PUBLIC HEALTH ASSESSMENT

YOUNG REFINING CORPORATION

DOUGLASVILLE, DOUGLAS COUNTY, GEORGIA

EPA FACILITY ID: GAD051011344

Prepared by:

Petition Response Section
Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Foreword

To be inserted by ATSDR

Table of Contents

Foreword i

Table of Contents ii

List of Abbreviations iv

Summary 1

Purpose and Health Issues 2

Background 2
- A. Site Description and History 2
- B. Demographics and Land Use 4
- C. Site Visits 4
- D. Stored Wastes 4

Community Health Concerns 4

Discussion 5
- A. Methods 5
- B. Extent of Contamination and Potential Human Exposure Pathways 6
  - 1. Groundwater 6
    - Hydrogeology 6
    - On -Site Groundwater Use and Evaluation 6
    - Off-Site Groundwater Use and Evaluation 8
    - Ground Water Exposure Pathways 9
  - 2. Soil 9
    - Evaluation of Soil Data 9
    - Soil Exposure Pathways 10
  - 3. Surface Water and Sediment 10
    - Surface Water Features 10
    - Evaluation of On-Site Surface Water 10
    - Evaluation of On-Site Sediment 11
    - Evaluation of Off-Site Surface Water Data 12
    - Evaluation of Off-Site Sediment Data 12
    - Evaluation of On-Site and Off-Site Surface Water, Sediment and NPDES 13
  - 4. Air 13

C. Public Health Implications 14
D. Health-Outcome Data Evaluation 16
E. Child Health Considerations 17

Community Health Concerns Evaluation 18

Conclusions 21

Recommendations 21

Public Health Action Plan 22

Preparers of Report 23

References 25

References Consulted (but not cited) 34

Appendix A 36
Figures 37

Appendix B 42
Tables 43

Appendix C 56
Glossary 57
ATSDR Public Health Assessment Methodology 63

Appendix D 65
Response to Public Comments 66

List of Abbreviations

APB	Air Protection Branch
API	American Petroleum Institute
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	Benzene, toluene, ethylbenzene, and xylenes
COC	Contaminant of concern
CREG	Cancer risk evaluation guide
CV	Comparison value
EMEG	Environmental media evaluation guide
EPA	Environmental Protection Agency
GA EPD	Georgia Department of Natural Resources, Environmental Protection Division
HWMB	Hazardous Waste Management Branch
LTHA	Lifetime health advisory
MCL	Maximum contaminant level
MRL	Minimal risk level
MW	Monitoring well
mg/kg/day	milligrams per kilogram of body weight per day
NPDES	National pollutant discharge elimination system
NR	Not reported
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RfD	Reference dose
RFI	RCRA facility investigation
RMEG	Reference dose media evaluation guide
SVOC	Semi-volatile organic compound
SWMU	Solid waste management unit
TCE	Trichloroethylene
TEQ	Toxic equivalence
TRI	Toxic release inventory
USGS	United States Geological Survey
VOC	Volatile organic compound
WPB	Water Protection Branch

Summary

The Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by a community activist to prepare a public health assessment to address community concerns related to the Young Refining Corporation site (the site) in Douglasville, Georgia. Since 1971, Young Refining has been refining asphaltic crude; the facility also re-refined waste oil and produced JP-4 jet fuel in the past (2, 12). Before 1971, the site was reportedly used for other activities; however, not all of them are well documented. In 1955, a business known as Cracker Asphalt was established on the site. While little is known about site operations between 1955 and 1971, it is believed that Cracker Asphalt disposed of waste sludges by on-site land application. Young Refining is still an active company producing several thousand gallons per day of oil refining products.

The petitioner and community members have identified a number of concerns. Residents are concerned about (1) possible leaking tanks; (2) piles of scrap metal and debris all over the site; (3) possible waste buried on or behind the site, including drums containing toxic and radiological wastes; (4) potential excess cancers and respiratory illnesses in the area; (5) possible effects on children who live, play, or attend schools near the site, including area youth who fish in the "lake" adjacent to Young Refining; (James McNamara, principal environmental engineer, Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999) possible effects associated with asphalt-like materials and discolored water in Cracker Creek along Huey Road; (6) possible effects associated with burning hazardous materials and releasing hazardous materials into the Cracker Creek; (7) respiratory and eye irritation, headaches, and nausea related to noxious odors, fumes, and black dust emanating from the site; and (8) possible impact of using Cracker Creek waters to irrigate backyard gardens.

The site is classified as an indeterminate public health hazard. This classification is based on the following data gaps: (1) data sets for off-site groundwater, surface water, and sediment are limited and do not provide enough information to clearly characterize these pathways; (2) air emissions data are not available for past activities.

Available data indicate that groundwater beneath the site contains elevated concentrations of petroleum-related products and solvents. Data also identified contaminants in on-site soil, surface water, and sediment. Georgia Department of Natural Resources, Environmental Protection Division (GA EPD) conducted private well sampling on August 21, 2000. This sampling did not detect site-related contaminants in downgradient private wells.

ATSDR recommends that (1) groundwater characterization activities continue, (2) additional surface water and sediment samples be collected from Cracker Creek, (3) ambient air monitoring for Volatile Organic Compounds (VOCs) and Semi-volatile Organic Compounds (SVOCs), and (4) biota sampling (fish, vegetable gardens).

Purpose and Health Issues

ATSDR was petitioned by a community activist to prepare a public health assessment for the Young Refining Corporation site in Douglasville, Douglas County, Georgia. The petitioner and community members had concerns about the site and site-related contaminants that may have impacted public health.

This public health assessment addresses community concerns by (1) identifying ways in which people may be exposed to site-related contaminants (past, present, or future); (2) evaluating environmental data; (3) determining potential health effects, if any, from exposures to site-related contaminants; and (4) providing recommendations.

A public health assessment was released for public comment on November 12, 1999. Public comments were received and ATSDR's responses to the comments are contained in Appendix D.

Background

A. Site Description and History

The 40-acre Young Refining site is located at 7982 Huey Road, Douglas County, Georgia, approximately 2 miles northeast of Douglasville (Figure 1, Appendix A). The site is bordered to the north and east by cattle-grazing fields owned by the Natural Resources Conservation Service; to the west by Huey Road, Arivec Chemicals, Inc., and Central Oil and Asphalt Corporation; and to the south by railroad tracks that run parallel to Bankhead Highway (U.S.Route 78). Residential areas are west, north, and east of the site; the nearest residence is approximately 75 yards from the site boundary. A fence restricts access to the site. Trees and vegetation are on the north, northeast, and east boundaries of the site (1, 2, 3).

Since 1971, Young Refining has primarily been refining asphaltic crude oil. Before 1971, the site was reportedly used for other activities; however, not all of them are well documented. In 1955, a business known as Cracker Asphalt was established on the site. While little is known about site operations between 1955 and 1971, it is believed that Cracker Asphalt disposed of waste sludges by on-site land application. In 1971, Young Refining Corporation purchased the site.

Young Refining produces paving and roofing asphalt, #2 fuel oil, lubricating and blending stocks, 450 bright stock (heavy #5 oil), and naphtha. Young Refining receives raw crude oil by rail and ships its final product by rail or truck. From approximately 1971 until 1976, Young Refining also handled hazardous liquid waste but ceased these activities in 1976 after receiving an Emergency Order from the GA EPD for improper disposal practices and toxic emissions resulting from burning this waste (1, 2, 4, 5). Before 1993, Young Refining also re-refined waste oil (used in on-site burners) and produced JP-4 jet fuel (2, James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication, 1999).

The facility treated wastewater and process effluent streams through a cascading oil/water separation process that consisted of one oil/water separator and four surface water ponds. Most of the oil/water separation process occurred in the separators. The treated wastewater then flowed through four on-site ponds toward pond 4 (Figure 2, Appendix A). Oil and possibly other facility byproducts were carried over to ponds 1 and 2. At one time, more than 4 inches of oil were reported to cover the surface of pond 1 (2). Discharges from pond 4 were routed to a 200-foot-long ditch that empties into Cracker Creek. Cracker Creek is intermittent and comprises mostly discharge from the site. The creek begins south of the site, on the former Arivec Chemicals, Inc. site (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication, 1999).

Since 1980, the GA EPD Air Protection Branch (APB) has regulated air releases from on-site burners and other process activities. Since 1987, GA EPD has regulated the discharge of treated wastewater from the site through the National Pollutant Discharge Elimination System (NPDES). GA EPD staff perform site inspections and have visited the site in response to community concerns about site operations. GA EPD has collected and analyzed on-site samples primarily from site ponds, NPDES outfall, and off-site samples from downstream of the site.

In June 1993, GA EPD issued an Administrative Order to close the on-site ponds and assess groundwater and soil quality on- and off-site (2, 7). In September 1993, GA EPD conducted a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) and identified 12 on-site solid waste management units (SWMUs) (Figure 2 & 3, Appendix A) (2). In July 1993, GA EPD issued a Consent Order to address air, water quality, and solid waste issues at the site (8).

In 1994, Young Refining began remedial actions at the site. In February 1995, GA EPD approved several supplemental environmental projects from a pollution prevention plan. The separators were removed from process water service and a new oil/water separator was installed to manage process water. In 1996, a closure plan for the ponds was finalized and is currently being implemented. Process wastewater is no longer discharged to pond 1; the wastewater is managed in a tank system before being discharged to the NPDES outfall; and surface drains are no longer used for process water. Waste was removed from pond 3. The other ponds are undergoing bioremediation to reduce contaminant levels. Oil is being captured and pumped back into the process from the surface of pond 2. Stormwater hold and release zones (e.g., using berms) have reduced the migration of oil. Solid waste was removed from several areas. Abandoned tankers were also removed. Groundwater monitoring wells were installed and sampled (6, 9-14). See Table 1, Appendix B for details about operational and regulatory actions at the site. The site is still in operation at this time.

B. Demographics and Land Use

The 1990 U.S. Census estimates that 71,120 people reside in Douglas County (Table 2, Appendix B) (15). Approximately 5,163 individuals live within a 1-mile radius of the site. The population is somewhat transient. Approximately 55 people currently work for Young Refining (11).

Land use is a mix of industrial (light and heavy), commercial, and residential. Approximately 30 residences are located within 1,000 feet of the site (16). An area south of the site is zoned for industrial and commercial uses and several small businesses form a business corridor along U.S. Route 78 (from northeast to southwest of the site). Eastside and Burnett Elementary Schools are about ½ mile south-southeast of the site and Stewart Middle School is almost 1 mile to the west-southwest (1).

C. Site Visits

In June and July 1991, January 1994, October 1996, and June 2000, ATSDR staff visited the site and the community (1, 3, 17). In 1991 and 1994, ATSDR staff and community members discussed site-related health concerns. In 1996, ATSDR inspected the characteristics and accessibility of nearby creeks and spoke to some community members who indicated that area residents avoid Cracker Creek because they believe it is contaminated. The most recent site visit was conducted in October 2003. This limited site visit was conducted to see if any significant changes had occurred in the communities surrounding Young Refining.

D. Stored Wastes and Physical Hazards

Historically, materials have been stored on the site. During site inspections, GA EPD saw debris in different parts of the site. According to GA EPD, current site conditions have improved and are now typical of an industrial setting. In 1993, EPA Region 4 initiated a geophysical survey to investigate the possibility that drums were buried in a trench on site. The results of this survey did not indicate the presence of buried drums (57).

Community Health Concerns

Community members are concerned that activities at the Young Refining site may have impacted the area groundwater, soil, streams, air, and health of the residents (1, 3, 17, 18). ATSDR gathered concerns from the petition letter, through meetings with community members, and through file searches and consultation with GA EPD staff. According to the GA EPD, some concerns about odors date back to the 1970s, and residents have voiced only sporadic concerns in recent years, such as:

- possible leaking tanks;
- piles of scrap metal and other debris all over the site;
- the possibility that waste is buried on or behind the site, including drums containing toxic and radiological wastes;
- the potential for an excess of cancers and respiratory illnesses in the area;
- the possible effects on children who live, play, or attend schools near the site, including area youth who fish in the “lake” adjacent to the site;
- the possible effects associated with asphalt-like materials and discolored water in Cracker Creek along Huey Road;
- the possible effects associated with burning hazardous materials or releasing them into Cracker Creek;
- respiratory and eye irritation, headaches, and nausea potentially related to noxious odors, fumes, and black dust emanating from the site; and
- the possible impact of using Cracker Creek waters to irrigate backyard gardens.

Discussion

To evaluate community concerns and possible public health implications of contamination related to the site, ATSDR reviewed available environmental data for the site and its surroundings. Section A briefly describes ATSDR methodologies, Section B discusses the extent of contamination and potential human exposure pathways associated with the site, Section C discusses public health implications, and Section D focuses on health outcome data evaluation, and Section E discusses child health considerations.

A. Methods

ATSDR uses established methodologies for determining how people may be exposed to site-related contaminants and evaluating what health effects, if any, can be associated with exposures to the contaminant concentrations in the different media (see Appendix C for more details). To make this determination, ATSDR identifies exposure pathways or the ways in which a contaminant may enter a person's body (ingestion, inhalation, or skin contact). If an exposure pathway was or is possible, the contaminant concentrations are evaluated to determine the likelihood of adverse health effects. Potential exposure pathways from groundwater, soil, surface water and sediment, and air are evaluated and summarized in Table 3, Appendix B and discussed under "Extent of Contamination and Potential Human Exposure Pathways."

ATSDR selects contaminants for further investigation based on whether detected concentrations exceed health-based comparison values (CVs), which are conservative screening values with built safety factors to account for uncertainties and sensitive populations (e.g., children or the elderly). Although a concentration equal to or below the relevant CV may be considered safe, a contaminant that exceeds the CV may or may not be considered a health threat. If a contaminant exceeds the CV, ATSDR performs a more detailed exposure analysis for that chemical.

The results of this Petitioned Health Assessment (PHA) are based upon data supplied by Georgia Department of Natural Resources. ATSDR evaluated all available sampling data collected at the site. The validity of analyses and conclusions drawn in this PHA are based on the reliability of the information referenced in reports related to Young Refining. ATSDR believes that the quality of the environmental data available in these documents are insufficient for public health decisions.

B. Extent of Contamination and Potential Human Exposure Pathways

Groundwater

Hydrogeology

The Austell Gneiss Formation is the predominant rock underlying the site and surrounding area. Groundwater is found in the joints and fractures of the bedrock and in the pore spaces in the overlying "residuum." Most of the groundwater in this type of system is typically found in the residual soils, and lesser amounts are found in the fractures of the underlying rocks (19). Soil depth (i.e., the depth of the residuum) varies throughout the area; however, well casing records indicate that soil depths in the residuum range from 11 feet to 87 feet, with an average of 57 feet (2, 20–22).

Groundwater recharge is mostly from the land surface. Water percolates to the water table and moves laterally to discharge areas such as seeps, streams, or lakes. Groundwater flow on the site appears to be toward the north/northwest. However, the direction of groundwater flow through the deeper fractured bedrock is variable and may fluctuate (11, 19).

On-Site Groundwater Use and Data Evaluation

The site obtains its drinking water from the Douglas County Water Authority (2). Other water needs are met from five on-site production wells that draw the water from bedrock at depths ranging from 200 feet to 400 feet. The production wells supply water to the cooling pond and are used for other processes at the site. A sixth production well, about 15 feet south of pond 3, was closed around 1989 (23, 24).

Production Well Data (1987 and 1988)

On October 28, 1987, GA EPD collected water samples from two production wells at the refinery, one near the back of the site and another near the northern boundary of the east side of the site. Samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals (barium, cadmium, chromium, and lead). No contaminants of concern (COCs) were detected (23).

On December 20, 1988, GA EPD collected and analyzed a water sample for VOCs from another on-site production well located about 15 feet south of pond 3. Benzene, methyl isobutyl ketone, toluene, and TCE were detected at concentrations exceeding their respective drinking water comparison values (CVs) (Michael Patton, Deputy Director, GA EPD Water and Wastewater Operations, personal communication, 1999). On-site groundwater is not a drinking water source. Water from the production well was pumped into wastewater ponds to dilute chemical concentrations in the ponds (26, 27).

On-Site Monitoring Well Data (1994-1999)

Young Refining installed 20 monitoring wells to define the nature and possible extent of horizontal groundwater contamination (four wells were installed in 1994, nine in 1997, and seven in 1998). Nineteen of the wells are downgradient of possible contaminant sources; two of these are outside the property line (Figure 4, Appendix A). The last well, located upgradient of the most likely sources of on-site contamination, serves as background. Sampling analysis from 1997 and 1999 did not identify COCs in that well.

On August 29 and 30, 1994, samples were collected from the first four monitoring wells and analyzed for VOCs, SVOCs, pesticides, herbicides, cyanide, sulfide, formaldehyde, fluoride, metals, and dioxins/furans. Pesticides, herbicides, and sulfide were not detected. Concentrations of cyanide, fluoride, and formaldehyde were below CVs in all four wells. Dioxins/furans were detected at trace levels, generally well below CVs. Certain VOCs, SVOCs, and metals exceeded their respective CVs (19). Table 5, Appendix B lists COCs found in this medium (19, 28-32).

On February 6 and 7, 1997, all 13 monitoring wells were sampled. Detectable levels of VOCs, SVOCs, dioxins/furans, and metals were found (33). This round of sampling revealed "free product" (a layer of petroleum product) in monitoring well (MW)-1B and MW-2R. Young

Refining pumped the free product from the two wells and recycled it within its refining process (29). These two wells were not analyzed for chemical constituents. In the other 11 wells, several VOCs, including benzene, toluene, ethylbenzene, and xylenes (BTEX), chlorinated solvents (such as TCE and tetrachloroethylene), SVOCs, and metals were detected above CVs .

On July 29, 1997, 11 monitoring wells were analyzed for VOCs, SVOCs, dioxins/furans, and metals. The two wells that previously identified free product were not sampled. Sampling results were comparable to the February 1997 results (31). On January 21, 1999, 18 monitoring wells (including the seven wells installed in 1998) were sampled for VOCs, SVOCs, dioxins/furans, and metals (the two wells that contained free product were not sampled). Findings were generally consistent with the February 1997 results (32).

No additional monitoring has been conducted since 1999.

Off-Site Groundwater Use and Data Evaluation

The Douglasville water supply system began operating in 1952. No records are available to determine whether the site received water from this system at that time (33). However, records indicate that Douglasville provided water lines to the site between 1974 and 1979 (Michael Patton, Deputy Director, Water and Wastewater Operations, personal communication, 1999).

According to the Douglasville-Douglas County Water and Sewer Authority, public water is available to all Huey Road residences. Records indicate that water near Huey Road and Bankhead Highway was available in 1977 and 1978. Most residences around the site receive water from the Douglasville-Douglas County Water and Sewer Authority, which meets safe drinking water standards (33). Residences on a private road running west off of Huey Road (approximately ¼-mile north of the site) and residences on Pirkle Road (almost ½-mile north of the site) do not have access to public water (25).

Well surveys near the site include a 1993 GA EPD record review and a 1996 well search. The GA EPD record review indicated that virtually all residences within ¼-mile of the site receive public water (2,10). These findings were based on information from the 1990 U.S. Census Bureau and data from the United States Geological Survey (USGS). The 1996 well search was performed as part of the site investigation and supersedes GA EPD's information from 1993. The closest well in the 1996 well search was hydraulically upgradient, approximately ½ to 1 mile southeast of the site (10, 27). This information indicates that private well use in the area is not widespread but is not completely defined. ATSDR identified two private well users on Lazy's Drive (a private drive off Huey Road) and Pirkle Road approximately ¼ mile and ½ mile north of the site. GA EPD sampling activities revealed that residences located on Lazy's Drive actually have Huey Road addresses even though they are not located on Huey Road.

On October 28, 1987, GA EPD collected a private drinking water well sample from a 20-foot-deep well located approximately 1 mile northwest of the site. The sample was analyzed for total metals, VOCs, and SVOCs. No COCs were identified (21,23).

Two off-site monitoring wells (MW-15B and MW-15R) were installed approximately 400 feet downgradient of the site (see Figure 4, Appendix A). In January 1999, samples were collected and analyzed for VOCs, SVOCs, dioxins/furans, and metals. Cis-1,2-dichloroethene was detected at 5 parts per billion (ppb) and 8 ppb, and 1,1,2-trichloroethane was detected at 2 ppb and 4 ppb. Lead was detected at 80 ppb in MW-15R; but not detected in MW-15B. Because no monitoring wells exist to the west or northwest, it is uncertain if contamination has migrated in that direction. Additional samples are needed to better define the extent of chemical migration, especially in northern, northwestern, and northeastern directions (32).

The GA EPD sampled private wells along Huey and Pirkle Road downgradient (north) of Young Refining Corporation on August 21, 2000 for metals, VOCs, SVOCs, pesticides, PCBs, and bacteriological contaminants. No contaminants of concern were identified in any of the private wells (73). No additional private well sampling data were available for evaluation.

Groundwater Exposure Pathways

Inhalation, ingestion, and dermal contact would be the primary exposure pathways associated with on- or off-site groundwater. On-site groundwater data identified COCs at the site. However, on-site groundwater has not been used in the past, nor is it currently used as a drinking water source. Therefore, no past or current completed exposure pathways exist on the site. If the site is developed in the future and groundwater is used as a drinking water source, this pathway should be re-evaluated.

Off-site groundwater data indicate that COCs are not present in private wells sampled along Huey and Pirkle Road downgradient (north and northwest) of Young Refining Corporation. Available data indicate that no current or past exposure to COCs has occurred. Future exposure is unknown because the extent of off-site groundwater contamination has not been determined.

Soil

Evaluation of Soil Data

On July 24, 1985, GA EPD collected and analyzed an on-site soil sample (unspecified depth) near the tanks for naphthalene, dimethyl naphthalene, and metals. No COCs were identified (33).

On October 28, 1987, GA EPD collected and analyzed a composite sample (3 to 6 inches in depth) near the on-site API separator for metals, VOCs, SVOCs, and polychlorinated biphenyls (PCBs). No COCs were identified (21,23).

GA EPD directed Young Refining to clean areas of visibly contaminated soil on-site. Because only two samples were collected at the 22-acre site, this media cannot be fully evaluated. GA EPD estimates that as much as 40% of site soils may have been impacted by petroleum products (especially in storage, process, and loading areas) (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999). As part of site cleanup, soil samples will be collected to ensure that the cleanup goals are met.

Soil Exposure Pathways

Soil is a potential exposure pathway through inhalation, inadvertent ingestion, and dermal contact for workers and trespassers. The soil pathway cannot be fully evaluated because of limited data. The two available on-site samples indicate no COCs; however, site investigators have noted areas of visibly stained soils, and GA EPD ordered the removal of petroleum-contaminated soil on different areas of the site. The soil pathway offsite also cannot be evaluated because of limited data. Stormwater runoff could have carried onsite contaminates offsite, but with limited data, determining whether onsite contaminants had migrated offsite is impossible.

Surface Water and Sediment

Surface Water Features

On-site surface water drains from the south into the four ponds in the northwest corner of the site. In 1987, GA EPD issued Young Refining a permit to discharge treated wastewater and stormwater from pond 4 into the Cracker Creek drainage basin. Cracker Creek starts as a drainage ditch on the Arivec Chemicals property, and runs along the west side of pond 2 before receiving permitted discharge from pond 4 (Figure 4, Appendix A). According to GA EPD, Cracker Creek has historically contained discharge from the site, an estimated 67,000 gallons per day, exclusive of stormwater flow. Young Refining is currently phasing out the use of the four ponds, and process wastewater is no longer discharged to the ponds. Currently, waste from pond 3 is being removed; when it is no longer contaminated, the pond will collect stormwater runoff. The other three ponds are undergoing bioremediation. After pond cleanup is completed, piping from pond 4 to the NPDES outfall will be removed (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999).

Beyond the site, Cracker Creek flows north behind approximately 15 houses on the east side of Huey Road, then flows under Huey Road between two houses north of the intersection of Huey Road and Pirkle Road, then discharges to an unnamed tributary of Cracker Creek near the intersection of Huey Road and Malone Road. The flow of Cracker Creek is intermittent, with a maximum depth of 2 feet. The distance from the site to the unnamed tributary is between 0.5

and 0.75 stream miles. The unnamed tributary enters Gothard's Creek near the Douglas County/Paulding County line after approximately 1.5 miles. Gothard's Creek enters Sweetwater Creek about six miles from the site. Sweetwater Creek Park, approximately 20 stream miles downstream from the site, is a major recreational and fishing area (2, 3, 9) (Figure 5, Appendix A).

Evaluation of On-Site Surface Water

On-Site Ponds

On July 29, 1991, GA EPD collected and analyzed surface water samples from ponds 1 and 2 for VOCs. Benzene and toluene were detected at levels in excess of drinking water CVs (34). During a 1996 study performed in advance of closing the ponds, a contractor for Young Refining analyzed samples from all four ponds for sulfide, cyanide, selected metals, VOCs, and SVOCs. Chromium, lead, mercury, and bis(2-ethylhexyl)phthalate were found in excess of their respective CVs. One of the four samples was also analyzed for cyanide, sulfide, pesticides, herbicides, PCBs, and dioxins; sulfide was detected above the CV for hydrogen sulfide (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999). Table 6, Appendix B presents the contaminants identified as COCs in this medium. However, the CVs used are for drinking water and are therefore not representative of a surface water scenario because people do not drink water from the on-site ponds.

On February 6 and 7, 1997, a Young Refining contractor collected two additional surface water samples, one from an area 75 feet north of the northwestern corner of pond 3, and another from an area 50 feet northwest of the corner of pond 4. Samples were analyzed for VOCs and SVOCs. Both samples had benzene at concentrations exceeding their CVs (30).

Water and Sediment From NPDES Outfall

The Young Refining NPDES permit imposed daily discharge limits and required regular monitoring of a number of physical/biological parameters (biological/chemical oxygen demand, total suspended solids, and pH), as well as oil and grease, total phenols, ammonia, sulfide, chromium, and zinc (36–38). Between 1992 and 1997, Young Refining also monitored for benzene and toluene.

Surface water data indicated levels of benzene, ammonia, and sulfide in excess of their respective CVs. Since March 1993, benzene has been elevated only in one instance (37). Elevated levels of sulfide and ammonia have been attributed to the bacterial breakdown of chemicals in on-site ponds (i.e., the bioremediation of ponds 1 and 2) (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999).

Surface water data analysis from 16 GA EPD samples collected since 1985 revealed manganese, ammonia, benzene, and TCE above their respective CVs (25-27, 34, 35, 39–43). Table 7, Appendix B, presents the COCs identified from the NPDES outfall.

On July 29, 1991 GA EPD collected and analyzed a sediment sample from the NPDES outfall (34) for selected metals, VOCs and SVOCs: no COCs were identified.

Evaluation of On-Site Sediment

On-Site Ponds

On July 24, 1985, a sample of the top layer of sediment from pond 1 was collected and analyzed for metals; no COCs were identified (33). On October 28, 1987, a sediment sample from the bottom of pond 1 was analyzed for metals, VOCs, SVOCs, and PCBs. Chromium and lead were detected above their respective CVs (23). On July 29, 1991, GA EPD collected and analyzed sediment samples from the banks of ponds 1 and 2 for metals, VOCs, and SVOCs. While some metals, BTEX, and two SVOCs were detected, none of the concentrations exceeded the soil CVs (36).

On March 26, 1996, as part of a study conducted prior to pond closure, a Young Refining contractor analyzed three sediment samples from ponds 2, 3, and 4 for metals, VOCs, and SVOCs; no COCs were identified. One sample from pond 2 was also analyzed for cyanide, sulfide, pesticides, herbicides, PCBs, and dioxins; sulfide exceeded its CV (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999). Table 8, Appendix B, lists the COCs identified in this medium.

Evaluation of Off-Site Surface Water Data

On October 3, and November 9, 1988, GA EPD collected water samples near Malone Road, downstream of the confluence of Cracker Creek with an unnamed tributary to Gothard’s Creek (Figure 5, Appendix A). Samples were analyzed for certain physical/biological parameters, selected metals, sulfide, ammonia, VOCs, SVOCs, and pesticides/PCBs (41, 42); no COCs were identified.

On June 14, 1989, GA EPD collected samples from Cracker Creek (downstream of the confluence with the unnamed tributary of Gothard’s Creek) and from the unnamed tributary (upstream from where it is fed by Cracker Creek). The latter location was sampled to assess conditions in the unnamed tributary before receiving water from Cracker Creek. Samples were analyzed for certain physical/biological parameters, ammonia, and selected metals (43); manganese was identified at 1,000 ppb, and exceeded the drinking water CV of 500 ppb.

On February 17, 1993, samples were collected from the unnamed tributary of Gothard's Creek (downstream of Cracker Creek) and at the upgradient site, and analyzed for selected metals, VOCs, and SVOCs; manganese was detected at 300 ppb from the downstream location (26).

In 1998, the Douglasville-Douglas County Water and Sewer Authority assessed Gothard's Creek. Samples were collected between June 29, 1998 and October 10, 1998 from an area near Maroney Mill Road and approximately 1.5 miles downstream of the site, The samples were analyzed for certain physical/biological parameters, zinc, and ammonia; no COCs were identified (Michael Patton, Deputy Director, water and wastewater operations, personal communications, 1999, 44).

Evaluation of Off-Site Sediment Data

GA EPD collected sediment samples on October 3, 1988, November 9, 1988, and June 14, 1989 (27, 41-43). No VOCs, SVOCs, or pesticides/PCBs were detected above CVs. Metals were detected at concentrations typically found in the eastern United States (44). In 1998, thallium was detected in two samples collected from the unnamed tributary (downstream of Cracker Creek) at 120 ppm and 26 ppm, above the soil CV of 5 ppm.

Evaluation of On-site and Off-site Surface Water, Sediment and NPDES Exposure Pathways

Surface water and sediment sampling data from on-site stormwater ponds and from the NPDES outfall indicate elevated levels of some VOCs, metals, ammonia, and sulfide. Exposures to these media would be infrequent and incidental (inadvertent inhalation, ingestion or dermal contact) for workers, trespassers and nearby residents.

Surface water and sediment sampling data from off-site did show elevated levels of thallium and manganese. All residences in located near Young Refinery receive their water from the city of Douglasville. No private well use has been identified in the area. Exposure to metals in the water and sediment cannot be evaluated because of the limited data available.

Air

Inhalation would be the route of exposure for workers trespassers and nearby residents. No on-site or off-site ambient air data are available for review. Therefore, past, present, and future exposure pathways cannot be evaluated. Contaminant data and concentrations of releases are needed to fully characterize this pathway.

Files from EPA, GA EPD, and the site indicate that air emissions were not measured.[1] However, data suggest that (1) the on-site tanks and equipment leaks emit VOCs; (2) the boiler and fireboxes (at the refinery) emit nitrogen oxides (NO_x), sulfur dioxide (SO_2), metals, and products of incomplete combustion; and (3) various processes and vents can release malodorous sulfur compounds (45–48). GA EPD issued an air permit to Young Refining to limit pollutant (e.g., VOCs) emissions (49, 50). Young Refining estimated their annual VOCs releases; but chemical and concentration-specific data are not available (51).

The most comprehensive chemical-specific emissions data for the site are from the toxic release inventory (TRI), an EPA-maintained chemical releases database (54-56). Table 10 summarizes TRI data from 1987 to 1997 (for benzene, cyclohexane, toluene, and xylene isomers). TRI data estimates the amount of reported emissions from the site; information to characterize overall air releases is not provided.

ATSDR reviewed an air toxics assessment that Young Refining submitted to GA EPD. Using an air dispersion model (to estimate how benzene emissions may impact off-site air quality) the assessment reported that “the ambient impact of Young’s benzene emissions remained below the allowable impact limits” (52). However, there are uncertainties inherent in the benzene emission rate because it was estimated and not measured.

C. Public Health Implications:

Groundwater

The groundwater pathway cannot be fully evaluated because off-site groundwater sampling has been limited. Data indicate that the groundwater beneath the site is contaminated with petroleum hydrocarbons, trichloroethylene (TCE), vinyl chloride, hydrocarbons, and other contaminants. Chlorinated compounds may be migrating underneath Young Refining from an upgradient source. Groundwater at the site is not used as a drinking water source; therefore, exposure to on-site groundwater is not a public health concern. Records indicate that safe public drinking water is available to all residences within at least ¼-mile radius of the site. ATSDR identified several private wells ¼- to ½-mile downgradient (north and northwest) of the site on Huey and Pirkle Roads. GA EPD sampled these downgradient private wells on August 21, 2000, and did not detect the presence of site related contaminants.

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[1] Young Refining has conducted some emissions testing, but it measured emissions of only total VOCs, not emissions of individual chemicals (e.g., benzene).

Soil

Available data did not identify COCs; however, the data are not considered representative of the entire site. Because access to the site is restricted, trespassing is not anticipated. Worker exposures would be likely sporadic and for short durations. Site cleanup actions are currently underway. Off-site soil migration is not anticipated

Offsite exposures do not appear to be a cause for concern. The thallium found in the unnamed tributary of Cracker creek needs to be resampled to establish the validity of the levels detected. Evaluation of offsite soil exposure is difficult because of the limited data available.

On Site Surface Water and Sediment

While surface water and sediment samples from these media identified some COCs, the limited exposure to these in on-site areas should not result in adverse health effects. The ponds are currently being remediated and sampling is required to ensure cleanup goals are met.

ATSDR does not expect that anyone has come into significant contact with on-site sediments within the pond or discharge area. Therefore, incidental exposures to the concentrations of contaminants detected would not result in adverse health effects.

Off-Site Surface Water and Sediment

Community members were concerned that Cracker Creek may be contaminated. The community members indicated that area residents avoid the creek because they believe it is contaminated. Available data do not adequately characterize potential exposure pathways in these media (specifically, from areas of Cracker Creek near the site). Limited samples were collected and analyses were limited to a few contaminants. Based on the available data, no health effects will occur from exposures to the contaminant levels detected.

Manganese exceeded the drinking water CV in two water samples, and thallium exceeded the soil CV in two sediment samples. While manganese was detected at a concentration of 300 ppb and 1,000 ppb, these concentrations should not cause adverse health effects because surface water would not be used for drinking. Doses that an adult would receive from incidental ingestion or skin contact would be far lower than those associated with adverse health effects. In 1998, thallium was detected in two samples collected from the unnamed tributary (downstream of Cracker Creek) at 120 ppm and 26 ppm, above the soil CV of 5 ppm. Background levels of thallium typically found in U.S. soils range between 0.3 ppm and 0.7 ppm (44). The U.S. Environmental Protection Agency (EPA) developed reference doses (RfD) for thallium to evaluate health effects; the RfD ranges from 0.00008 to 0.00009 milligrams per kilogram of body weight per day (mg/kg/day) (45).[2] Using a standard intake rate of 100 mg of soil per day and body weight of 70 kg, estimated doses to adults exposed to the highest levels of thallium detected would be 0.0002 mg/kg/day. For children who may be exposed to more soil/sediment (200 mg/day) and weigh less (16 kg), estimated doses to the highest concentration detected would be 0.002 mg/kg/day. These doses, while higher than the RfD for thallium, should not result in adverse health effects because (1) people are not likely to contact sediments on a regular basis, and (2) available animal studies show no adverse effects below doses of 0.25 mg/kg/day; site-related dose estimates are more than 100 times lower (44).

D. Health-Outcome Data Evaluation

Government agencies routinely collect health information for populations in different geographic areas; many state health departments have developed registries of illnesses and diseases; some county and local health departments periodically collect health information; and community members and groups may also collect health information in particular areas of interest. The health-outcome data are evaluated to identify trends in populations and any unusual increases in disease in specific areas.

Community members were concerned about an excess of cancer and respiratory illnesses in the area. ATSDR contacted the Georgia Division of Public Health, the Douglas County Board of Health, and GA EPD to gather health-outcome data. The Georgia Division of Public Health maintains a cancer registry that records cancer deaths, tracks overall cancer rates and specific cancers by sex and age, and generates an overall age-adjusted cancer death rate for each county and the state. The Division of Public Health also maintains registers for other diseases, and is the only agency in the area with a disease registry. No health studies or other health-outcome data were generated for this area. The county level is the smallest geographic unit tracked by the Division of Public Health. The 1990 United States Census indicated that 71,120 people lived in Douglas County, with 5,163 people residing within a 1-mile radius of the site. The available health outcome information does not adequately represent information for the specific study area within a 1-mile radius of the site. Additionally, available environmental data do not indicate current exposure. Therefore, no conclusion can be drawn concerning health outcomes. The following table includes information for specific cancer types.

[2] The EPA RfD is the body dose of a chemical below which no adverse effects would be expected. For thallium compounds, available RfDs are based on animal studies in which no effects were seen at dose levels above 0.25 mg/kg/day. Uncertainty factors of 3,000 were applied to derive the RfD. That is, the RfD is 3,000 times less than levels at which NO effects were seen in available studies (28).

Type of Cancer	County Data*	State Data*
Breast	26.7	23.9
Colon	10.7	15.8
Leukemia	6.2	6.3
Lung	65.6	54.3
Non-Hodgkin's Lymphoma	7.2	5.7
Pancreas	6.4	8.2
Prostate	23.5	31.6

* Rates per 100,000.

ATSDR reviewed state and county cancer mortality rates. County-level cancer mortality rates are not specific enough to make a determination about the smaller geographic data needed to address community concerns. Data indicate that cancer mortality rates for Douglas County (1992–1996) were overall slightly higher in Douglas County (182.2 cases/100,000 people) than in the state (174.7/100,000). However, this information is not site-specific. Mortality data analysis presented in this report represents information about two groups and does not consider individual risk factors or individual exposures. ATSDR has not identified environmental exposure at levels of health concern.

Other health concerns associated with the site cannot be evaluated with the available data.

E. Child Health Considerations

Children are at greater risk of health effects from exposures to hazardous substances than adults because (1) they play outside more often than adults, thus increasing the likelihood of contact with chemicals in the environment; (2) they are shorter than adults and are more likely to be exposed to soil, dust, and heavy vapors close to the ground; (3) they are smaller than adults, and their exposures would result in higher doses of chemical per body weight; and (4) their developing body systems can sustain damage if toxic exposures occur during certain growth stages. Therefore, ATSDR evaluated how children might be affected by the types and quantities of chemicals detected in water and soil at the site and sought to determine if detected contaminant levels might be associated with any reproductive or developmental effects.

Children may have limited access to the site and to its surrounding areas. Therefore, ATSDR reviewed possible exposure scenarios for children (e.g., trespassing onto the site). On the basis of current land use and available data, no conclusions can be made regarding possible exposures.

Additional data from downstream creeks, off-site groundwater, and ambient air are needed to assess potential off-site exposures to children.

Community Health Concerns Evaluation

Q: What health effects are associated with odors around the site, and what is the air quality in the area?

A: GA EPD records indicate that community concerns related to odors from the site began in the 1970s, with reports of odors reminiscent of rotten eggs, natural gas, oil, and asphalt. Some residents reported that the odors made them gag or burned their eyes, nose, throat, or skin, and the odors were often especially bad during the night.

No ambient air data are available for review (i.e., information on chemical concentrations in the air); therefore, ATSDR could not evaluate this pathway. While VOCs, NO_x, SO_2, and metals may be emitted during the refining process, concentrations are unknown. However, various components of the process can result in releases of sulfur-containing compounds.

Sulfur-containing compounds are particularly odoriferous (e.g., the smell of rotten eggs) and are a by-product of many industrial processes, not just oil refining. The human senses can detect such compounds at very low concentrations. These odors may be offensive and very unpleasant, and some people may experience nausea or headaches. At concentrations of sulfides in air above 100 ppb, sensitive people can experience eye, nose, and throat irritation. Often these effects reverse when the odor goes away (57).

Q: What health effects can occur from exposure(s) to contaminated soil/sediment (with petroleum odor) near Cracker Creek?

A: Residents reported asphalt-like materials and black water in Cracker Creek (along Huey Road). No soil samples were collected near the creek and no sediment data are available from the creek; therefore, ATSDR cannot evaluate this concern.

Q: Is it safe to grow produce near the site and to use local surface water to irrigate backyard produce gardens?

A: No soil or biota samples were collected from area vegetable gardens; therefore, this concern cannot be evaluated. Surface water sampling off-site did find manganese, but further testing was not conducted to validate the manganese levels.

Q: Is it safe for local youth to fish in the pond near the site?

A: The pond is northeast of the site, on land owned by the Natural Resources Conservation Service, and is used for cattle ranching. The pond is approximately ¼-mile from the principal refining operations and is not hydraulically connected or influenced by the facility. The pond is dammed on one side and fed by an unnamed drainage that originates east of the site (James McNamara, principal environmental Georgia Department Natural Resources, Environmental Protection Division, personal communication 1999). However, no water or fish samples were collected from the pond; therefore, this concern cannot be fully evaluated.

Q: What health effects could occur from past burning of hazardous materials at the site?
A: Residents wanted to know whether people living near the site in the past may have been exposed to the same chemicals detected at the Basket Creek hazardous waste site. Residents feel that some chemical wastes at Basket Creek originated from the site that also incinerated a portion of these wastes in their boilers (59-61).

No air sampling data are available to evaluate past potential exposures. In 1976, GA EPD ordered Young Refining to stop incinerating certain wastes in the boilers because the incineration could produce harmful chemicals (5). The site has not incinerated hazardous wastes in many years. Past exposures could not be evaluated, and any public health effects are unknown. Current and future exposures are not occurring or expected to occur.

Q: Is there an excess of cancers or other illnesses in the vicinity of the site?
A: ATSDR reviewed state and county cancer mortality rates. County-level cancer mortality rates are not specific enough to make a determination about the smaller geographic data needed to address community concerns. Data indicate that cancer rates are slightly higher in Douglas county than in the rest of Georgia; however, this information is not site-specific. A comparative table for specific cancers is presented in the Health Outcome Data section of this document.

Linking observed heath effects with environmental exposures is generally difficult. A detailed evaluation of all possible risk factors (e.g., work, hobbies, smoking, age, family history) is necessary when health scientists study health effects in a community to further investigate possible causes for reported diseases. The available environmental and exposure data are currently insufficient to make a health determination on the issue of excess cancer or other illnesses.

Q. Are leaking tanks present on site, and do they represent a public health concern?
A: Currently, leaking tanks are not present on site. Past investigations by the GA EPD revealed oil releases near above ground storage tanks. The impact of past leaks will be investigated as part of a RCRA facility investigation.

Q: Do piles of scrap and debris on the site represent a public health concern?
A: Most piles of scrap and debris have been removed from the site; therefore, they do not represent a public health concern.

Q: Is waste buried on the site ?
A: A geophysical survey conducted for EPA Region 4 in 1993 did not indicate the presence of buried drums on site.

Conclusions

Young Refining Corporation site cannot be fully evaluated because of limited or missing sampling data from air, soil, water and area biota (fish, vegetable gardens). Young Refining is still in business, and ATSDR classified the site as an indeterminate public health hazard based on a number of data gaps identified as part of the public health assessment.

1. On-site groundwater does not represent a public health concern because people are not coming into contact with it. Current information indicates that groundwater contamination has migrated off-site.

2. Off-site groundwater data indicate that COCs are not present in private wells sampled along Huey and Pirkle Road downgradient (north and northwest) of Young Refining Corporation.

3. The air, soil, and biota pathways off-site cannot be fully evaluated because of limited data.

Recommendations

1. Continue groundwater characterization activities to assess the extent of groundwater contamination, particularly the areas to the north, northeast, and northwest of the site.

2. Collect additional surface water and sediment samples from Cracker Creek to characterize potential exposures. Until data are collected and analyzed, residents should avoid the creek, which is an industrial-use stream. ATSDR will evaluate data as they become available and update the community.

3. Conduct ambient air monitoring for VOCs, SVOCs, and particulates near the facility property line.

4. Collect samples from area biota (fish, vegetable gardens) to characterize potential exposures.

5. Collect off-site soil samples to characterize potential exposures.

Public Health Action Plan

This plan was developed for actions needed at the site. Its purpose is to ensure that this public health assessment identifies public health hazards and to provide a plan of action designed to mitigate and prevent adverse human health effects that may result from exposure to hazardous substances in the environment. The following section lists the public health actions that are completed or planned .

Actions Completed

1. GA EPD sampled private wells along Huey and Pirkle Road in August 2000.

2. ATSDR evaluated the public health implications of private well data collected in August 2000 along Huey and Pirkle Road.

3. GA EPD conducted a screening site inspection in 1987 and an RFA in 1993, to identify areas of potential contamination at the site.

4. Since 1991, ATSDR has conducted several site visits and met with concerned community members.

5. Pursuant to a multimedia consent order, Young Refining developed and began implementing a groundwater monitoring plan and pond closure plan. The facility started site remedial activities that include excavating contaminated soils and miscellaneous debris.

6. Young Refining developed an RCRA facility investigation (RFI) workplan to evaluate all SWMUs.

Actions Planned

1. ATSDR will evaluate any additional environmental data when feasible to update the community.
2. GA EPD will continue to monitor site conditions and oversee Young Refining’s efforts to address site-related contamination.

Preparers of Report

Alaric Denton, MSEH, REHS/RS
Environmental Health Scientist
Health Consult Team
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Lovyst Luker
Environmental Health Scientist
Petitions Response Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Charles H. Weir
Environmental Engineer
Petitions Response Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Susan Moore
Section Chief, Toxicologist
Health Consultations Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

David S. Sutton, PhD, PE
Environmental Engineer
Petition Response Section
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Concurrence:

Donald Joe, PE
Deputy Branch Chief
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Robert Safay
Senior Regional Representative
Region IV
Office of Regional Operations
Agency for Toxic Substances and Disease Registry

Susan Moore
Acting Branch Chief
Exposure Investigations and Consultations Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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Appendix A

Figures

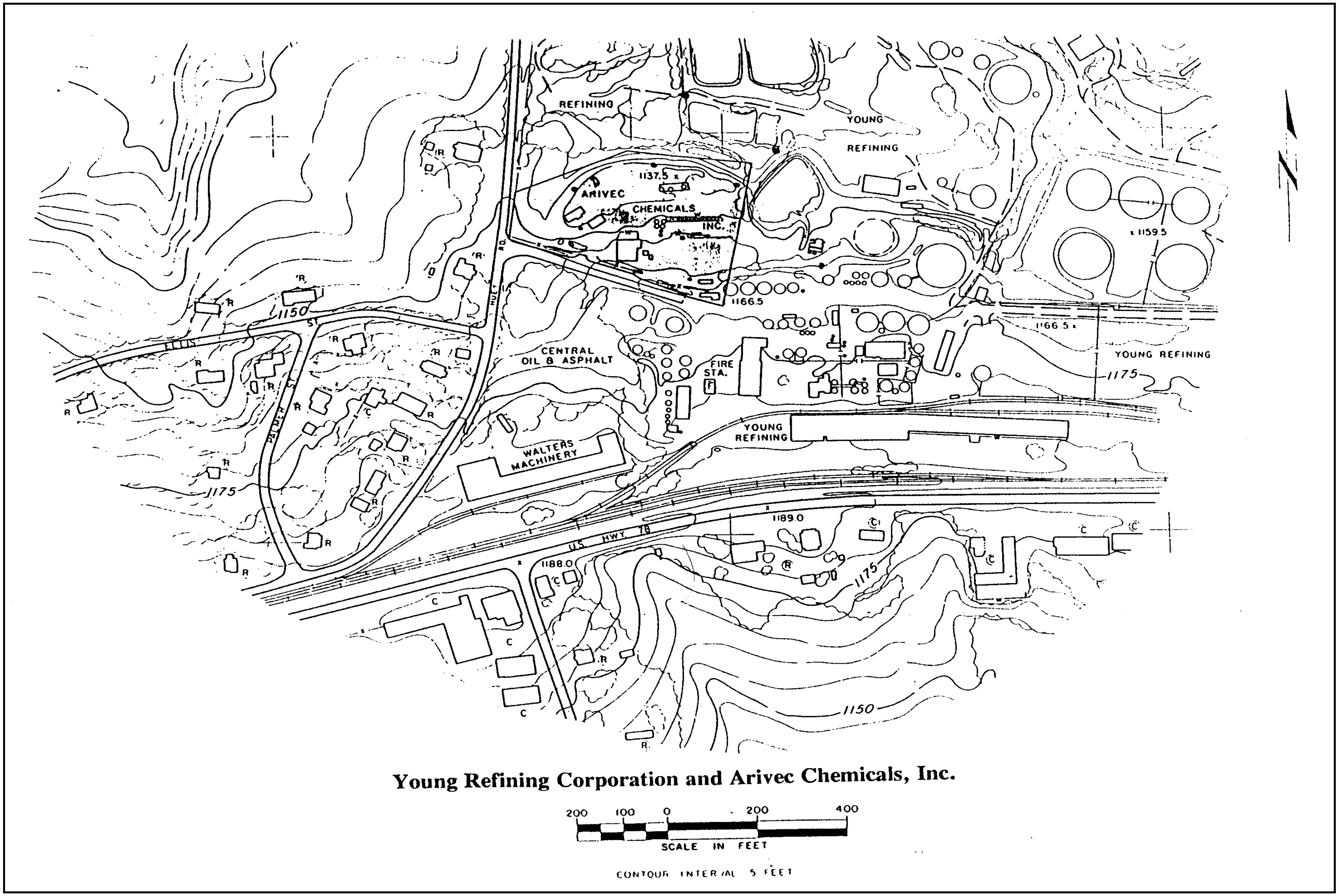
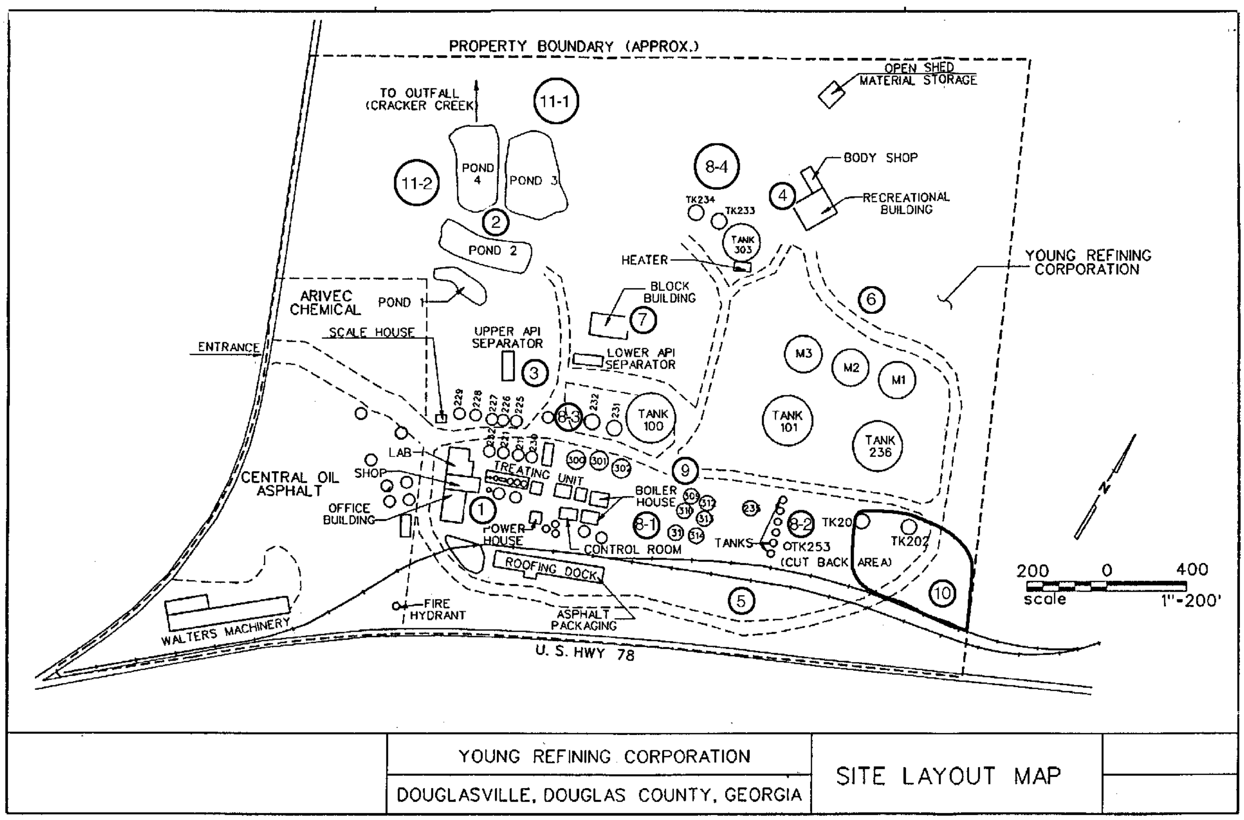


Figure 1. Young Refining Corporation Site Location Map **Source: (17)**

Figure 2. Site Layout **Sources: (2, 14)**



SWMU ID	Location
1	Production area
2	Ponds
3	API separator
4	Recreation building
5	Railroad
6	M-tank dump
7	Warehouse area
8-1	Tank farm 1
8-2	Tank farm 2
8-3	Tank farm 3
8-4	Tank farm 4
9	Tanker loading area
10	East corner
11-1	Abandoned tanker 1
11-2	Abandoned tanker 2
12	Surface drainage

Figure 3. Solid Waste Management Units (SWMUs)

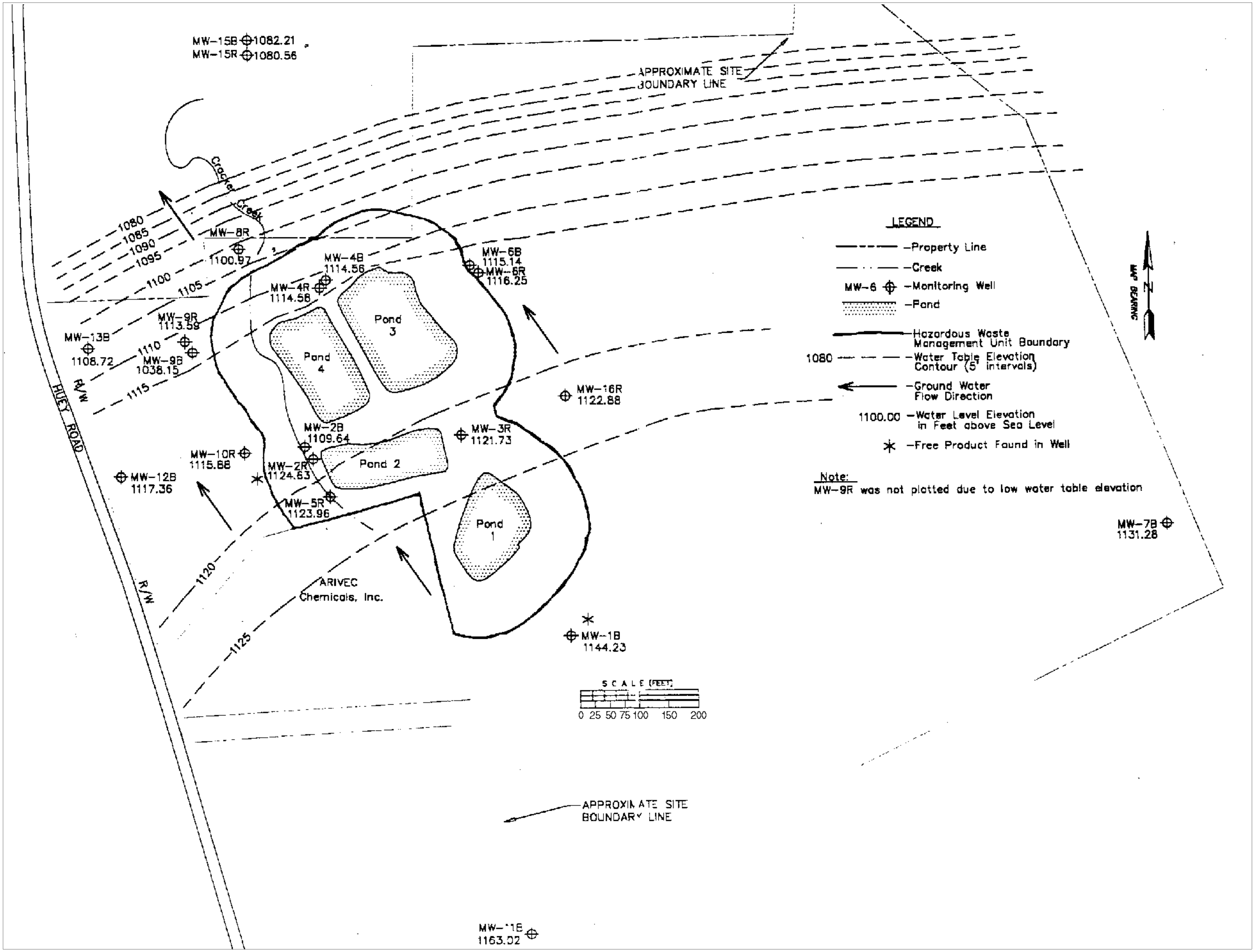
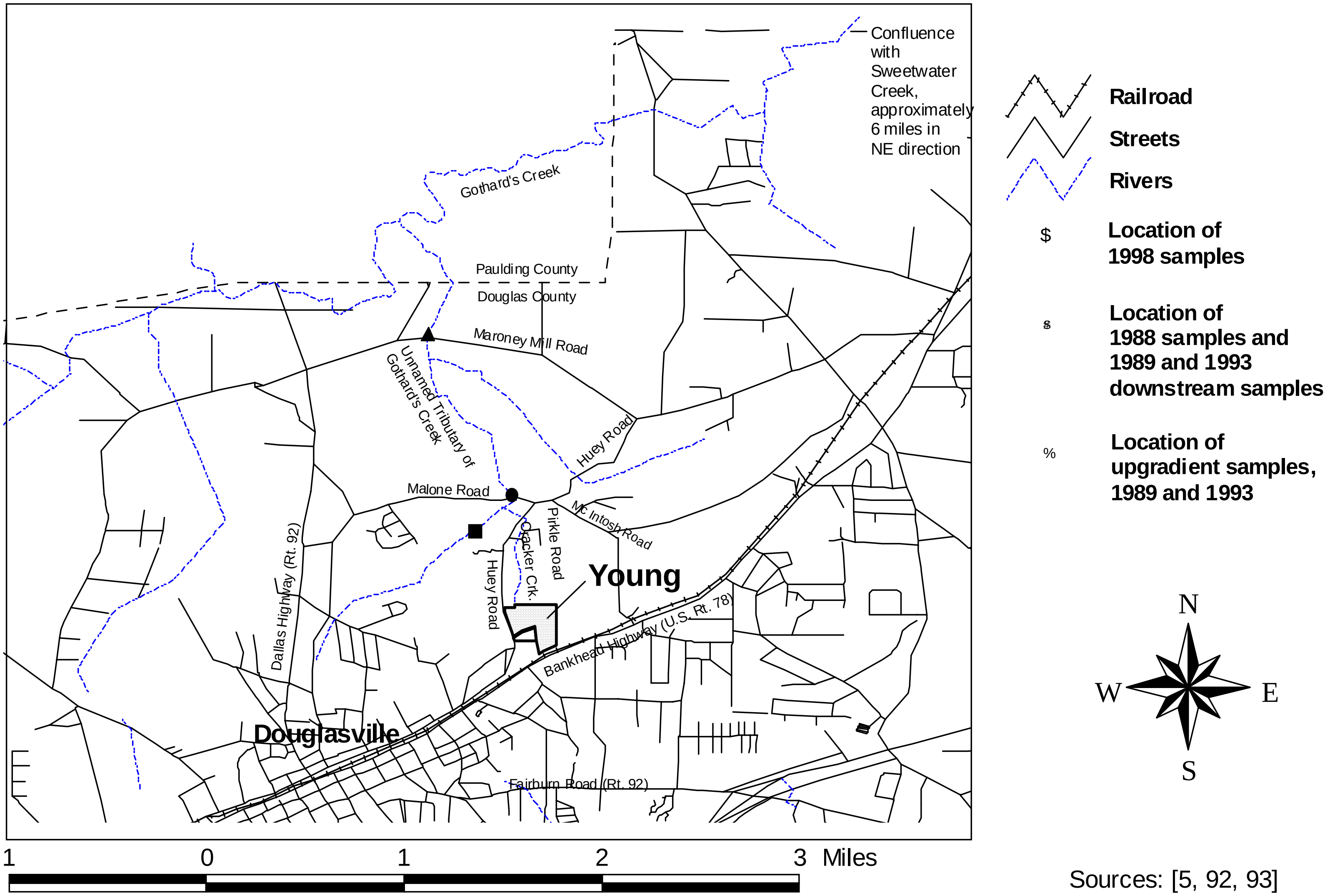


Figure 4. Young Refining Corporation. Locations of Groundwater Monitoring Wells, On-site Ponds, and Cracker Creek

Source: (72)

Figure 5. Young Refining Corporation. Surface Water Features and Sampling Locations



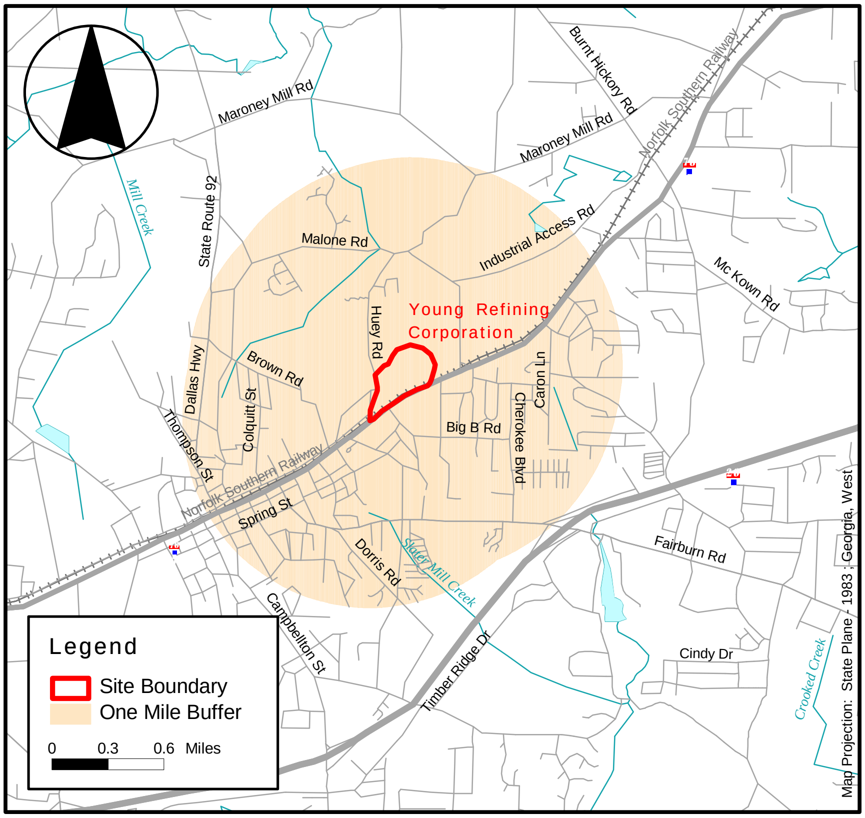
Sources: [5, 92, 93]

Young Refining Corporation

INTRO MAP

Douglasville, Georgia

EPA Facility ID GAD051011344



Base Map Source: 1995 TIGER/Line Files

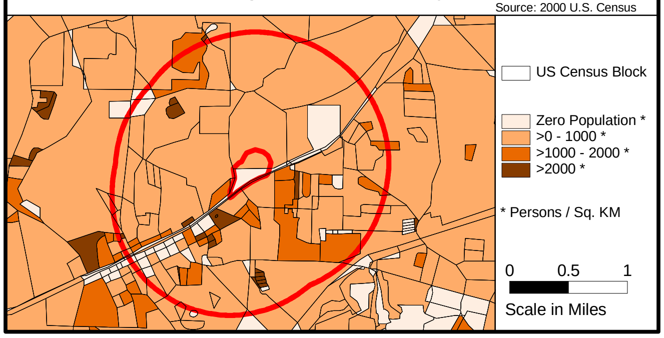
Douglas County, Georgia

Demographic Statistics Within One Mile of Site*	
Total Population	6418
White alone	3733
Black alone	2282
Am. Indian and Alaska Native alone	21
Asian alone	52
Native Hawaiian and Other Pacific Islander alone	0
Some other race alone	157
Two or More races	170
Hispanic or Latino	315
Children Aged 6 and Younger	856
Adults Aged 65 and Older	568
Females Aged 15 - 44	1589
Total Housing Units	2449

Demographics Statistics Source: 2000 US Census
*Calculated using an area-proportion spatial analysis technique

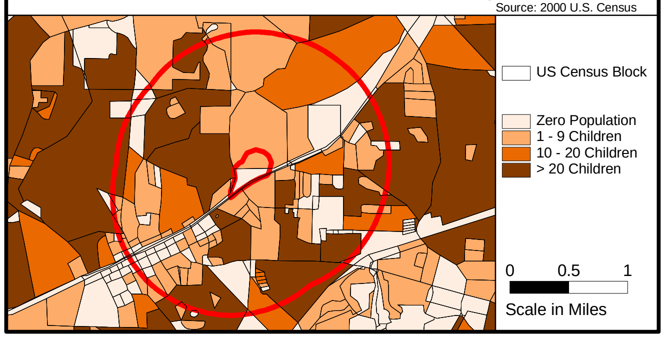
Population Density

Source: 2000 U.S. Census



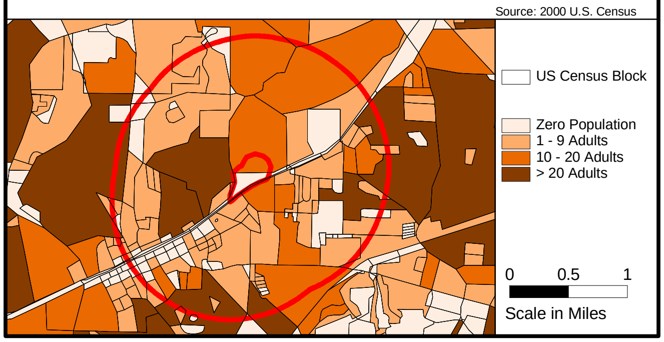
Children 6 Years and Younger

Source: 2000 U.S. Census



Adults 65 Years and Older

Source: 2000 U.S. Census



Females Aged 15 - 44

Source: 2000 U.S. Census

JVA012904

ATSDR GIS

Appendix B

Tables

Table 1. Operational and Regulatory Events at Young Refining Corporation

Date	Event
1955-1971	Cracker Asphalt operates on site (1,2).
1971	Young Refining (YR) begins operations on site (1,2).
1973	YR inadvertently spills oil into Cracker Creek, contaminating a residential garden (1).
Winter and spring 1976	YR burns liquid wastes containing hazardous substances in its plant boilers (1, 20, 21). During this period, residents often complain about odors and illnesses (1).
Mar. 19, 1976	GA EPD issues an emergency order (EPD-SWM-17) requiring YR to stop disposing of chemical wastes at the Basket Creek Disposal site, a nonpermitted hazardous waste landfill (1, 2, 58, 53).
Apr. 1976	Two GA EPD inspectors become ill (due to inhalation and dermal exposures) while inspecting and sampling liquid wastes at the Basket Creek sites (1, 4). After determining that these liquid wastes originate at YR, GA EPD samples and analyzes the wastes in the on-site holding tanks and detect several hazardous substances (1).
May 1976	GA EPD denies YR's request to burn hazardous liquid wastes in its plant boilers, after determining that incineration of the wastes could produce corrosive and poisonous combustion products or toxic air emissions (e.g., phosgene, sulfuric acid, hydrochloric acid, and toxic sulfur compounds) (1, 5).
Nov. 1976	YR begins transporting the above-mentioned wastes to a disposal plant in North Carolina (1).
Oct. 8, 1980	GA EPD issues an air quality permit to YR (61).
Jul. 24, 1985	GA EPD's Generator Compliance Unit inspects YR and subsequently administers an enforcement action for violation of standards that apply to small quantity hazardous waste generators (2, 35).
Jul. 11, 1986	During an inspection of Arivec Chemicals, Inc., GA EPD inspectors note strong odors at YR because of their filling of asphalt drums (62).
Apr. 1987	After a worker is killed in a flash fire at the refinery in 1985, the state Fire Marshal's office inspects YR. The facility receives a citation for violations related to improper storage of flammable liquids (1, 2, 55).
May 12, 1987	YR receives a letter from GA EPD's APB detailing a number of steps to reduce fugitive emissions at the refinery. Among these items is a requirement to remove all oil from the surface of the on-site surface water ponds (2).
Sept. 16, 1987	YR receives a permit to discharge wastewater under the National Pollution Discharge Elimination System (63).
Mar. 14 and 15, 1988	GA EPD inspectors discover 250 5-gallon paint containers in an out-of-service tank. The lead content is approximately 45%, and some of the containers are either damaged or rusted through. Inspectors also note several other solid and hazardous waste violations (2, 64).
Jan. 10, 1990	Acting upon a complaint, GA EPD inspectors found that YR uses waste oil as a fuel source. Conversations with staff indicate that YR has been burning waste oil since August 1988. GA EPD inspectors conclude that YR's use of waste oil as a fuel source meets regulatory requirements (65).
Dec. 28, 1990	GA EPD issues a new air quality permit to YR (66).

Table 1. Operational and Regulatory Events at Young Refining Corporation (continued)

Date	Event
Jun. 6, 1991	GA EPD inspectors smell faint asphalt-type odor at YR; however, they become insensitive to the smell after 5 minutes. Inspectors also note that odors are likely emanating from oil-covered areas (67).
Sept. 4, 1992	GA EPD issues a new NPDES permit to YR (68).
Feb. 4, 1993	GA EPD's Air Protection, Water Protection, and Hazardous Waste Management Branches (APB) conduct a multi-media inspection at YR. Violations found during the inspection include the following: opacity and record violations (air); foam, oil layer on Ponds 1 and 2, ammonia, inoperable equipment, and failure to report (water); and unpermitted treatment/storage, failure to report and submit plans, and failure to classify wastes (hazardous waste) (2, 27, 68, 69).
Feb. 16, 1993	After a former YR employee complains that hundreds of drums are buried at the facility, EPA conducts a geophysical survey, which does not substantiate the claim (70).
Mar. 1, 1993	GA EPD issues a notice of violation to YR for releasing a bilious foam (a nonhazardous substance) into Cracker Creek (February 13–19 and 26–27). The foam is reportedly nearly 6-feet deep where Cracker Creek crosses Huey Road (2, 14, 68).
Jun. 23, 1993	GA EPD issues an administrative order (EPD-HW-1040) to YR, requiring it to come into full compliance with its NPDES and air quality permits, properly close four surface water impoundments, and assess groundwater and soil characteristics at and around the refinery, among other things. YR appeals the order (2, 6, 69).
Jul. 1993	GA EPD issues a consent order to address air, water quality, and solid waste issues at the site. GA EPD requires YR to remove petroleum-contaminated soils and oil from the surface of the ponds, implement a closure plan, perform groundwater sampling, and prepare and implement an RCRA facility investigation (RFI) plan to address the SWMUs identified in the facility assessment. The order also requires YR to remove unused drums, trailers, scrap metal, and solid waste.
Jul. 8, 1994	Because of violations noted in 1993 and earlier, GA EPD and YR execute a consent order (EPD-HW-1096). Under this order, YR must meet requirements of its NPDES and air quality permits; cease unauthorized solid waste handling practices; collect and dispose of unused drummed additives and lubrication oil; properly remove all unused trailers on site; sort and separate recyclable scrap metal; remove nonrecyclable solid waste; remove all nonoperational personal vehicles; remove used tires; remove off-spec product and petroleum-contaminated soils from SWMU #2, #4, and #11; remove oil from the surface of the ponds; install a groundwater monitoring system, sample, and develop a groundwater quality assessment plan; submit and implement a closure plan for the ponds; prepare and implement an RFI plan; and provide GA EPD with all required notifications (8).
Sept. 27, 1994	GA EPD inspectors notice that the covers to the API separator have been removed and that Ponds 1 and 2 are covered with a layer of oil. (70)
Mar. 31, 1995	GA EPD, on its annual compliance inspection, observes that YR has ceased used-oil processing, no longer rents out on-site tank space, and has removed several out-of-service tanks. GA EPD also observes accumulations of solid waste, metal scrap, and other debris; open containers of oil and other materials; several areas of standing water and oil; and oil on the surface of Pond 2 (James McNamara, principal environmental engineer, personal communication 1999).
Apr. 27, 1995	GA EPD issues an administrative order requiring YR to manage all process wastewater in on-site tanks and to discharge all wastewater in accordance with its NPDES permit (11).

Table 1. Operational and Regulatory Events at Young Refining Corporation (continued)

Date	Event
Aug. 25, 1995	GA EPD inspectors observe an oil layer on Ponds 1 and 2, and note that the largest source of VOC emissions are fugitive emissions from the API separator, drains, and equipment leaks (46).
Feb. 29, 1996	GA EPD inspectors observe leaking valves and pipe flanges (47).
Sept. 30, 1996	GA EPD approves a closure plan for YR's on-site ponds, which includes a plan for bioremediation of Ponds 1, 2, and 4 (9).
May 21, 1997	GA EPD issues a new NPDES permit to YR (71).
Jul. 29, 1997	GA EPD inspectors, during the annual compliance inspection observe the following: (1) temporary berms hold and release stormwater, (2) waste is being removed from Pond 3 as part of closure, (3) foam at the outfall point discharges to Cracker Creek, (4) accumulation of 5-gallon containers, piles of soil, and (5) oil on the ground under tanks and rail cars. Inspectors report that YR has not generated or shipped any hazardous waste in the past 2 years (13).
Jul. 9, 1998	APB issues YR an Air Quality Permit (#2951-097-0010-5-01-0), which supersedes YR's former emissions permit and changes the facility's regulatory status under Title V of the Clean Air Act to that of a "minor source" of air pollution. GA EPD requires a facility-wide air toxics assessment to be performed before changing YR's designation (51, 54).
Sept. 25, 1998	GA EPD inspectors, during the annual compliance inspection, observe improvements in site conditions, including continued excavation and dewatering activities, a new oil water separator, less oil on the surface of Pond 2, stormwater and oil migration controls, and the presence of a cell to hold excavated wastes. GA EPD inspectors observe visible foam at the NPDES outfall and 50 feet down Cracker Creek and some accumulation of solid waste. Inspectors report that YR has not sampled groundwater since 1997. Issuance of a permit is delayed by the incomplete delineation of groundwater contamination (12).
Jul. 15, 1999	A consent order is executed by GA EPD and YR after APB and EPA representatives observe numerous procedural violations of YR's air quality permit during site visits conducted on August 20, 1998 and July 9, 1998. However, none of the violations addressed pertain to excess emissions (72).

Table 2. Demographics in a 1-mile radius of the site

	Site Area*		Census Tract 803		Douglas County	
	Number	%	Number	%	Number	%
Total population	5,163		11,709		71,120	
White	3,939	76.3	9,334	79.7	64,734	91.0
Black	1,154	22.4	2,222	19.0	5,597	7.9
American Indian, Eskimo, Aleut	16	0.3	26	0.2	176	0.2
Asian or Pacific Islander	30	0.6	87	0.7	386	0.5
Other	24	0.5	40	0.3	227	0.3
Hispanic	57	1.1	128	1.1	749	1.1
Less than 18 years old	1,457	28.2	3,105	26.5	20,149	28.3
18 years old or more	3,706	71.8	8,604	73.5	50,971	71.7
Children aged 6 years or younger	651	12.6	1,336	11.4	7,850	11.0
Females aged 15 to 44 years	1,331	25.8	2,989	25.5	18,395	25.9
Adults aged 65 years and older	527	10.2	1,168	10.0	4,997	7.0
Occupied housing units			4,154		24,277	
Owner-occupied			2,607	62.8	18,880	77.8
Average housing value			78,000		81,200	

*Reference: (15)

Table 3. Young Refining Corporation (YR) Potential Exposure Pathways

Pathway Name	Exposure Elements					Time
	Source	Medium	Route of Exposure	Point of Exposure	Receptor Population	
Groundwater	Chemical leaching through soil at YR	Groundwater	Inhalation, ingestion, dermal contact	Residences with private water wells	Residents owning private wells	Future
Soil	Corrosion of process equipment/ scrap metal, chemical spills, and/or mishandling of chemical wastes at YR	Surface soil	Inhalation, inadvertent ingestion, dermal contact	Facility Ground	Workers	Past, Current, Future
					Trespassers	Unknown
Surface water and sediment	Stormwater and wastewater discharges at YR	Surface water and sediment	Inhalation, inadvertent ingestion, dermal contact	Wastewater ponds	Workers	Past, Current, Future
					Trespassers	Unknown
				Cracker Creek and residences near the creek	Nearby residents	Past, Current, Future
Air	Stack and fugitive air emissions from YR	Ambient air	Inhalation	Facility	Workers	Past, Current, Future
					Trespassers	
				Nearby residences	Nearby residents	
Food chain	Stormwater and wastewater discharges from YR	Homegrown produce and fish in nearby surface water	Ingestion	Nearby residences	Trespassers	Unknown
					Nearby residents	Unknown
Stored wastes and physical hazards	Chemical spills or stored chemical wastes at YR	Chemical wastes and other raw materials	Inhalation, dermal contact	Facility	Workers	Past, Current, Future
					Trespassers	Unknown

Table 4. Young Refining Corporation (YR) Eliminated Pathways

Pathway Name	Exposure Elements					Time
	Source	Medium	Route of Exposure	Point of Exposure	Receptor Population	
Groundwater	Chemical leaching through soil at YR	Groundwater	Inhalation, ingestion, dermal contact	Residences on-site wells	Residents on-site workers	Past and Present

Table 5. Monitoring Well Groundwater Data (August 29-30, 1994, February 6-7, 1997, July 29, 1997, and January 21, 1999)

Contaminant of Concern	Chemical Concentration Range (ppb)*	Location of Maximum Detection	Date of Maximum Detection	Number of Samples	Number of Times Detected	Comparison Value (ppb)	Type of Comparison Value
Volatile Organic Compounds							
Acetone	< 10–1,200	MW-5R	2/7/97	44	2	1,000	RMEG†-child
Benzene	< 1–3,200	MW-3R	8/29/94	44	24	1	CREG‡
Chlorobenzene	< 0.25–260	MW-2R	8/30/94	44	11	200	RMEG-child
Chloroethane	< 0.37–930	MW-5R	1/21/99	33	5	3.6	RBC§-C
1,2-Dichlorobenzene	< 5–500	MW-5R	2/7/97	40	10	64	RBC¶-N
1,1-Dichloroethane	< 0.15–14,000	MW-5R	2/7/97	44	23	800	RBC-N
1,2-Dichloroethane	< 0.12–150	MW-5R	2/7/97	44	11	0.4 2,000	CREG I-EMEG**-child
1,1-Dichloroethene	< 0.48–2,400	MW-5R	2/7/97	44	17	0.06 90	CREG C-EMEG††-child
cis-1,2-Dichloroethene	< 5–48,000	MW-5R	2/7/97	40	26	3,000	I-EMEG-child
1,1-Dichloropropene	< 5–220	MW-5R	2/7/97	40	1	NA	
Isopropylbenzene	7–52	MW-2B	7/29/97	40	4	NA	
Methylene chloride	< 5–350	MW-5R	2/7/97	44	6	5 2,000	CREG C-EMEG-child
4-Methyl-2-pentanone	< 1– 4,900	MW-5R	2/7/97	44	5	140	RBC-N
Naphthalene	< 10–140	MW-5R	2/7/97	44	12	20	I-EMEG-child
Tetrachloroethylene	< 0.2–149	MW-9B	7/29/97	44	14	0.7 100	CREG I-EMEG-child
Toluene	< 0.14–13,500	MW-5R	7/29/97	44	13	200	I-EMEG-child
1,1,1-Trichloroethane	< 0.25–10,000	MW-5R	2/7/97	44	17	200	LTHA‡‡

Contaminant of Concern	Chemical Concentration Range (ppb)*	Location of Maximum Detection	Date of Maximum Detection	Number of Samples	Number of Times Detected	Comparison Value (ppb)	Type of Comparison Value
1,1,2-Trichloroethane	< 0.37–23	MW-6R	1/21/99	33	10	0.6 40	CREG RMEG-child
Trichloroethylene	< 0.22–602	MW-9B	7/29/97	44	18	3	CREG
1,2,4-Trimethylbenzene	12–130	MW-5R	1/21/99	29	2	12	RBC-N
1,3,5-Trimethylbenzene	< 10–42	MW-5R	1/21/99	29	1	12	RBC-N
Vinyl Chloride	< 0.61–3,770	MW-5R	7/29/97	44	18	0.2	C-EMEG-child
Total Xylenes	< 0.21–3,500	MW-5R	2/7/97	44	15	2,000	I-EMEG-child
Semi-Volatile Organic Compounds							
bis(2-Ethylhexyl)phthalate	< 10–110	MW-7B	1/21/99	33	3	3 200	CREG RMEG-child
Isophorone	< 10–34	MW-9B	7/29/97	44	6	40	CREG
2-Methylnaphthalene	< 10–22	MW-5R	7/29/97	44	6	NA§§	
2-Nitrophenol	< 5–17	MW-5R	7/29/97	29	2	NA	
1,2,4-Trichlorobenzene	< 5–167	MW-5R	7/29/97	29	1	100	RMEG-child
Metals							
Total Barium	< 10–1,700	MW-5R	1/21/99	44	31	700	RMEG-child
Cadmium	< 5–7.3	MW-2R	8/30/94	4	1	2	C-EMEG-child
Chromium	< 10–390	MW-2R	8/30/94	33	7	30 (Cr VI) 20,000 (CrIII)	RMEG-child RMEG-child
Lead	< 5–1,635	MW-2R	8/30/94	44	20	15	USEPA Action Level
Mercury	< 0.2–3.2	MW-2R	8/30/94	4	2	1 (methyl mercury) 3 (mercuric chloride)	RMEG-child RMEG-child

Contaminant of Concern	Chemical Concentration Range (ppb)*	Location of Maximum Detection	Date of Maximum Detection	Number of Samples	Number of Times Detected	Comparison Value (ppb)	Type of Comparison Value
Vanadium	< 50–180	MW-2R	8/30/94	33	4	30	I-EMEG-child
Zinc	25–5,100	MW-5R	1/21/99	44	35	3,000	C-EMEG-child
Dioxins/Furans							
2,3,7,8-TCDD TEQ¶¶	ND–0.00004	MW-2R	8/30/94	27	24	0.00001	C-EMEG-child

References: (17, 30, 31, 32)

* ppb = Parts per billion
† RMEG = Reference dose media evaluation guide
‡ CREG = Cancer risk evaluation guide
§ RBC-C = EPA risk-based concentration (carcinogenic)
¶ RBC-N = EPA risk-based concentration (non-carcinogenic)
** I-EMEG = Intermediate environmental media evaluation guide
†† C-EMEG = Chronic environmental media evaluation guide
‡‡ LTHA = Lifetime health advisory, drinking water
§§ NA = Not available (ATSDR has no comparison value for this chemical.)
¶¶ Dioxins and furans were identified and reported as the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) toxic equivalence (TEQ). TEQ is a screening tool, expressing the total dioxin and furan concentration in relation to the toxicity of 2,3,7,8-TCDD, most toxic form of dioxins/furans. 2,3,7,8-TCDD was not detected in any of the samples at concentrations exceeding 0.000002 ppb. Only three samples (collected from MW-2 and MW-4) had 2,3,7,8-TCDD TEQ concentrations slightly exceeding the most conservative comparative value. As a conservative screen, ATSDR used the detection limit (for nondetected values) in calculating the TEQ concentrations. Detection limits for various congeners ranged from 0.00000064 ppb to 0.000027 ppb. Concentrations of nondetected congeners likely were much lower, if they were present at all.

Table 6. Surface Water Data - On-site Ponds (July 29, 1991, March 26, 1996, and February 6-7, 1997)

Contaminant of Concern	Chemical Concentration Range (ppb)*	Number of Samples	Number of Times Detected	Comparison Value (ppb)	Type of Comparison Value
Benzene	< 1–1,100	8	4	1	CREG†
Toluene	< 5– 500	6	4	200 700	I-EMEG‡-child I-EMEG-adult
bis(2-Ethylhexyl)phthalate	< 10–57	4	1	3 200 700	CREG RMEG§-child RMEG-adult
Sulfide	4,600	1	1	30 (hydrogen sulfide) 100 (hydrogen sulfide)	RMEG-child RMEG-adult
Chromium	< 40–160	4	2	30 (chromium VI) 100 (chromium VI) 20,000 (chromium III) 50,000 (chromium III)	RMEG-child RMEG-adult RMEG-child RMEG-adult
Lead	< 40–360	4	1	15	EPA action level
Mercury	< 2– 2	4	1	1 (methylmercury) 4 (methylmercury) 3 (mercuric chloride) 10 (mercuric chloride)	RMEG-child RMEG-adult RMEG-child RMEG-adult

References: (8, 33, 36)

* ppb = Parts per billion
† CREG = Cancer risk evaluation guide
‡ I-EMEG = Intermediate environmental media evaluation guide
§ RMEG = Reference dose media evaluation guide

Table 7. Surface Water Data - NPDES Outfall (1985 through 1999)*

Contaminant of Concern	Maximum Detected Concentration (ppb)†	Date(s) of Maximum Detection	Comparison Value (ppb)	Type of Comparison Value
Benzene	24	12/20/88 1/25/93 2/17/93	1	CREG‡
Trichloroethylene§	10	2/7/97	3	CREG
Ammonia	79,000	9/18/98	3,000 10,000	I-EMEG¶-child I-EMEG-adult
Sulfide	3,200** 1,120	7/29/98 12/27/95	30 (hydrogen sulfide) 100 (hydrogen sulfide)	RMEG††-child RMEG-adult
Manganese§	1,900	2/17/93	500 2000	RMEG-child RMEG-adult

References: (28, 29, 30, 33, 36, 40–43)

* Under the NPDES permit, benzene was monitored monthly from September 1992 through May 1997; ammonia was monitored quarterly from September 1992 through May 1997 and twice per quarter subsequently; and sulfide was monitored quarterly from September 1992 through May 1997 and twice per quarter subsequently. ATSDR's review of GA EPD records revealed 16 additional sampling events at the Young Refining NPDES Outfall between 1985 and the present. They were collected on April 11, 1985; October 25, 1988; December 20, 1988; July 29, 1991; August 24, 1992; February 4, 1993; February 17, 1993; and February 6-7, 1997; as well as an unspecified day in August 1988, December 1988, February 1989, March 1989, April 1989, May 1989, June 1989, and July 1989. The parameters for which each sample was analyzed varied by sampling event.

† ppb = Parts per billion

‡ CREG = Cancer risk evaluation guide

§ Only one sample was analyzed for this parameter.

¶ I-EMEG = Intermediate environmental media evaluation guide

** Lab re-analysis of this sample did not measure sulfide above the detection limit.

††RMEG = Reference dose media evaluation guide

Table 8. Sediment Data - On-Site Ponds (July 24, 1985, October 28, 1987, July 29, 1991, and March 26, 1996)

Contaminant of Concern	Chemical Concentration Range (ppm)*	Number of Samples	Number of Times Detected	Comparison Value (ppm)	Type of Comparison Value
Chromium	0.07–400	7	7	200 (chromium VI) 2,000 (chromium III) 80,000 (chromium III) 1,000,000 (chromium III)	RMEG-child RMEG-adult RMEG-child RMEG-adult
Lead	0.1–880	7	7	400	EPA action level

References: (9, 33, 34)

* ppm = Parts per million.
† RMEG = Reference dose media evaluation guide

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Table 9. Young Refining Corporation. Air Emission Data Reported to EPA's Toxic Release Inventory (TRI)*†

Reporting Year	Annual Air Emission Rate (lbs/yr) Reported to TRI			
	Benzene	Cyclohexane	Toluene	Xylene isomers‡
1987	NR§	NR	NR	NR
1988	2,359	500	500	NR
1989	2,027	500	500	NR
1990	2,262	1,000	1,000	NR
1991	255	NR	NR	255
1992	255	NR	NR	255
1993	500	NR	NR	255
1994	500	NR	NR	255
1995	500	NR	NR	255
1996	500	NR	NR	255
1997	255	NR	NR	NR
1998	500	NR	NR	NR
1999	500	NR	NR	NR
2000	500	NR	NR	NR
2001	621	NR	NR	NR

References: (52, 53, 54)

* From 1987 to 1997, Young Refining did not report emissions of any other chemical to TRI.
† The emissions data listed in this table were reported by Young Refining. The accuracy of these data is not known.
‡ The emissions data for xylene isomers are the sum of emissions for the three individual isomers.
§ NR = Not reported. An industrial facility is required to report chemical releases to TRI only when (1) the facility processes or manufactures more than 25,000 pounds of the chemical in a given calendar year, or (2) the facility otherwise uses more than 10,000 pounds of the chemical in a given year.

Appendix C

Glossary and
ATSDR Public Health Assessment Methodologies

Glossary

Acute	Occurring over a short period of time (less than or equal to 14 days).
Aquifer	An underground bed or layer of earth, gravel, or porous stone that yields water.
Bedrock	The solid rock (e.g., granite) that lies underneath loose material, such as soil, sand, clay, or gravel.
Carcinogen	A substance that may produce cancer.
Census	An official (usually periodic) enumeration or count of a population. Includes related demographic information, physical, social, and economic characteristics of the population.
Chronic	Occurring over a long period of time (more than 1 year).
Combustion	A chemical change as a result of oxidation (combining with oxygen), accompanied by the production of heat and light (e.g., burning).
Comparison values (CVs)	Estimated contaminant concentrations in specific media that are not likely to cause adverse health effects, given a standard daily ingestion rate and body weight. CVs are calculated from scientific literature available on exposure and health effects.
Concentration	The amount of one substance dissolved or contained in a given amount of another. For example, sea water contains a higher concentration of salt than fresh water.
Confluence	A flowing together of two or more streams at a common point of juncture.
Demographic	Of or relating to the study of the characteristics of human populations (e.g., size, growth, density, distribution, vital statistics).
Detection limit	See quantitation limit.
Disease registry	A confidential database of individuals diagnosed with long term illnesses (e.g., cancer registry). The database is used by public health organizations to assess and track the occurrence of diseases.
Dose	The amount of a substance to which a person is exposed; dose takes body weight into account.
Emissions	A substance discharged into the air.
Exposure	Contact with a chemical by swallowing, breathing, or skin/eye contact. May be short term (acute) or long term (chronic).

Fracture	Geologically speaking, a crack or fault (i.e., a long, continuous, and extensive crack) that causes parallel displacement of underground rock layers or formations in a rock.
Fugitive emissions	Gaseous vapors emanating or volatilizing from a stationary source (e.g., a puddle of liquid) that disperses within the surrounding air.
Gneiss	An igneous, banded or foliated metamorphic rock, usually of the same composition as granite.
Groundwater	Water beneath the ground surface in a saturated zone (voids 100% liquid filled).
Health assessment	Evaluation of data/information on chemical release(s) into the environment to assess past, current, or future impact on public health. May lead to the development of health advisories, recommendations, and identification of health studies, or actions needed to evaluate and reduce/mitigate the occurrence of adverse health effects.
Hydrogeology	The scientific study of the properties, distribution, and effects of water in the earth's subsurface (e.g., soil and rocks).
Ingestion	Swallowing (eating or drinking) substances through the mouth. Chemicals can get into food, drink, or onto hands and be ingested and absorbed into the blood and distributed throughout the body.
Inorganic	Nonliving, nonorganic matter; not products of organic life.
Intermediate	Between a short and long period of time (more than 14 days, but less than 1 year).
Leaching	Removing chemical constituents from an environmental medium (e.g., soil) by the action of a percolating liquid (e.g., rainwater being absorbed in the ground).
Media	Soil, water, air, plants, animals, or other parts of the environment.
Migration	The progressive movement of physical matter from one location to another.
Noncarcinogen	A substance not considered to be cancer producing; may produce other diseases or illnesses.
Organic	Of, related to, or derived from living organisms.
Periphery	The outermost part or region within a boundary or specified zone.
Petition	A formally written document by an individual or group requesting a right or benefit from another person or group in authority.

Petitioned Public Health Assessment	A health assessment prepared at public request. When a petition is received, a team of environmental health scientists gather data to determine whether there is a reasonable basis for a health assessment. When a petition is accepted, ATSDR staff uses established methodology to prepare a health assessment.
Policy	A plan/course of action, as of a government, political party, or business, intended to influence and determine decisions, actions, and other matters.
Pollution	The presence of chemical or hazardous substances in the environment. From a public health perspective, pollution is addressed when it potentially affects the health and quality of life of people living and working near it.
Potentially exposed	People are potentially exposed when environmental data indicates contamination in one or more media through which people could be exposed (through air, drinking water, soil, food chain, surface water), and evidence exists of human exposure (i.e., through drinking contaminated water, breathing contaminated air, having contact with contaminated soil, or eating contaminated food).
Quantitation limit	The lowest concentration an analytical device can measure.
Refinery	An industrial plant for purifying a substance, such as petroleum.
Regulate	To provide direction according to rule, principle, or law.
Respiratory	Of, relating to, used in, or affecting the process of inhaling/exhaling (breathing).
Remedial	An action or means of exhibiting correction (e.g., environmental cleanup).
Risk	In risk assessment, the probability that something will cause injury and the potential severity of that injury.
Route of exposure	The way in which a person may contact a chemical substance. For example, drinking (ingestion) and bathing (skin contact) are two different routes of exposure to contaminants that may be found in water.
Solvent	A substance, usually a liquid, that is capable of dissolving or breaking down another substance, such as glue, grease, oil, or paint.
Surveillance study	A health-based study to observe the progression of a specific disease within a selected group of individuals.
Survey	A determination of the boundaries, area, distance, or elevations of land parcels or specific structures on the earth's surface by means of measuring angles and distances, using the techniques of geometry and trigonometry.

Topographic	Detailed, precise description of a place or region; usually represented graphically (on a map) to illustrate relative positions and elevations of distinct surface features.
Toxicology	Study of the nature, effects, and detection of poisons and treatment of poisoning.
Tributary	A stream that flows into a larger stream or other body of water.
Tumor	An abnormal growth of tissue resulting from uncontrolled, progressive multiplication of cells that serve no physiological function (e.g., a neoplasm).
Volatile organic compounds (VOCs)	Substances containing carbon and different proportions of other elements (such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen) that easily become vapors or gases. A significant number of VOCs are used as solvents (paint thinners, lacquer thinner, degreasers, and dry cleaning fluids).

ATSDR Public Health Assessment Methodology

Quality Assurance

To prepare a health assessment, ATSDR relies on the referenced data/information. ATSDR assumes that adequate quality assurance and control measures were taken during chain-of-custody, laboratory procedures, and data reporting. The validity of the analyses and conclusions drawn in this document are determined by the availability and reliability of the information.

Human Exposure Pathway Evaluation and the Use of ATSDR CVs

ATSDR assesses a site by evaluating the level of exposure in potential or completed exposure pathways. An exposure pathway is the way chemicals may enter a person's body to cause a health effect. It includes all these steps between the release of a chemical and the population exposed: (1) a chemical release source, (2) chemical movement, (3) a place where people can come into contact with the chemical, (4) a route of human exposure, and (5) a population that could be exposed. In this assessment, ATSDR evaluates chemicals in the soil and groundwater that people living in nearby residences may consume or come into contact with.

Data evaluators use CVs, which are screening tools used to evaluate environmental data that are relevant to the exposure pathways. CVs are concentrations of contaminants that are considered to be safe levels of exposure. CVs used in this document include ATSDR's environmental media evaluation guide (EMEG), the reference dose media evaluation guide (RMEG), and the cancer risk evaluation guide (CREG). When an ATSDR CV was unavailable, the EPA risk-based concentration served as the CV. CVs are derived from available health guidelines, such as ATSDR's minimal risk levels and EPA's cancer slope factors and reference doses.

The derivation of a CV uses conservative exposure assumptions, resulting in values that are much lower than exposure concentrations observed to cause adverse health effects, thus ensuring that the CVs are protective of public health in essentially all exposure situations. That is, if the concentrations in the exposure medium are less than the CV, the exposures are not of health concern and no further analysis of the pathway is required. However, while concentrations below the CV are not expected to lead to any observable health effect, it should not be inferred that a concentration greater than the CV will necessarily lead to adverse effects. Depending on site-specific environmental exposure factors (for example, duration of exposure) and activities of people that result in exposure (time spent in area of contamination), exposure to levels above the CV may or may not lead to a health effect. Therefore, ATSDR's CVs are not used to predict the occurrence of adverse health effects.

The following table describes the CVs and health guidelines considered in the Arivec public health assessment.

Comparison Values and Health Guidelines	Description
Cancer risk evaluation guides (CREG)	ATSDR-derived health comparison values (CVs). CREGs are estimated media-specific concentrations expected to cause no more than one excess cancer in a population of 1 million individuals exposed over a lifetime (70 years). CREGs are calculated from EPA's cancer slope factors.
Cancer slope factor (CSF)	An EPA quantitative assessment to define the relationship between a chemical dose and its carcinogenic effect as a linear function, assuming a zero threshold and a lifetime exposure (70 years). However, the true risk is unknown and could be as low as zero.
Drinking water equivalent levels (DWEL)	Health CVs based on the EPA oral reference dose. DWELs represent corresponding concentrations of a chemical substance in drinking water that are estimated to have negligible deleterious effects in humans at an intake rate of 2 liters per day, assuming that drinking water is the sole source of exposure.
Environmental media evaluation guides (EMEG)	ATSDR-derived health CVs. EMEGs are media-specific concentrations calculated from ATSDR's minimal risk levels, factoring in default body weights and ingestion rates. Different EMEGs are calculated for adults, children, and (in the case of soil) pica children. Likewise, different EMEGS are computed for varying durations of exposure such as acute (1–14 days), intermediate (15–365 days), and chronic (more than 365 days).
Lifetime health advisories (LTHA)	Health CVs calculated from the drinking water equivalent levels. Each LTHA represents the concentration of a chemical substance in drinking water estimated to have negligible deleterious effects in humans over a lifetime (70 years), assuming a consumption of 2 liters of water per day for a 70-kg adult, and taking into account other sources of exposure. In the absence of chemical-specific data, the assumed fraction of total intake from drinking water is 20%. LTHAs are not derived for chemical substances that are potentially carcinogenic to humans.
Maximum contaminant levels (MCL)	Legally enforceable drinking water standards promulgated by EPA. MCLs represent concentrations of chemical substances in drinking water that EPA deems protective of public health (considering water availability, economic feasibility, and water treatment technology) over a lifetime (70 years), at an exposure rate of 2 liters of water per day.

Minimal risk levels (MRL)	ATSDR-derived health guidelines that represent estimates of daily human exposure to chemical substances (i.e., doses expressed in mg/kg/day) that the agency considers unlikely to be associated with any appreciable risk of deleterious noncancer effects over a specified duration of exposure. MRLs are calculated using data from human and animal studies and are reported for acute (1–14 days), intermediate (15–365 days), and chronic (more than 365 days) exposures. MRLs are published in ATSDR toxicological profiles for specific chemicals.
Reference doses (RfD)	EPA-derived health guidelines that represent estimates of human daily exposure to chemical substances unlikely to cause non-carcinogenic adverse health effects over a lifetime (70 years). Like the ATSDR minimal risk level, the EPA RfD is expressed in mg/kg/day.
Reference dose media evaluation guides (RMEG)	ATSDR-derived health CVs that represent concentrations of chemical substances in air, water, or soil that are estimated from EPA reference doses, factoring in default values for body weight and intake rate. Different RMEGs are calculated for adults and children.
Risk-based concentrations (RBC)	Health CVs derived by the EPA Region III Office. RBCs represent levels of chemical substances (non-carcinogens and carcinogens, when applicable) in air, water, soil, and fish that are considered safe, assuming default values for body weight, exposure duration, and ingestion/inhalation rates.

Selecting COCs

COCs are the site-specific chemical substances that health assessors select for further evaluation of potential health effects. Identifying COCs is a process that requires health assessors to examine (1) contaminant concentrations at the site, (2) the quality of environmental sampling data, and (3) the potential for human exposure. A thorough review of each of these issues is required to accurately select COCs in the site-specific human exposure pathway. The following section describes the selection process.

In the first step of the COC selection process, the maximum contaminant concentrations are compared directly to health CVs. ATSDR considers site-specific exposure factors to ensure selection of appropriate health CVs. If the maximum concentration reported for a chemical is less than the health CV, ATSDR concludes that exposure to that chemical is not of public health concern; therefore, no further data review is required for that chemical. However, if the maximum concentration is greater than the health CV, the chemical is selected for additional data review. Additionally, any chemicals detected that do not have relevant health CVs are also selected for additional data review.

CVs have not been developed for some contaminants and on the basis of new scientific information, other CVs may be determined inappropriate for a specific type of exposure. In those cases, the contaminants are included as COCs if current scientific information indicates exposure to those contaminants may be of public health concern.

The next step of the process requires a more in-depth review of data for each of the contaminants selected. Factors used in the selection of the COCs include the number of samples with detections above the minimum detection limit, the number of samples with detections above an acute or chronic health CV, and the potential for exposure at the monitoring location.

Appendix D

Response to Public Comments

Response to Public Comments

Q: I would like to know what is the status of Young's permit for hazardous waste generator?

A: A permit is not required to generate hazardous waste. Georgia hazardous waste regulations require Young to obtain a hazardous waste permit to investigate and clean up contamination resulting from solid waste management.

Q: When did hazardous waste generation or shipment resume?

A: The Young Refining Corporation public comment public health assessment stated that an annual compliance inspection done on July 29, 1997, revealed that Young had not generated or shipped hazardous wastes in the prior 2 ½ years. A news article published on March 12, 1998, stated that Young Refining Corporation is one of 21 chemical shippers recognized for safe rail transport of hazardous materials in 1997. This recognition was for materials that Young produces and ships to customers for use. Hazardous wastes are materials that Young uses that can no longer be used for their intended purpose because of their chemical or physical properties and are classified as hazardous wastes according to GA EPD hazardous waste rules. The Young Refining Corp public comment draft was referring to hazardous wastes. Young is a small quantity generator of hazardous wastes.