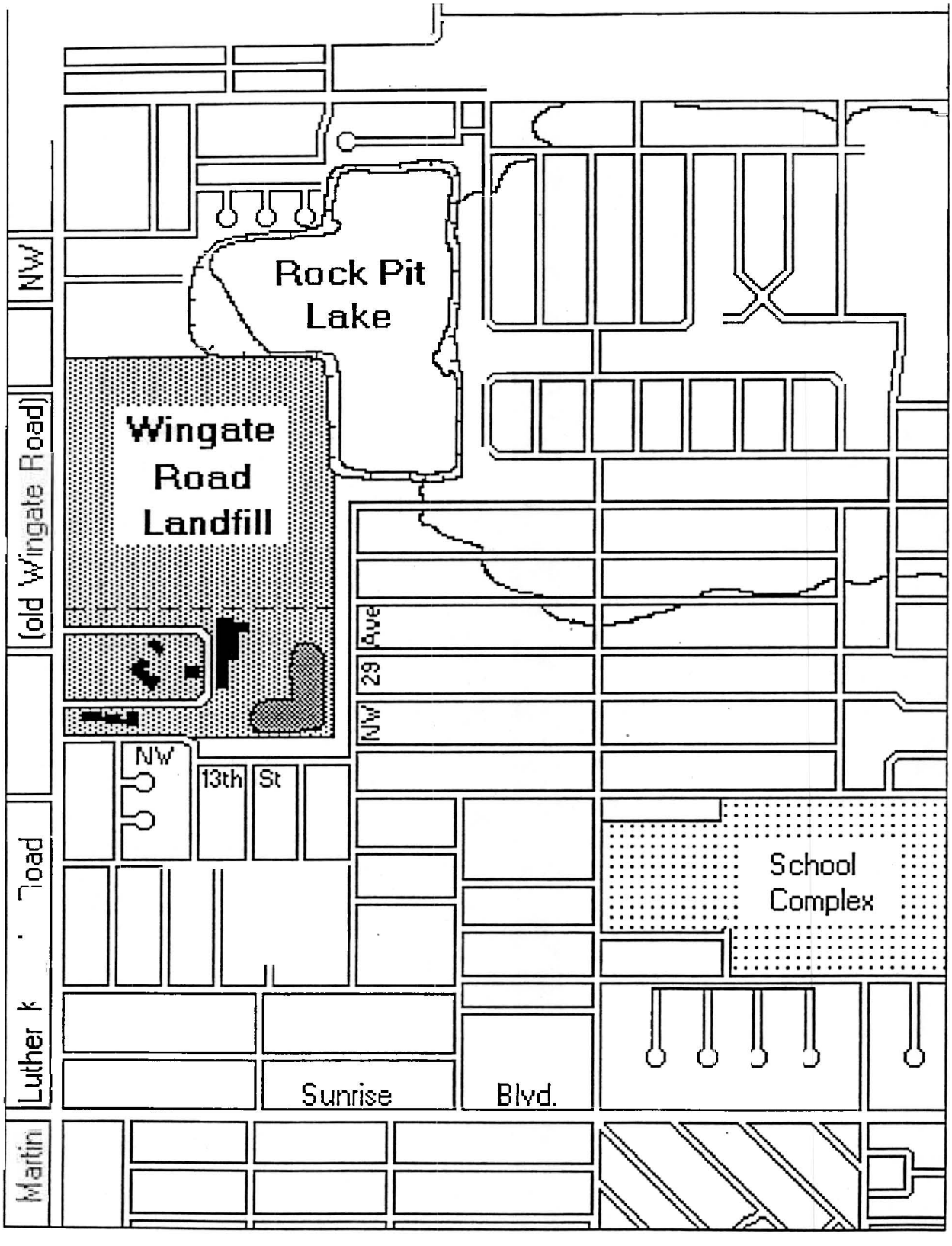



**Figure 2.** Site Map of Wingate Road Landfill (adapted from the BRA).


Rock Pit
Lake
Wingate
Road
Landfill
NW
(old Wingate Road)
Luther K
Road
Martin
NW
13th
St
29
Ave
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School
Complex
Sunrise
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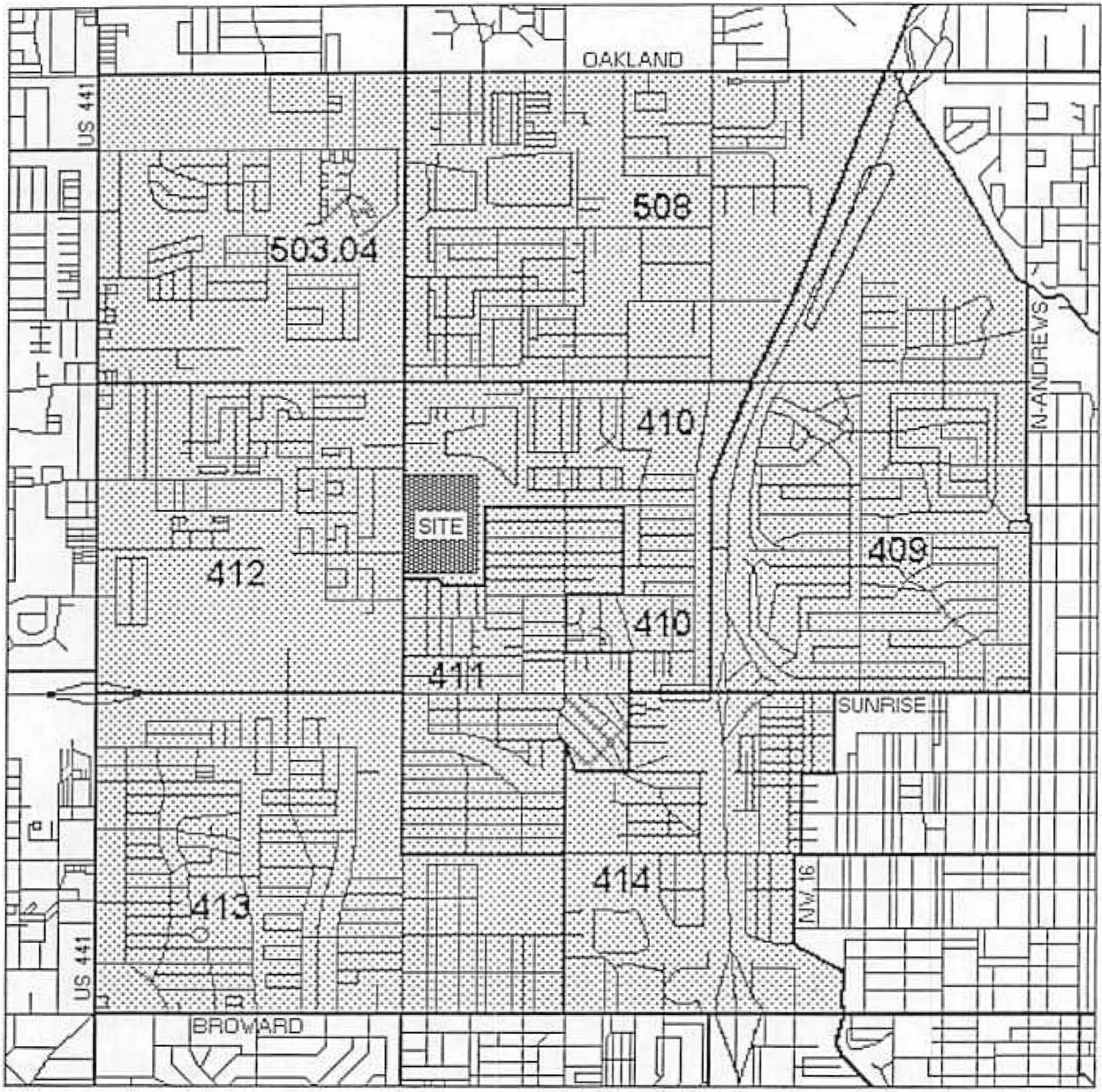


**Figure 4**. Census Tracts Selected for FCDS Analysis (adapted from Bureau of Census files).

## Table 1. Wingate Road Incinerator and Landfill Known or Suspected Carcinogens

| Contaminant | Target Organs |
|---|---|
| Aldrin | Liver |
| Arsenic (Inorganic) | Skin (basal, squamous), Lung, Bladder, Kidney, Liver, Colon |
| Benzo(a)Pyrene | Stomach, Esophagus, Larynx, Nasal, Trachea, Pharynx |
| Benzo(b)Fluoranthene | Lung, Thorax, Liver |
| Benz(a)Anthracene | Pulmonary, Liver, Stomach |
| Beryllium | Lung |
| Bis(Chloroethyl)Ether | Liver |
| Bis(2-Ethylhexyl)Phthalate | Liver, Pancreas |
| Butyl Benzyl Phthalate | Mononuclear Cell Leukemia, Lymphoma |
| Cadmium | Lung |
| Chlordane (γ) | Liver |
| Chromium(VI) | Lung |
| Chrysene | Lung, Liver |
| Dibenz(a,h)Anthracene | Pulmonary, Breast, Hemangiosarcoma |
| 1,4-Dichlorobenzene | Kidney, Liver |
| 4,4'-DDD | Lung, Liver, Thyroid |
| 4,4'-DDE | Liver, Thyroid |
| 4,4'-DDT | Liver |
| Dieldrin | Liver |
| Dioxin | Liver, Respiratory, Biliary, Sebaceous Glands, Lymphoma, Nasal, Stomach, Soft Tissue |
| Heptachlor | Liver |
| Heptachlor Epoxide | Liver |
| Hexachlorobenzene | Liver, Thyroid, Kidney, Hemangioendothelium |
| Indeno(1,2,3-c,d)Pyrene | Lung, Thorax |
| Lead | Kidney |
| Lindane (γ-BHC) | Liver |
| Methylene Chloride | Liver, Alveolus, Bronchus, Salivary Gland, Monocytic Leukemia |
| 4-Methylphenol | – Unknown – |
| Nickel | Lung, Nasal |
| PCB (1254) | Liver, Biliary |
| Toxaphene | Liver, Thyroid |

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

Date: August 15, 1995

Carolyn E. Voyles
Environmental Toxicology Section

From: Ningyi Huang NH
Environmental Epidemiology

Subject: Cancer incidence around Wingate Road Landfill

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In response to a request from your office, we examined the incidence rates and standardized incidence ratios(SIRs) of selected types of cancers in residents around Wingate Road Site. I have enclosed Appendix I which explains the background information on these analyses. Appendices II to V display the SIRs of four race-gender groups of selected types of cancers. Appendices VI to IX show age specific incidence rates of selected cancer types. Although several SIRs of cancers are suspiciously high in the area, we can not link these high ratios to the site at this moment since exposure information is not available in our data. Further studies are necessary to distinguish the relationship between hazard exposure and cancer incidence in this area.

Enclosures

Raul Quimbo, HSEE
Sharon Heber, HSEE

## Appendix

# Background information on the analysis of Wingate Road Landfill Site cancer cluster

1) The cancer information is from FCDS commercial file from 1981 to 1990.

2) Study group is cases from census tract 409, 410, 411, 412, 413, 414, 503.04 and 508 between 1981 and 1990.

3) Reference group is all cases in the state with census tract code between 1981 and 1990.

4) The population information is from census report for census years 1980 and 1990.

Because detailed race and gender information are not available for some census tracts in 1980's census, we assumed that the age distribution of these race-gender groups is the same as the age distribution of the gender group in that census tract.

Since there is no population information available for census tracts between the two census years, we assume that average annual population for the ten year period is 1980's population plus 1990's population divided by two [average annual population=(1980's populatio+1990's population)/2].

5) The Standardized Incidence Ratio (SIR) is used in this analysis. The SIR is calculated as the ratio of the observed number of cause-specific cases in the study area to the expected number, multiplied by 100. The expected number is based on the site-specific incidence rate in the reference group, stratified by race (white or non-white), gender (male or female) and age (five-year group). The expected number is computed by multiplying the rates for each race-gender grouping and age-specific categories in the reference group by the corresponding population categories in study area. The resulting quantities are summed over the stratifying factors to obtain the expected number. Ninety-five percent confidence interval (95% CI) for SIR is calculated under the assumption that the observed cancer incidence followed a Poisson distribution. A SIR is designated as statistically significant if the 95% CI does not include the null value of 100.

6) The site category of cancer is based on CDC standard (category table is enclosed).

WHITE MALE STARDARDIZED INCIDENCE RATIOS FOR
CANCERS IN EIGHT CENSUS TRACTS AROUND WINGATE ROAD SITE, 1981--1990
(Reference group is Florida State white male)

| Primary site of cancer | Obs | SIR | 95% CI of SIR |
|---|---|---|---|
| All Sites | | 160 | 143 - 177 |
| Salivary Glands | | 612 | 159 - 1360 |
| Nasopharynx | | 336 | 0 - 1319 |
| Tonsil | | 287 | 27 - 822 |
| Oropharynx | | 0 | 0 - 419 |
| Hypopharynx | | 124 | 0 - 487 |
| Other Buccal Cavity & Pharynx | | 249 | 0 - 975 |
| Digestive System | | | |
| Esophagus | | 248 | 89 - 487 |
| Stomach | | 190 | 86 - 335 |
| Colon Excluding Rectum | | | |
| Cecum | | 99 | 26 - 221 |
| Appendix | | 0 | 0 - 788 |
| Ascending Colon | | 191 | 76 - 359 |
| Hepatic Flexure | | 108 | 0 - 423 |
| Transverse Colon | | 205 | 53 - 455 |
| Splenic Flexure | | 227 | 21 - 649 |
| Descending Colon | | 296 | 107 - 580 |
| Sigmoid Colon | | 105 | 48 - 185 |
| Large Intestine, NOS | | 228 | 82 - 447 |
| Liver | | 283 | 53 - 693 |
| Intrahepatic Bile Duct | | 0 | 0 - 492 |
| Gallbladder | | 279 | 0 - 1094 |
| Other Biliary | | 0 | 0 - 158 |
| Pancreas | | 224 | 107 - 385 |
| Respiratory System | | | |
| Nasal Cavity, Ear & Sinuses | | 0 | 0 - 211 |
| Larynx | | 296 | 161 - 472 |
| Lung & Bronchus | | 153 | 117 - 193 |
| Pleura | | 0 | 0 - 156 |
| Trachea, Mediastinum & Other Respiratory Organs | | 0 | 0 - 527 |
| Soft Tissue (including Heart) | | 0 | 0 - 79 |
| Prostate | | 151 | 118 - 188 |
| Urinary System | | | |
| Bladder | | 141 | 91 - 201 |
| Kidney & Renal Pelvis | | 118 | 43 - 232 |
| Eye & Orbit | | 1023 | 266 - 2271 |
| Thyroid | | 152 | 0 - 598 |
| Lymphomas | | | |
| HodgKins Disease | | | |
| Nodal | | 0 | 0 - 113 |
| Extranodal | | 0 | 0 - 4196 |
| Non-HodgKins Lymphoma | | | |
| Nodal | | 215 | 97 - 378 |
| Extranodal | | 0 | 0 - 59 |
| Multiple Myeloma | | 205 | 53 - 455 |
| Monocytic | | | |
| Acute Monocytic | | 0 | 0 - 1855 |
| Chronic Monocytic | | 0 | 0 - 10537 |
| Other Monocytic | | 0 | 0 - 6042 |

The analyses were based on FCDS Commer8190.dat data file
Obs: Observed cases.
SIR: Standardized Incidence Rate.

Appendix III

WHITE FEMALE STARDARDIZED INCIDENCE RATIOS FOR CANCERS IN EIGHT CENSUS TRACTS AROUND WINGATE ROAD SITE, 1981--1990
(Reference group is Florida State white female)

| Primary site of cancer | Obs | SIR | 95% CI of SIR |
|---|---|---|---|
| All Sites | | 156 | 139 - 174 |
| Salivary Glands | | 242 | 0 - 950 |
| Nasopharynx | | 0 | 0 - 499 |
| Tonsil | | 0 | 0 - 232 |
| Oropharynx | | 0 | 0 - 908 |
| Hypopharynx | | 0 | 0 - 278 |
| Other Buccal Cavity & Pharynx | | 0 | 0 - 464 |
| Digestive System | | | |
| Esophagus | | 86 | 0 - 338 |
| Stomach | | 192 | 69 - 376 |
| Colon Excluding Rectum | | | |
| Cecum | | 175 | 80 - 309 |
| Appendix | | 0 | 0 - 724 |
| Ascending Colon | | 213 | 97 - 375 |
| Hepatic Flexure | | 293 | 55 - 718 |
| Transverse Colon | | 197 | 62 - 407 |
| Splenic Flexure | | 122 | 0 - 478 |
| Descending Colon | | 160 | 30 - 391 |
| Sigmoid Colon | | 125 | 60 - 214 |
| Large Intestine, NOS | | 238 | 86 - 467 |
| Liver | | 154 | 0 - 604 |
| Intrahepatic Bile Duct | | 0 | 0 - 582 |
| Gallbladder | | 0 | 0 - 116 |
| Other Biliary | | 154 | 0 - 605 |
| Pancreas | | 222 | 110 - 373 |
| Respiratory System | | | |
| Nasal Cavity, Ear & Sinuses | | 0 | 0 - 291 |
| Larynx | | 86 | 0 - 337 |
| Lung & Bronchus | | 138 | 96 - 187 |
| Pleura | | 0 | 0 - 648 |
| Trachea, Mediastinum & Other Respiratory Organs | | 0 | 0 - 1065 |
| Soft Tissue (including Heart) | | 109 | 0 - 428 |
| Breast | | 163 | 131 - 198 |
| Urinary System | | | |
| Bladder | | 195 | 100 - 320 |
| Kidney & Renal Pelvis | | 277 | 126 - 487 |
| Eye & Orbit | | 0 | 0 - 290 |
| Thyroid | | 65 | 0 - 254 |
| Lymphomas | | | |
| HodgKins Disease | | | |
| Nodal | | 140 | 0 - 548 |
| Extranodal | | 0 | 0 - 2185 |
| Non-HodgKins Lymphoma | | | |
| Nodal | | 165 | 65 - 310 |
| Extranodal | | 57 | 0 - 223 |
| Multiple Myeloma | | 262 | 83 - 542 |
| Monocytic | | | |
| Acute Monocytic | | 0 | 0 - 2169 |
| Chronic Monocytic | | 0 | 0 - 18824 |
| Other Monocytic | | 0 | 0 - 18950 |

The analyses were based on FCDS Commer8190.dat data file
Obs: Observed cases.
SIR: Standardized Incidence Rate.

NONWHITE MALE STARDARDIZED INCIDENCE RATIOS FOR
CANCERS IN EIGHT CENSUS TRACTS AROUND WINGATE ROAD SITE, 1981--1990
(Reference group is Florida State nonwhite male)

| Primary site of cancer | Obs | SIR | 95% CI of SIR |
|---|---|---|---|
| All Sites | | 112 | 102 -- 123 |
| Salivary Glands | | 0 | 0 -- 83 |
| Nasopharynx | | 61 | 0 -- 241 |
| Tonsil | | 169 | 61 -- 332 |
| Oropharynx | | 84 | 0 -- 330 |
| Hypopharynx | | 152 | 55 -- 298 |
| Other Buccal Cavity & Pharynx | | 0 | 0 -- 60 |
| Digestive System | | | |
| Esophagus | | 107 | 62 -- 164 |
| Stomach | | 164 | 106 -- 235 |
| Colon Excluding Rectum | | | |
| Cecum | | 97 | 25 -- 215 |
| Appendix | | 0 | 0 -- 387 |
| Ascending Colon | | 85 | 16 -- 207 |
| Hepatic Flexure | | 164 | 15 -- 470 |
| Transverse Colon | | 76 | 7 -- 217 |
| Splenic Flexure | | 0 | 0 -- 58 |
| Descending Colon | | 76 | 7 -- 219 |
| Sigmoid Colon | | 131 | 62 -- 224 |
| Large Intestine, NOS | | 0 | 0 -- 26 |
| Liver | | 64 | 12 -- 156 |
| Intrahepatic Bile Duct | | 0 | 0 -- 288 |
| Gallbladder | | 0 | 0 -- 184 |
| Other Biliary | | 130 | 0 -- 509 |
| Pancreas | | 120 | 62 -- 197 |
| Respiratory System | | | |
| Nasal Cavity, Ear & Sinuses | | 0 | 0 -- 71 |
| Larynx | | 155 | 92 -- 235 |
| Lung & Bronchus | | 97 | 79 -- 118 |
| Pleura | | 253 | 0 -- 994 |
| Trachea, Mediastinum & Other Respiratory Organs | | 0 | 0 -- 161 |
| Soft Tissue (including Heart) | | 56 | 11 -- 137 |
| Prostate | | 132 | 108 -- 158 |
| Urinary System | | | |
| Bladder | | 84 | 36 -- 152 |
| Kidney & Renal Pelvis | | 188 | 105 -- 295 |
| Eye & Orbit | | 334 | 31 -- 957 |
| Thyroid | | 89 | 0 -- 348 |
| Lymphomas | | | |
| HodgKins Disease | | | |
| Nodal | | 0 | 0 -- 36 |
| Extranodal | | 0 | 0 -- 1376 |
| Non-HodgKins Lymphoma | | | |
| Nodal | | 130 | 56 -- 236 |
| Extranodal | | 110 | 21 -- 269 |
| Multiple Myeloma | | 188 | 102 -- 300 |
| Monocytic | | | |
| Acute Monocytic | | 1442 | 1 -- 5651 |
| Chronic Monocytic | | 0 | 0 -- 4666 |
| Other Monocytic | | . | . -- . |

The analyses were based on FCDS Commer8190.dat data file.
Obs: Observed cases.
SIR: Standardized Incidence Rate.

NONWHITE FEMALE STARDARDIZED INCIDENCE RATIOS FOR
CANCERS IN EIGHT CENSUS TRACTS AROUND WINGATE ROAD SITE, 1981--1990
(Reference group is Florida State nonwhite female)

| Primary site of cancer | Obs | SIR | 95% CI of SIR |
|---|---|---|---|
| All Sites | | 110 | 100-- 121 |
| Salivary Glands | | 121 | 0 -- 476 |
| Nasopharynx | | 0 | 0 -- 164 |
| Tonsil | | 74 | 0 -- 291 |
| Oropharynx | | 199 | 0 -- 780 |
| Hypopharynx | | 0 | 0 -- 126 |
| Other Buccal Cavity & Pharynx | | 0 | 0 -- 178 |
| Digestive System | | | |
| Esophagus | | 33 | 3 -- 95 |
| Stomach | | 116 | 58 -- 195 |
| Colon Excluding Rectum | | | |
| Cecum | | 47 | 9 -- 116 |
| Appendix | | 0 | 0 -- 282 |
| Ascending Colon | | 68 | 13 -- 166 |
| Hepatic Flexure | | 0 | 0 -- 81 |
| Transverse Colon | | 204 | 81 -- 383 |
| Splenic Flexure | | 240 | 45 -- 588 |
| Descending Colon | | 59 | 6 -- 169 |
| Sigmoid Colon | | 39 | 10 -- 86 |
| Large Intestine, NOS | | 78 | 15 -- 191 |
| Liver | | 0 | 0 -- 45 |
| Intrahepatic Bile Duct | | 0 | 0 -- 408 |
| Gallbladder | | 0 | 0 -- 64 |
| Other Biliary | | 235 | 22 -- 674 |
| Pancreas | | 91 | 41 -- 160 |
| Respiratory System | | | |
| Nasal Cavity, Ear & Sinuses | | 138 | 0 -- 542 |
| Larynx | | 43 | 0 -- 167 |
| Lung & Bronchus | | 78 | 51 -- 111 |
| Pleura | | 0 | 0 -- 4970 |
| Trachea, Mediastinum & Other Respiratory Organs | | 0 | 0 -- 1390 |
| Soft Tissue (including Heart) | | 0 | 0 -- 23 |
| Breast | | 124 | 103 -- 146 |
| Urinary System | | | |
| Bladder | | 72 | 19 -- 160 |
| Kidney & Renal Pelvis | | 110 | 44 -- 207 |
| Eye & Orbit | | 0 | 0 -- 306 |
| Thyroid | | 171 | 68 -- 322 |
| Lymphomas | | | |
| HodgKins Disease | | | |
| Nodal | | 251 | 79 -- 520 |
| Extranodal | | 0 | 0 -- 1614 |
| Non-HodgKins Lymphoma | | | |
| Nodal | | 204 | 101 -- 342 |
| Extranodal | | 51 | 0 -- 201 |
| Multiple Myeloma | | 123 | 56 -- 217 |
| Monocytic | | | |
| Acute Monocytic | | 0 | 0 -- 1219 |
| Chronic Monocytic | | | . -- . |
| Other Monocytic | | | . -- . |

The analyses were based on FCDS Commer8190.dat data file
Obs: Observed cases.
SIR: Standardized Incidence Rate.

APPENDIX VI

| AGE GROUP | CANCER--ALL SITES | | PANCREAS CANCER | | PROSTATE CANCER | | KIDNEY CANCER | | EYE CANCER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WINGATE | STATE | WINGATE | STATE | WINGATE | STATE | WINGATE | STATE | WINGATE | STATE |
| 0--4 | 0.00 | 19.23 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 1.69 | 0.00 | 1.22 |
| 5--9 | 0.00 | 10.92 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.39 | 0.00 | 0.25 |
| 10--14 | 0.00 | 10.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 |
| 15--19 | 0.00 | 16.29 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.09 | 0.00 | 0.12 |
| 20--24 | 0.00 | 24.64 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 |
| 25--34 | 82.99 | 50.43 | 0.00 | 0.17 | 0.00 | 0.03 | 0.00 | 0.54 | 0.00 | 0.21 |
| 35--44 | 230.64 | 99.07 | 0.00 | 1.35 | 0.00 | 0.42 | 0.00 | 3.87 | 65.90 | 0.45 |
| 45--54 | 660.87 | 298.36 | 0.00 | 7.13 | 34.78 | 12.35 | 0.00 | 12.08 | 0.00 | 1.08 |
| 55--64 | 1290.32 | 816.59 | 103.23 | 17.99 | 129.03 | 108.54 | 0.00 | 25.36 | 0.00 | 1.63 |
| 65--74 | 2850.63 | 1734.93 | 91.22 | 38.62 | 706.96 | 425.95 | 114.03 | 43.50 | 45.61 | 3.03 |
| >75 | 3831.78 | 2559.26 | 62.31 | 56.57 | 1059.19 | 743.53 | 31.15 | 51.73 | 0.00 | 3.73 |

# AGE SPECIFIC INCIDENCE RATES OF SELECTED CANCER TYPES AMONG WHITE FEMALE AROUND WINGATE LANDFILL SITE AND IN THE STATE OF FLORIDA

| AGE GROUP | CANCER -- ALL SITES | | PANCREAS CANCER | | BREAST CANCER | | KINDEY CANCER | |
|---|---|---|---|---|---|---|---|---|
| | WINGATE | STATE | WINGATE | | | | | |
| 0--4 | 0.0 | 15.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 |
| 5--9 | 162.6 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| 10--14 | 83.7 | 9.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| 15--19 | 0.0 | 17.7 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.1 |
| 20--24 | 39.2 | 56.1 | 0.0 | 0.1 | 0.0 | 1.2 | 0.0 | 0.2 |
| 25--34 | 285.7 | 130.5 | 0.0 | 0.3 | 129.9 | 17.7 | 0.0 | 0.5 |
| 35--44 | 606.1 | 222.2 | 0.0 | 0.7 | 213.9 | 80.5 | 0.0 | 1.7 |
| 45--54 | 812.5 | 424.7 | 0.0 | 4.7 | 250.0 | 167.0 | 31.3 | 5.1 |
| 55--64 | 915.7 | 729.6 | 0.0 | 12.3 | 333.0 | 230.3 | 0.0 | 11.6 |
| 65--74 | 2005.2 | 1180.8 | 34.9 | 28.9 | 558.0 | 330.1 | 104.6 | 20.2 |
| >75 | 1941.6 | 1417.3 | 169.7 | 47.4 | 471.3 | 341.1 | 37.7 | 23.8 |

## AGE SPECIFIC INCIDENCE RATES OF SELECTED CANCER TYPES AMONG NONWHITE MALE AROUND WINGATE LANDFILL SITE AND IN THE STATE OF FLORIDA

| | | | | | | | | EYE CANCER | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | STATE | WINGATE | |
| 0--4 | 15.41 | 13.06 | 0.00 | 0.00 | [illegible] | | | [illegible] | [illegible] | 1.34 |
| 5--9 | 5.09 | 8.40 | 0.00 | 0.00 | [illegible] | | | 0.60 | [illegible] | |
| 10--14 | 4.65 | 6.85 | 0.00 | 0.00 | 0.00 | | | 0.00 | [illegible] | 0.00 |
| 15--19 | 8.77 | 12.82 | 0.00 | 0.00 | [illegible] | | | 0.51 | [illegible] | 0.13 |
| 20--24 | [illegible] | 17.08 | 0.00 | 0.13 | 0.00 | | | 0.63 | [illegible] | 0.00 |
| 25--34 | 31.69 | [illegible] | 0.00 | 0.14 | 0.00 | | | 0.57 | [illegible] | 0.00 |
| 35--44 | 73.90 | 99.58 | | 2.56 | [illegible] | | | 2.56 | [illegible] | 0.21 |
| 45--54 | 457.60 | [illegible] | | 9.55 | 32.30 | | | 10.17 | [illegible] | 0.00 |
| 55--64 | 1011.05 | [illegible] | [illegible]98 | 25.52 | [illegible] | | | [illegible] | [illegible] | 1.25 |
| 65--74 | | [illegible] | 61.44 | 47.11 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0.63 |
| >75 | | 2060.12 | 75.33 | 56.99 | [illegible] | 812.75 | 37.66 | 30.73 | 0.00 | 0.99 |

## AGE SPECIFIC INCIDENCE RATES OF SELECTED CANCER TYPES
## AMONG NONWHITE FEMALE AROUND WINGATE LANDFILL SITE AND IN THE STATE OF FLORIDA

| | WINGATE | STATE | [illegible] CANCER WINGATE | [illegible] STATE | [illegible] WINGATE | [illegible] STATE | KIDNEY CANCER WINGATE | KIDNEY CANCER STATE |
|---|---|---|---|---|---|---|---|---|
| 0--4 | 26.07 | 13.32 | 0.00 | 0.00 | 0.00 | 0.11 | 5.21 | 2.13 |
| 5--9 | 0.00 | 6.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 |
| 10--14 | 4.78 | 8.67 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.39 |
| 15--19 | 21.81 | 12.20 | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.13 |
| | 26.47 | 33.34 | 0.00 | 0.00 | 0.00 | 1.54 | 0.00 | 0.12 |
| | 105.49 | 98.60 | 0.00 | 0.19 | 26.37 | 18.18 | 0.00 | 0.88 |
| | 217.96 | 192.91 | 0.00 | 1.60 | 91.40 | 63.89 | 7.03 | 2.58 |
| | 427.74 | 366.20 | 4.50 | 5.84 | 171.09 | 122.46 | 0.00 | 4.93 |
| | 730.92 | 642.33 | 7.17 | 18.81 | 179.15 | | 14.33 | 10.56 |
| 65--74 | 852.85 | 960.18 | 48.05 | 38.30 | 240.24 | 217.94 | 12.01 | 17.64 |
| >75 | 1341.46 | 1038.14 | 73.17 | 55.98 | 170.73 | 213.66 | 24.39 | 17.11 |