ENVIRONMENTAL BASICS AND COMMUNITY EMPOWERMENT WORKSHOP WORKBOOK

Saturday, July 9 2011

8:30 a.m. – 1:00 p.m.

TOPICS COVERED

- Environmental concerns in the North Birmingham neighborhoods
- Taking charge of your family's health by reducing risk from chemical exposure
- Resources to help families and communities produce change
- What other communities like yours have done to improve their neighborhoods
- Laws and programs that should protect you

Hosted by: Concerned Citizens of North Birmingham
Sponsored and Presented by:
U.S. EPA through the Technical Assistance Services for Communities (TASC) Program
Brian Holtzclaw • (404) 821-0697 • holtzclaw.brian@epa.gov

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Environmental Basics and Community Empowerment Workshop
U.S. EPA, Technical Assistance Services for Communities
July 9, 2011

Workshop Agenda

Environmental Basics and Community Empowerment Workshop
Technical Assistance Services for Communities
Workshop Agenda
July 9, 2011

Intended audience: Residents of North Birmingham neighborhoods

Participants in the workshop will learn about:

1. Environmental concerns in North Birmingham neighborhoods.
2. Taking charge of your family's health by reducing risk from chemical exposure.
3. Resources to help families and communities produce change.
4. What other communities like yours have done to improve their neighborhoods.
5. Laws and programs that should protect you.

Materials: Notebook of presentations, fact sheets and resource contacts

Facilitator: Michael Lythcott, TASC, Skeo Solutions

8:30 a.m. – 8:45 a.m.	**Open Registration**
8:45 a.m. – 9:00 a.m.	**Welcome and Introductions** • Purpose • Topics covered in the workshop • EPA's commitment to help the community *Michael Lythcott, Facilitator* *Councilwoman Maxine Parker, North Birmingham* *Brian Holtzclaw, U.S. EPA*
9:00 a.m. – 9:15 a.m.	**Introduction to TASC** • Purpose of the TASC program • What did the TASC team learn about community concerns from community interviews and background research? *Terrie Boguski, Skeo Solutions*
9:15 a.m. – 9:30 a.m.	**Environmental Justice** • Definition and history of environmental justice • Prioritizing environmental justice *Brian Holtzclaw, U.S. EPA*
9:30 a.m. – 10:30 a.m.	**Environmental Basics** **Chemical Exposure and Risk** • How do chemicals move in air, soil and water? • What are the risks of chemical exposure?

	<u>Environmental Basics (cont.)</u>
	
	Chemicals and the Walter Coke Plant
	• Specific potential contaminants of concern found at the Walter Coke plant
	  o Arsenic
	  o Polycyclic Aromatic Compounds
	• Where are chemicals likely to be found?
	
	Potential Health Effects from Contaminants of Concern
	• General explanation of potential health effects of contaminants of concern
	• How can you reduce your exposure?
	
	Terrie Boguski, Skeo Solutions
	
	Questions (15 min.)

10:30 a.m. – 10:45 a.m.	**<u>Break</u>**
10:45 a.m. – 11:00 a.m.	**<u>Review of Soil Sampling Results and Next Steps</u>** • Sampling and results • School and residential cleanups • Next steps *Brian Holtzclaw, U.S. EPA*

11:00 a.m. – 11:30 a.m.	**<u>Review of Regulations</u>**
	
	• Overview of environmental regulations that apply to the Walter Coke Facility
	  o Air (Clean Air Act)
	  o Water (Clean Water Act – National Pollutant Discharge Elimination System)
	  o Cleanup (Resource Conservation and Recovery Act)
	• Federal, state and local agency roles and responsibilities
	
	Brian Holtzclaw, U.S. EPA
	
	Questions (15 min.)

11:30 a.m. – 11:45 a.m.	**<u>Break</u>**
11:45 a.m. – 12:45 p.m.	**<u>Tools and Resources</u>** • Resources to help families and communities produce change • What other communities like yours have done to improve their neighborhoods *Michael Lythcott, Skeo Solutions* **Questions** (15 min.)
12:45 p.m. – 1:00 p.m.	**<u>Wrap Up and Next Steps</u>** *Brian Holtzclaw, U.S. EPA*

Environmental Basics and Community Empowerment Workshop Technical Assistance Services for Communities Workshop

July 9, 2011

Presenter Biographies

Brian Holtzclaw

Brian Holtzclaw serves as a Community Engagement Coordinator in EPA Region 4's RCRA Division. RCRA (Resource Conservation and Recovery Act) is the program that addresses hazardous waste related issues with active facilities. Brian has over twenty-five years experience in federal/state government environmental agencies, as well as the manufacturing industry sectors. He has worked directly with communities, helping citizens that have may have been directly or indirectly impacted by air, soil, surface water, ground water, and/or sediment contamination.

Brian currently provides assistance to several disadvantaged communities that host RCRA operating facilities in the Southeast. This includes the neighborhoods that are adjacent to the Walter Coke facility and other industries in N. Birmingham. He also served as Chair of the Region's Environmental Justice Team, Chair of a national multi-agency task force to promote community revitalization issues. Brian is very active in community issues, volunteering in a leadership capacity with several non-profit agencies over the years.

Brian is committed to the partnering of local, regional, state, federal government agencies, industrial and non-governmental organizations to achieve environmental results. Brian has been recognized externally and internally for his contributions.

Mr. Holtzclaw graduated with a Chemical Engineering BS degree from Georgia Tech.

Michael Lythcott

Michael is a Senior Associate in Skeo Solutions' Collaborative Solutions Group and is a skilled facilitator, mediator, curriculum developer and trainer. He works with clients to develop targeted outreach strategies for productively engaging with stakeholders. He also builds innovative models for collaboration between communities and their better-resourced project partners.

Michael's vast experience as a mediator and facilitator helps to bring stakeholders with diverse values together to find collaborative solutions to shared problems and tough issues they face. Through an iterative process of facilitated discourse and mutual discovery, Michael helps our clients remain focused on acceptable, productive approaches often in the presence of striking differences. By becoming more comfortable and effective while interacting in the presence of "business-as-usual" cultural and situational differences (e.g., industry/government/grassroots), our clients become better able to manage similar situations on their own.

Michael is an expert in the area of Cultural Competence in both the domestic and international arenas. He is also a recognized, national expert on neighborhood relocation, property value impacts and other real estate related issues that arise based

on the proximity of residential neighborhoods to operating industrial facilities and contaminated sites.

Michael is the former Vice-Chair of the Waste and Facility Siting Subcommittee of the National Environmental Justice Advisory Council (NEJAC) and former Vice Chairman of the National Black Environmental Justice Network (NBEJN). Michael has been a visiting faculty member at Georgetown University for their advanced training program for Intercultural trainers; at Colorado State University, Department of Hydrology; at The New York School for Industrial and Labor Relations at Cornell University; and at Oberlin College, where he delivers the Environmental Justice Lecture twice annually for their Environment and Society series.

Terrie Boguski

Terrie Boguski is an accomplished environmental professional and world recognized life cycle assessment practitioner. Terrie has over 20 years of experience in the environmental field as a technical director, program manager, author, and educator. Ms. Boguski focuses her expertise on assisting companies and communities in developing their sustainable practices.

For Skeo Solutions, Ms. Boguski provides technical assistance to community groups under EPA's Technical Assistance Services for Communities (TASC) Program. In this role, Ms. Boguski provides technical assistance, educational materials and presentations to community groups on a number of environmental topics. Terrie is currently working with communities in Kansas and Massachusetts.

In the area of life cycle assessment (LCA), Ms. Boguski conducts LCA studies and life cycle greenhouse gas inventories (carbon footprints) on product systems for industrial clients. In 2008-2010, she conducted LCAs for several confidential clients, as well as carbon footprint studies for Verso Paper. In 2009, Ms. Boguski conducted a life cycle carbon footprint of the National Geographic magazine. She is currently working on LCA studies for other major companies. Terrie resides in Kansas and provides LCA educational presentations in classroom and workshop settings at Kansas State University.

PowerPoint Presentation

Environmental Basics and Community Empowerment Workshop

WELCOME AND INTRODUCTIONS

Purpose

To provide environmental basics and community empowerment. Topics include:

1. Environmental concerns in the North Birmingham neighborhoods
2. Taking charge of your family's health by reducing risk from chemical exposure
3. Resources to help families and communities produce change
4. What other communities like yours have done to improve their neighborhoods
5. Laws and programs that should protect you

Workshop Agenda

- **Welcome and Introductions** (*Brian Holtzclaw*)
- **Introduction to TASC** *(Terrie Boguski)*
- **Environmental Justice** *(Brian Holtzclaw)*
- **Environmental Basics** *(Terrie Boguski)*
- **Review of Soil Sampling Results and Next Steps** *(Brian Holtzclaw)*
- **Review of Regulations** *(Brian Holtzclaw)*
- **Tools and Resources** *(Michael Lythcott)*
- **Wrap Up and Next Steps** *(Brian Holtzclaw)*

What is EPA?

- The United States Environmental Protection Agency (EPA)
- A federal agency committed to protecting human health and the environment by enforcing regulations based on laws passed in Congress

EPA Encourages Community Engagement

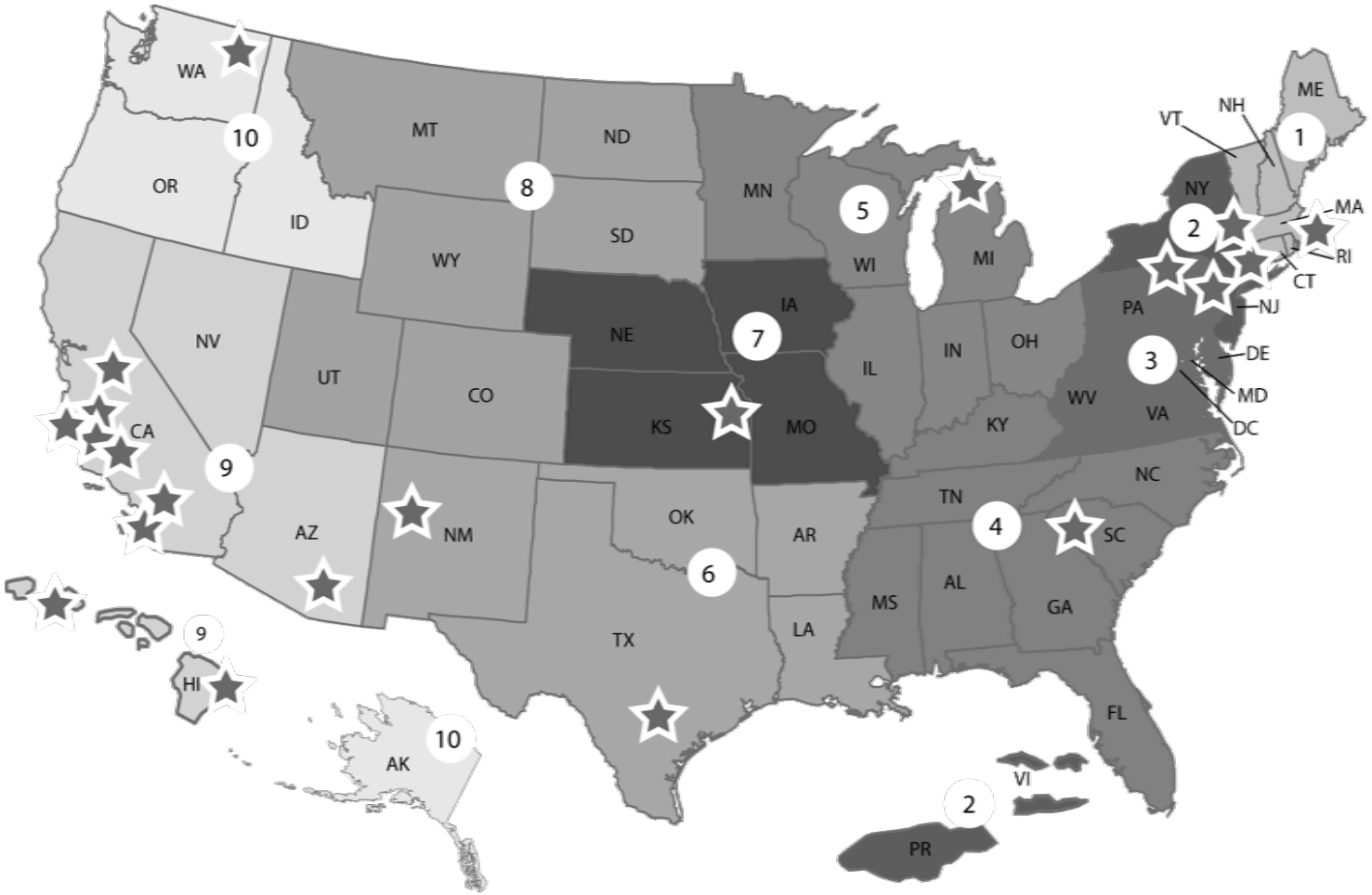
North Birmingham is one of the top targeted areas for community engagement in the Southeast by the EPA RCRA Division's Corrective Action program.

INTRODUCTION TO TASC

TASC Program

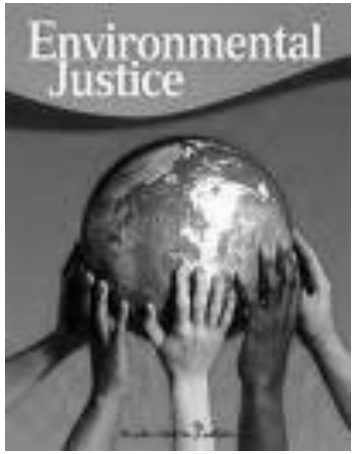
- National Program funded by EPA Headquarters to provide:
  - Information assistance
  - Community education
  - Technical expertise
  - Technical assistance needs evaluation and plan development
  - Superfund Job Training Initiative

TASC Program



TASC Needs Assessment Report Results

- Community concerns:
  - Potential contaminants coming from plant
  - Potential health effects of these contaminants
  - Risks from fumes, odors and dust from the plant
  - Methods of reducing risk from fumes, odors and dust
  - Scope of state and federal regulations that apply to Walter Coke



ENVIRONMENTAL JUSTICE

What is Environmental Justice?

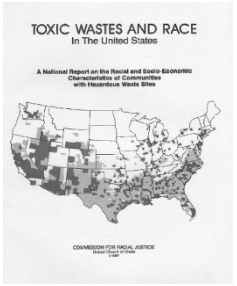
EPA has defined Environmental Justice as the **fair treatment** and **meaningful involvement** of all people regardless of race, color, national origin, or income as the administration develops, implements and enforces federal laws, regulations and policies.

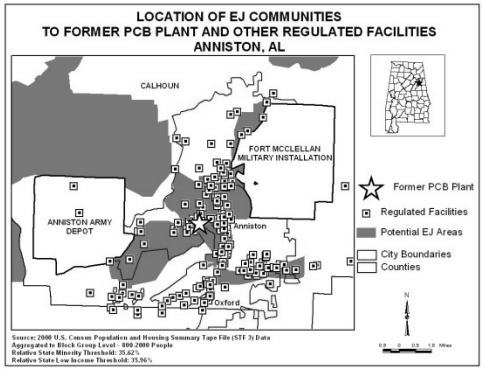
– U.S. EPA

ENVIRONMENTAL JUSTICE

Roots of Environmental Justice

Environmental justice represents the convergence of two of the greatest social movements of the latter half of the twentieth century (i.e., the civil rights movement and the environmental movement). Many groups emerged post 1982.



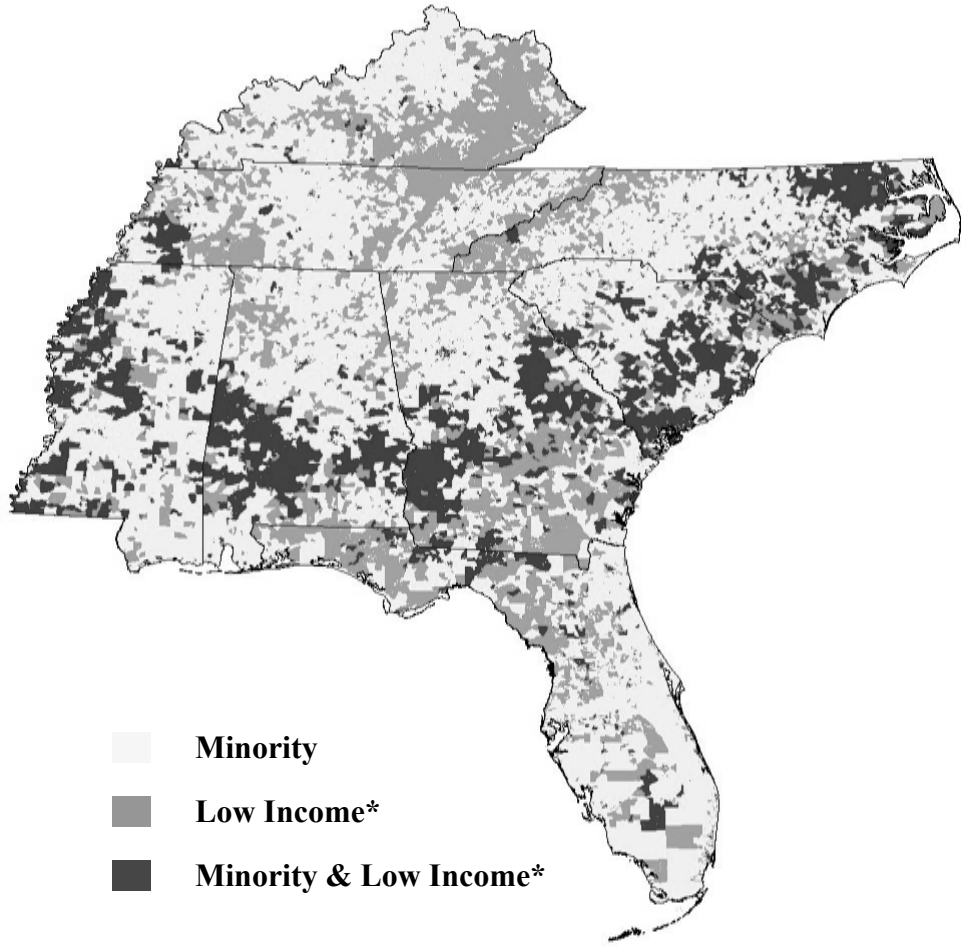


Why Prioritize Environmental Justice?

- **Morally Right Thing To Do!**
- **Constitutional Right to Equal Protection Under the Laws**
  - Clean water, air, and land are not parochial
- **Clean Air Act, Clean Water Act, and CERCLA have inherent inclusion message:**
  - No one should bear undue burden

ENVIRONMENTAL JUSTICE

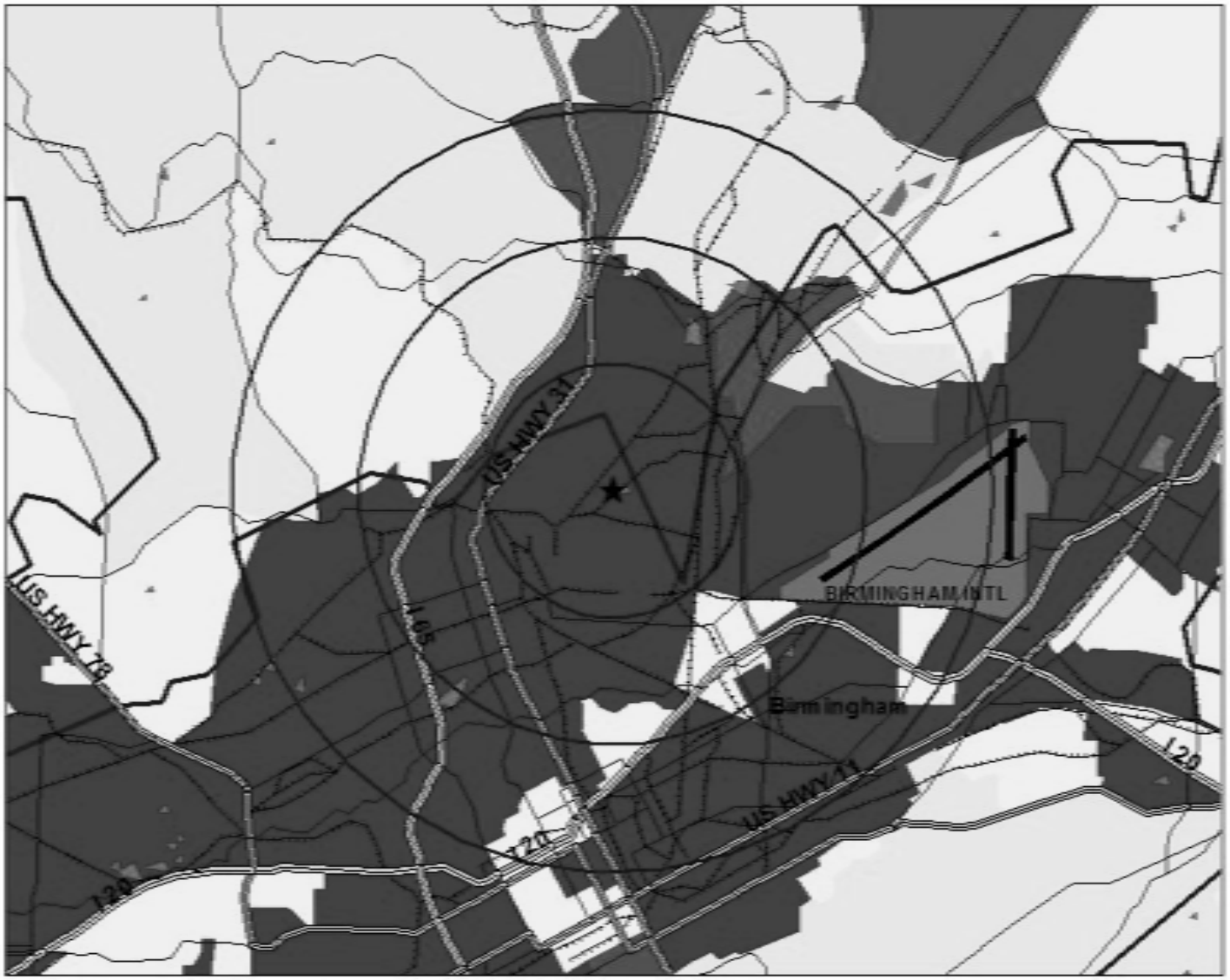
Environmental Justice Communities in the Southeast

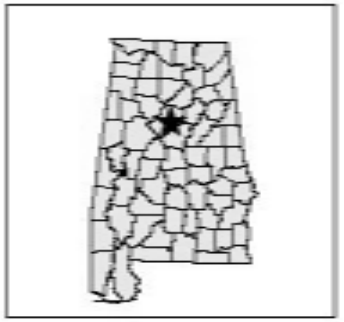


*Low Income < $15,000/year

ENVIRONMENTAL JUSTICE

POTENTIAL EJ AREAS AROUND WALTER COKE, ALABAMA





Site Location
1, 2, 3mi. Buffer Zones
Major Streams
Railroads
County Boundaries
Indian Lands

Potential EJ Areas
Low Income
Minority
Minority/Low Income
Non-EJ Areas

N

0.4 0 0.4 0.8 Miles

Source: 2000 U.S. Census Population and Housing Summary Tape File 3 (STF3) Data
Aggregated to Block Group Level

Relative State Minority Threshold: 35.62%
Relative State Low Income Threshold (20K): 35.96

EPA REGION 4
OFFICE OF ENVIRONMENTAL ACCOUNTABILITY

EPA Priority to Environmental Justice

"We have begun a new era of outreach and protection for communities historically underrepresented in EPA decision-making… We must include environmental justice principles in all of our decisions... The protection of vulnerable subpopulations is a top priority, especially with regard to children."

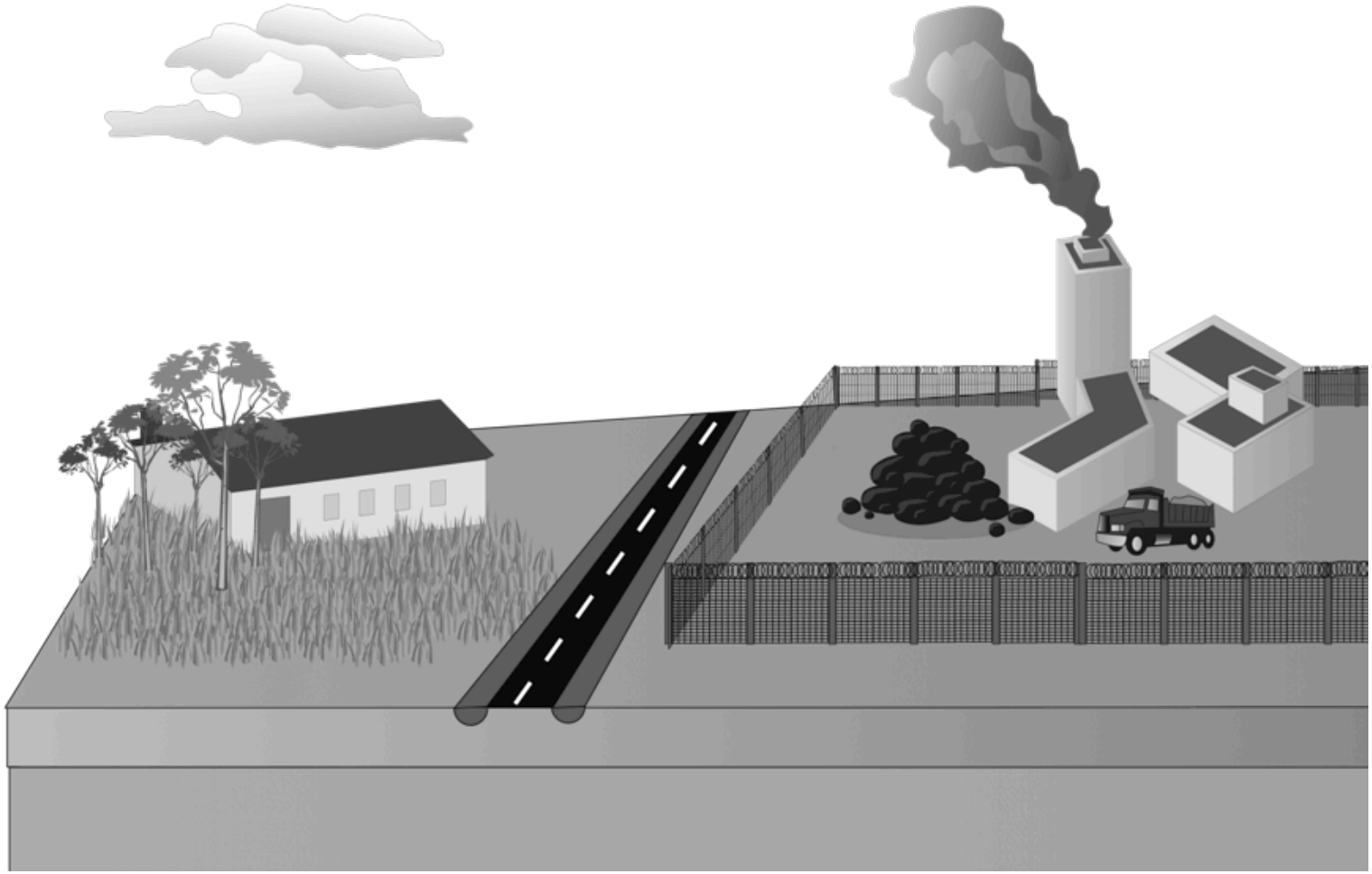
- EPA Administrator Lisa Jackson

"To the greatest extent practicable and permitted by law,… each Federal agency shall make achieving environmental justice part of its mission…"

- Presidential Executive Order 12898

ENVIRONMENTAL BASICS

How Do Chemicals Move in the Environment?



What Happens When Chemicals Spill?

Chemicals can:

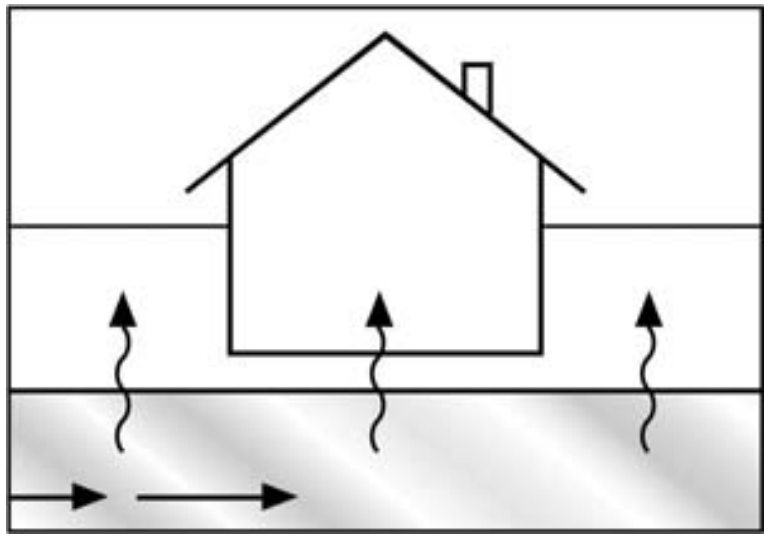
- volatilize into the air
- stick to the soil
- run off into streams or lakes
- percolate down through the soil
  - float on the water table
  - sink under the aquifer
  - dissolve in the ground water
- be destroyed by natural processes

Air Pollution

- Small particles may be emitted from industrial processes
- Some chemicals volatilize into the air

Vapor Intrusion

- When chemicals in soil or ground water volatilize into the air, people in nearby structures may be affected by increasing concentrations trapped indoors



Soil Contamination

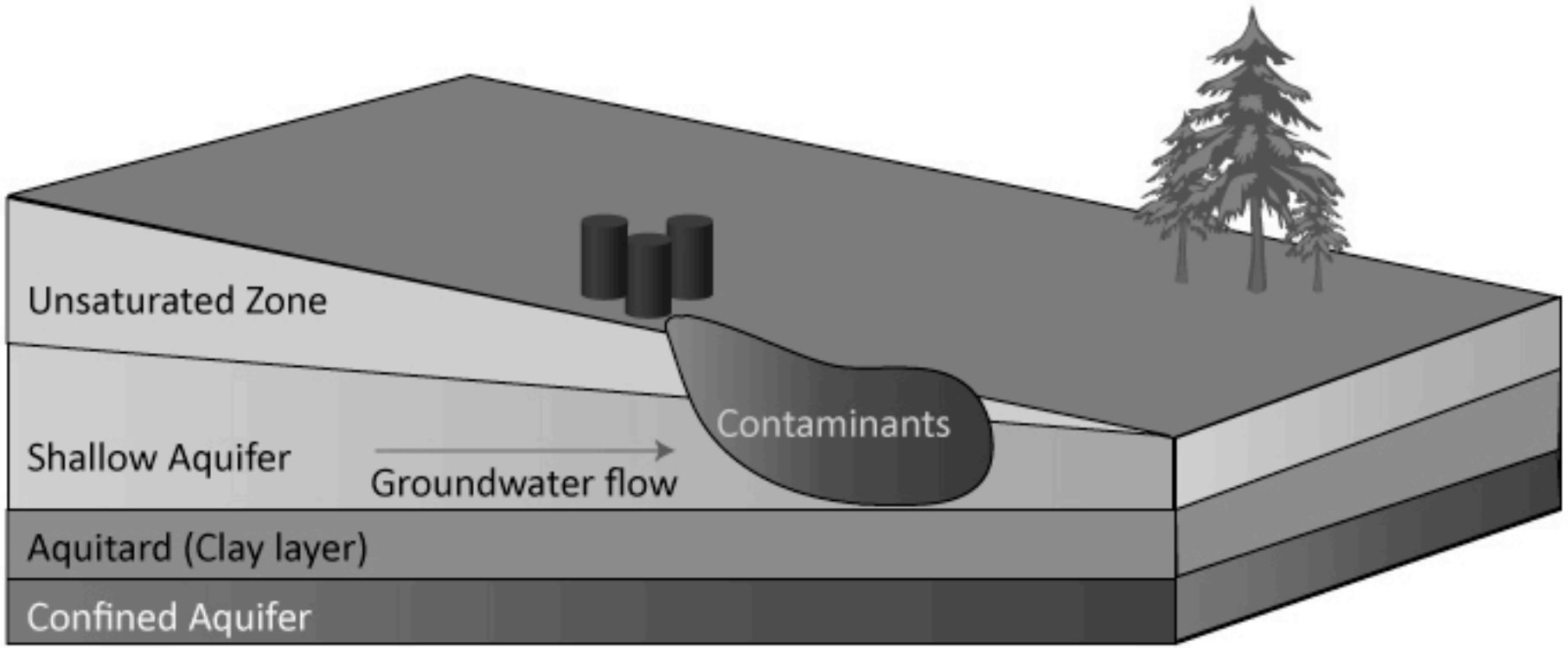
- When toxic chemicals remain in the soil, contact with the soil might be harmful to people

Runoff

- Flooding or heavy rain can cause contaminants to be carried by surface water from contaminated areas to other locations

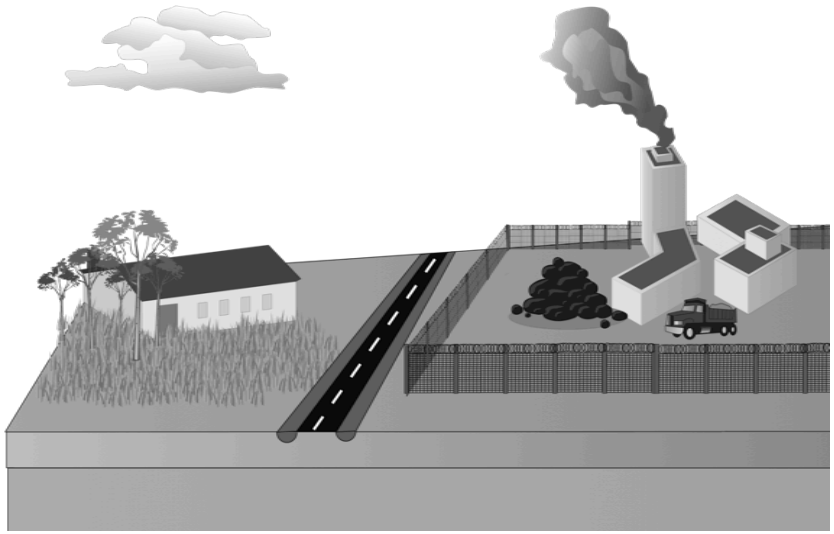
Ground Water Contamination

- Chemicals might move through the soil and dissolve in, float on top of, or sink below ground water
- People using ground water for drinking might be at risk



Potential Contaminants of Concern at This Time

- Arsenic
- Polycyclic aromatic compounds (PAHs)



What Happens to Arsenic?

- An element that does not degrade in the environment, though it might react with other elements and change form
- Moves readily through the environment
- Emitted as a fine dust when arsenic-containing ores are heated
- Elementary arsenic does not dissolve easily in water, whereas arsenic compounds might readily dissolve (solubility)

What Happens to Polycyclic Aromatic Hydrocarbons (PAHs)?

- Do not volatilize readily into air at normal temperatures (low volatility)
- Do not dissolve very much in water (low solubility)
- Usually found in soil or waste materials (low vapor pressure)
- Heavier than water; sink in ground water (high specific gravity)
- Move slowly in the environment (low vapor pressure)

Avoiding Risk

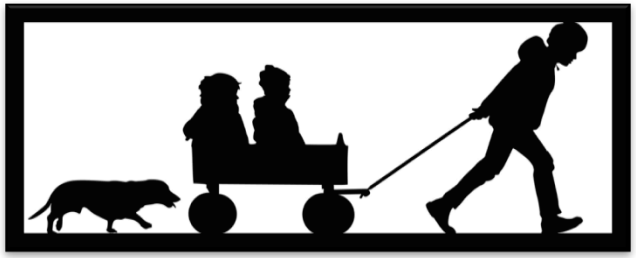
- Remediation or cleanup techniques at contaminated sites are often "risk-based." This term means that steps are taken to prevent exposure to the contaminants, thus preventing the risk of health effects.

- Personal steps can also be taken to reduce risk from contaminants that might be present in the environment.

Risk Happens When…

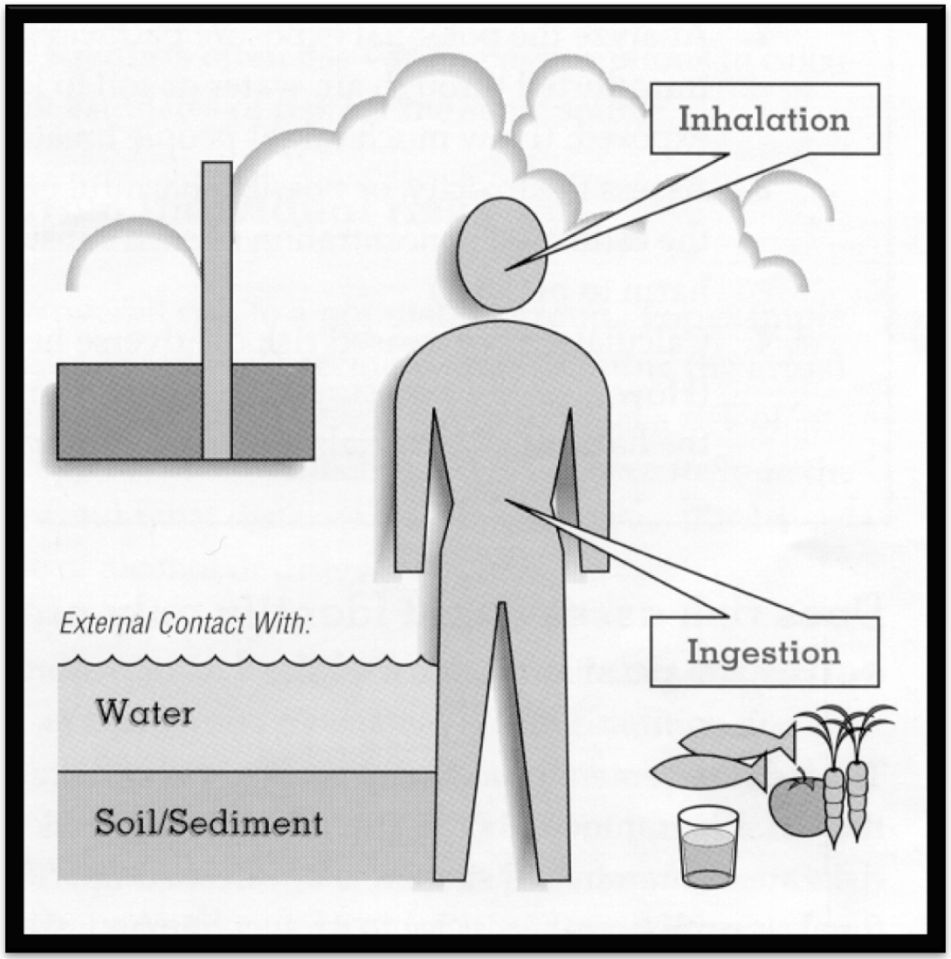
1. Contaminants exist
2. Concentrations are high enough

3. There is a pathway for exposure



4. There are people present who might be exposed

Exposure Pathways



- Inhalation
- Ingestion of
  - soil, ground water, contaminated food
- Absorption through skin

How to Remove Exposure Pathways

- Pollution prevention and control
- Institutional controls:
  - restrict land use, prohibit drinking water wells
- Engineered barriers:
  - parking lots, clean soil cover, clay or man-made caps, barrier walls
- Control activities:
  - ground water pumping
    - to prevent ground water from contacting contaminated soil or to prevent migration of ground water

Risk Management

- Goal – to reduce contaminant concentrations at the point of exposure to acceptable levels by:
  - Controlling or removing the source
  - Treating or containing contamination
  - Eliminating exposure pathways

Risk Management

- Every contaminated site is different. Decisions need to be made based on the specific conditions of the site and specific risk factors.

Arsenic: Overall Health Effects

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Breathing high levels:
  - Sore throat or irritated lungs
- Ingesting high levels:
  - Can result in death
- Skin contact:
  - Can cause redness and swelling

Arsenic: Overall Health Effects

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Exposure to low levels:
  - Nausea and vomiting
  - Decreased production of red and white blood cells
  - Abnormal heart rhythm
  - Damage to blood vessels
  - Sensation of “pins and needles” in feet

Arsenic and Cancer

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Studies have shown that ingestion of inorganic arsenic can increase the risk of:
  - Skin cancer
  - Cancer in the liver, bladder and lungs
- Inhalation can cause increased risk of lung cancer

Arsenic and Cancer

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Department of Health and Human Services and EPA have determined that inorganic arsenic is a known human carcinogen
- International Agency for Research and Cancer has determined that inorganic arsenic is carcinogenic to humans

PAHs: Overall Health Effects

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Exposure to high levels:
  - Eye irritation
  - Nausea and vomiting
  - Diarrhea
  - Confusion
  - Skin irritation and inflammation

PAHs: Overall Health Effects

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- Exposure to low levels over a long time:
  - Asthma-like symptoms
  - Cataracts
  - Kidney damage
  - Liver damage and jaundice
  - Skin redness and inflammation
  - Increased risk of skin, lung, bladder and gastrointestinal cancers

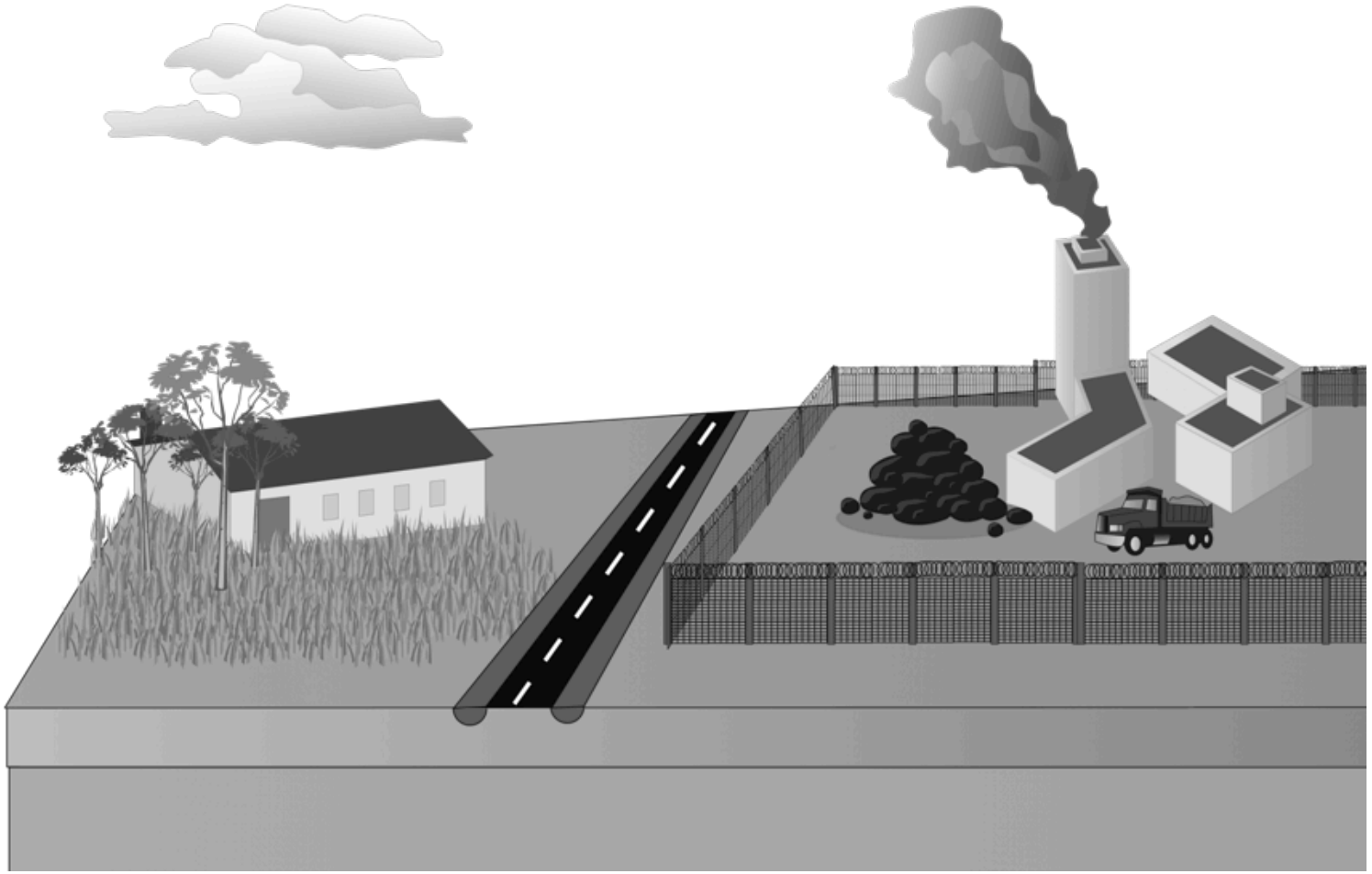
PAHs and Cancer

Citation:

Agency for Toxic Substances and Disease Registry (ATSDR)

- People who have breathed or touched mixtures of PAHs and other chemicals over long periods of time have developed cancer
- Department of Health and Human Services has determined that some PAHs might reasonably be expected to be carcinogens

How Can You Reduce Your Exposure?



Reduce Exposure to

- Contaminated soil
  - Avoid getting soil in your mouth; wash often
  - Keep young children and pets away from bare earth areas and garden soil known to be contaminated
  - Avoid breathing contaminated dust; stay indoors, close windows when dust is blowing
  - Keep yards vegetated and driveways covered
  - Remove shoes; keep soil and dust outside
  - Use damp-mop and damp-cloth cleaning methods
  - Use a HEPA filter vacuum cleaner for indoor cleaning
  - Change furnace filters in timely manner

Reduce Exposure to

- Water runoff
  - Avoid contact with surface water suspected of being contaminated
  - Avoid areas where water runoff might have deposited contamination
  - Avoid activities that cause airborne dust in areas where water runoff might have deposited contamination

Reduce Exposure to

- Garden soil
  - Test garden soil for suspected contaminants, if possible
  - Avoid gardening in moderately or heavily contaminated soil
    - Plants growing on PAH-contaminated soils might contain PAHs in their tissues
    - Plant arsenic concentrations tend to increase with increasing soil arsenic
  - Wash garden produce thoroughly to remove soil
  - Keep young children and pets away from garden soil known to be contaminated
  - Wet soil to prevent dust

The Environment and Asthma

- Bad air can trigger asthma attacks
  - On bad air days, stay inside and reduce activity
  - EPA keeps tabs on local air quality across the country through its daily **Air Quality Index**
  - Check online at
    - Jefferson County Department of Health http://www.jcdh.org/EH/AnR/AnR03.aspx
    - EPA's Air Now http://www.airnow.gov/index.cfm?action=airnow.local_city&cityid=1

JCDH

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ALABAMA

KEEP KIDS SAFE THIS SUMMER
MEN'S HEALTH
JUNE IS HOME SAFETY MONTH
2010 ANNUAL REPORT
TANNING, TATTOOS AND TAMALES

24-Hour contact number for reporting health emergencies
(205) 933-9110

AIR QUALITY MAY BE UNHEALTHY FOR SENSITIVE GROUPS

HOME A-Z INDEX CONTACT US SEARCH ▶

- Clinical Services
- Disease Control
- Immunization
- Environmental Health
- Storm Water Management
- Air Quality Forecast/Index
- Inspection Services
- Food Protection
- Health Action
- Health Education
- Birth/Death Certificates
- Emergency Prep & Response
- Health Information
- Policy, Grants and Assessment
- CPPW Grant
- International Program
- Programas Internacionales
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- Links

Birmingham Area Air Quality Forecasts

Date	Air Quality Index Forecast	Responsible Pollutant
Friday, July 01, 2011	Unhealthy Sensitive Groups	Ozone
Saturday, July 02, 2011	Unhealthy Sensitive Groups	Ozone
Sunday, July 03, 2011	Unhealthy Sensitive Groups	Ozone

Forecast Discussion

Friday: AIR QUALITY ALERT! The upper ridge will continue to build into the area from the west, which will continue the hot and dry conditions. Skies will be clear with a few clouds developing during the afternoon hours. Winds will be from the southeast around 5 mph. Calm winds and a good amount of radiational cooling on Thursday night will lead to a morning inversion, which will bump up PM2.5 concentrations early in the day. Ozone will be in the orange range of the AQI, which triggers an air quality alert. PM2.5 will be in the yellow range of the AQI. ML

Saturday-Sunday: AIR QUALITY ALERT SATURDAY & SUNDAY! An upper ridge will span from the desert SW to the SE. Thus, it will be a hot weekend as temperatures reach the upper 90s both days. Moisture will gradually increase over the course of the weekend with a few scattered clouds developing during the afternoon hours. There will be a very slim chance for an isolated shower on Sunday with a little bit more moisture and instability in place. Winds will be very light and variable throughout the weekend. The AQI for Ozone is expected to be in the orange range on Saturday and Sunday, which will trigger an air quality alert both days. The AQI for PM2.5 is expected to be in the yellow range over the entire weekend. ML

Note: Forecast available by e-mail, **phone** (205)933-0583 , **or on** Twitter.

Daily Air Quality Index Report

Date: Friday, July 01, 2011
24-hr Collection Period Ending at: 02:00 PM

Today's Air Quality Information	
Air Quality Index	93
Primary Pollutant	Ozone
Air Quality Description	Moderate

Done Internet 100%

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AIRNOW

LOCAL AIR QUALITY CONDITIONS AND FORECASTS

Zip Code: Go State: Alabama Go

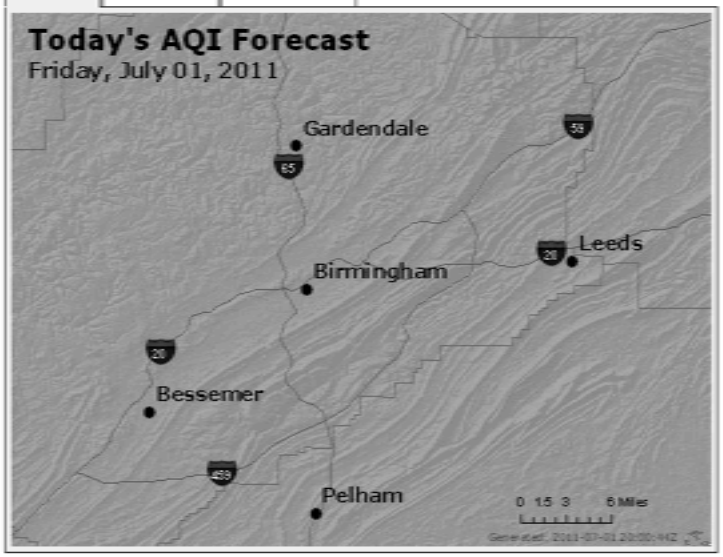
U.S. Air Quality Summary (text)

AIRNow Home >> Alabama >> **Birmingham**

Data courtesy of: Alabama Department of Environmental Management, Jefferson County Department of Health

BP Oil Spill Information - Air Monitoring on Gulf Coastline

Forecast | Current AQI | AQI Animation



Good | Moderate | USG | Unhealthy | Very Unhealthy | Hazardous | ! Action Day

Air Quality Forecast

Today's High	Tomorrow's High
Air Quality Index (AQI): 111 — Unhealthy for Sensitive Groups	Air Quality Index (AQI): 111 — Unhealthy for Sensitive Groups
Health Message: Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.	**Health Message:** Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.
! ACTION DAY	! ACTION DAY

AQI - Pollutant Details

Today's High	Tomorrow's High
Ozone ! 111 Unhealthy for Sensitive Groups	Ozone ! 111 Unhealthy for Sensitive Groups
Particles (PM2.5) 75 Moderate	Particles (PM2.5) 62 Moderate

Forecast Discussion: Saturday-Sunday: AIR QUALITY ALERT SATURDAY & SUNDAY! An upper ridge will span from the desert SW to the SE. Thus, it will be a hot weekend as temperatures reach the upper 90s both days. Moisture will gradually increase over the course of the weekend with a few scattered clouds developing during the afternoon hours. There will be a very slim chance for an isolated shower on Sunday with a little bit more moisture and instability in place. Winds will be very light and variable throughout the weekend. The AQI for Ozone is expected to be in the orange range on Saturday and Sunday, which will trigger an air quality alert both days. The AQI for PM2.5 is expected to be in the yellow range over the entire weekend. ML

Local Air Quality Resources

Alabama Partners for Clean Air | Birmingham Air Quality E-mail (EnviroFlash) | Birmingham Area Air Quality Forecast | Real-time Air Quality Data

State Air Quality Resources

Alabama Department of Environmental Management
Alabama Department of Environmental Management - Air Quality
Alabama Department of Environmental Management Contacts
Alabama Highest Daily 1-Hour Average Ozone Values
Alabama Highest Daily 8-Hour Average Ozone Values
American Lung Association (ALA) of Alabama

Current Conditions

Air Quality Index (AQI)
observed at 14:00 CDT

101 **Unhealthy for Sensitive Groups**

Health Message: Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.

AQI - Pollutant Details

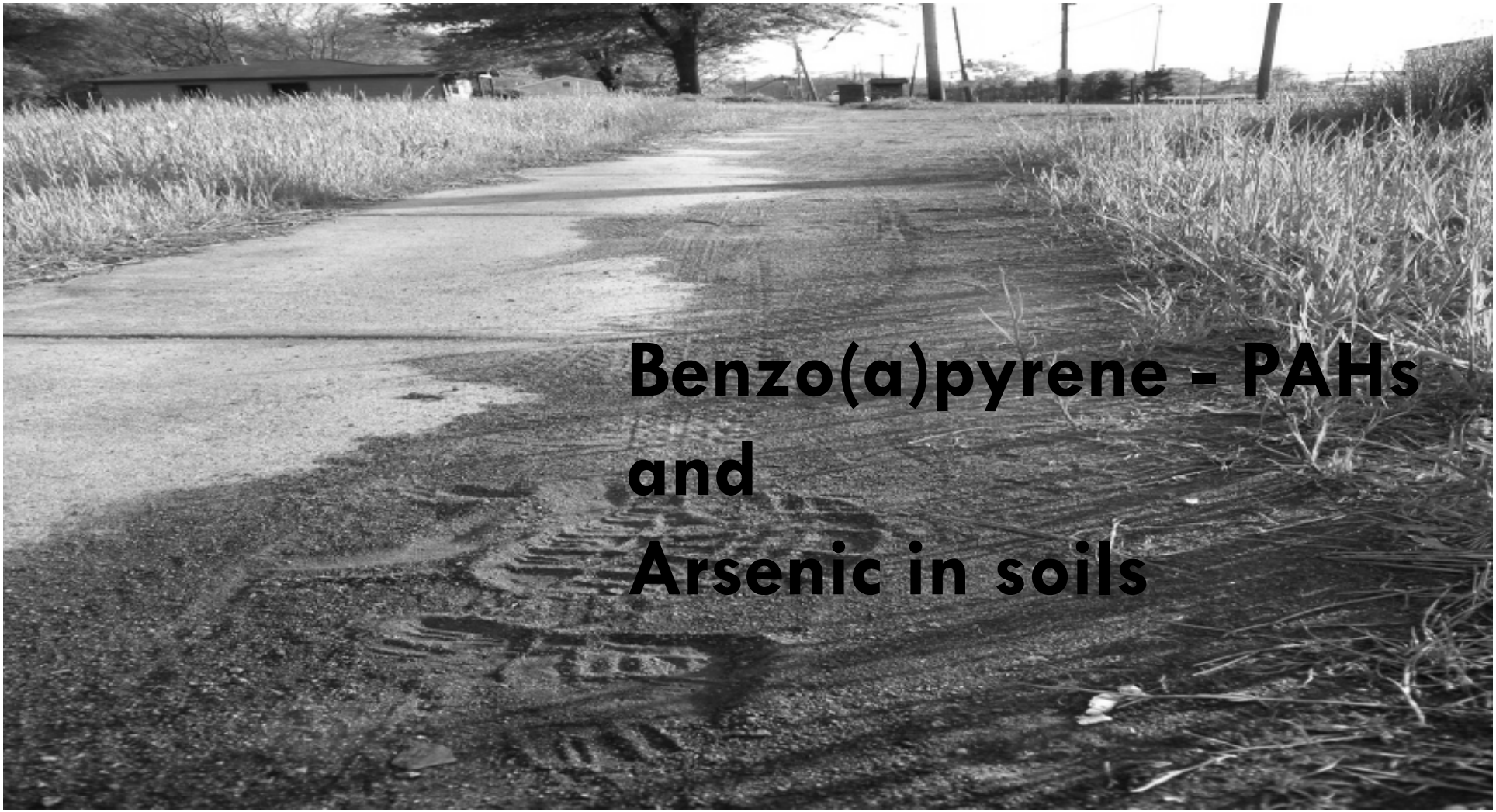
Done | Internet | 100%

REVIEW OF SOIL SAMPLING RESULTS and NEXT STEPS

Soil Sampling Event (2009)

A total of 66 residential properties were sampled along with four schools.

Targeted Chemicals of Potential Concern



Results

21 properties out of 76 properties

> cleanup level of 1.5 mg/kg for BaP (28%)

3 properties out of 76 properties

> cleanup level of 37 mg/kg for arsenic (4%)

Schools

- **Hudson and Former Carver High School exceeded both arsenic and BaP**
- **Riggins School exceeded only BaP cleanup level**
- **Calloway School was below EPA's cleanup number for BaP and arsenic**

School Cleanup

Slated for Cleanup

√ Hudson K-8 Former and New School

√ Opportunity School at Riggins

Former Carver High School (City of B'ham)

No Cleanup Required

Calloway Head Start School (Leased to JCCEO)

Residential Cleanup

Targeted for Cleanup

√ 23 homes that exceeded cleanup levels

Next Steps

"Community" Soil Testing and Replacement Work

• New Agreement - Will focus on Walter Coke and EPA's RCRA overall environmental work outside the fence-line of the facility. After being drafted, a meeting and a public comment period will be conducted.

• New additional sampling and cleanup - A new workplan will be designed for how to execute additional sampling and cleanup in neighborhoods. After being drafted, a meeting and public comment period will be conducted.

"Inside the Facility Fence-line" Ongoing Work

EPA RCRA will continue working with Walter Coke regarding on-site environmental issues related to cleanup.

REVIEW OF REGULATIONS

Preface

The following review of environmental regulations focuses on Walter Coke, not on other active facilities in Birmingham. The reason is that the TASC contract was awarded to assist the adjacent communities of the Walter Coke facility.


Clean Air Act
(CAA)
JCDH
JCDH
Air
Principal Environmental Laws that Walter Coke Inc. is subject to and overseeing agencies
Walter Coke Inc.
Clean Water Act
(CWA)
ADEM
ADEM
Water
Resource Conservation and Recovery Act
(RCRA)
3008 (h)
Enforcement Order
EPA
Waste

Current Regulations

- Cleanup – Resource Conservation and Recovery Act "RCRA" *(lead is EPA Corrective Action program)*
- Air – Clean Air Act *(delegated to Jefferson County Department of Health)*
- Water – Clean Water Act *(delegated to Alabama Department of Environmental Management)*

Cleanup Regulations
RCRA versus Superfund (CERCLA)

RCRA

- Focuses on prevention and remediation of releases from currently operating facilities

Superfund

- Addresses uncontrolled releases of hazardous substances often from facilities no longer in operation where contamination resulted from past practices*

* Superfund is not currently triggered

RCRA Stages

- RCRA Facility Assessment (RFA)
  - Limited research of existing information
- RCRA Facility Investigation (current stage)
  - Initial "Grid-based" statistical investigation for residential sampling
  - "Full characterization" of extent and nature of contamination
- Interim Measures/ Corrective Measures Study/Final Remedy (Cleanup)

TOOLS AND RESOURCES

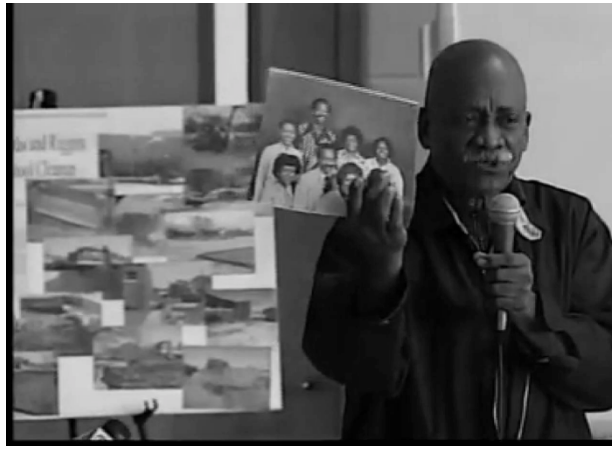
You Are Already Making A Difference!

In Unity There is Strength

- Environmental justice communities just like you have organized themselves all over the country.
- You have taken your first steps and are getting up to speed.
- The media attention that you have is a huge benefit of being steadfastly on the case!
- You are many voices, yet one voice!

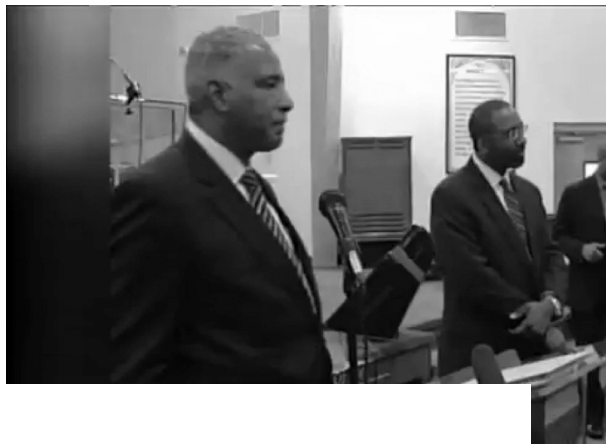
Important Steps You Have Taken

- You came together to SPEAK UP about needed CHANGE



Important Steps You Have Taken

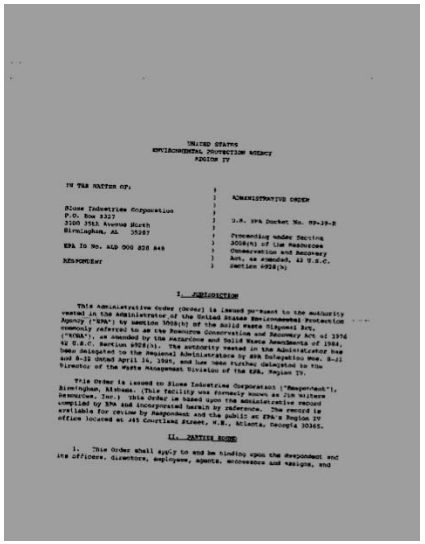
- You REACHED OUT to those who could help DO SOMETHING



UAB

ATSDR Agency for Toxic Substances & Disease Registry

Important Steps You Have Taken



UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION IV

IN THE MATTER OF:

Sloss Industries Corporation
P.O. Box 8327
3100 35th Avenue North
Birmingham, AL 35207

EPA ID No. ALD 000 826 848

RESPONDENT

ADMINISTRATIVE ORDER

U.S. EPA Docket No. RCRA-3-2

Proceeding under Section 3008(a) of the Resource Conservation and Recovery Act, as Amended, 42 U.S.C. Section 6928(a)

I. JURISDICTION

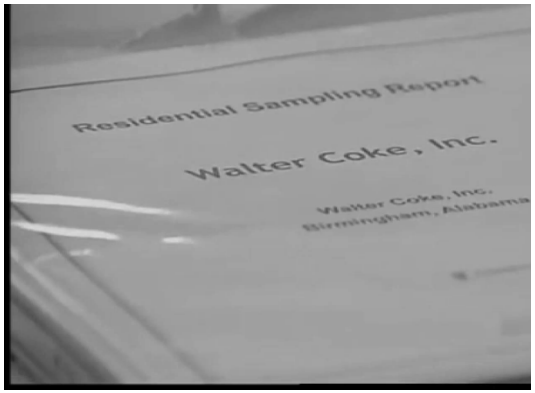
This Administrative Order (Order) is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency ("EPA") by section 3008(a) of the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 ("RCRA"), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. Section 6928(a). The authority vested in the Administrator has been delegated to the Regional Administrators by EPA Delegation Nos. 8-31 and 8-32 dated April 16, 1984, and has been further delegated to the Director of the Waste Management Division of the EPA, Region IV.

This Order is issued to Sloss Industries Corporation ("Respondent"), Birmingham, Alabama. (This facility was formerly known as Jim Walters Resources, Inc.) This Order is based upon the administrative record compiled by EPA and incorporated herein by reference. The record is available for review by Respondent and the public at EPA's Region IV office located at 345 Courtland Street, N.E., Atlanta, Georgia 30365.

II. NATURE BOUND

1. This Order shall apply to and be binding upon the Respondent and its officers, directors, employees, agents, successors and assigns, and

- You produced real change in real time!



You Are Not Alone!

"Huge Environmental Justice Victory in Anniston, Alabama"

- Community Against Pollution *Anniston, Alabama*

"The Struggle Continues for Dixon County, Tennessee"

You Are Not Alone!

"Youth Group Shuts Down Toxic Waste Facility"

-Youth United for Community Action (YUCA) Palo Alto, California

"Del Amo Superfund Cleanup Plan Proposed"

-Del Amo Action Committee Torrance, California

You Are Not Alone!

Current Partners		
Collegeville, Harriman Park, and Fairmont Neighborhood Associations	Southeast Pediatric Environmental Health Specialty Unit – Emory University	City of Birmingham (City Council)
Jefferson County Committee for Economic Opportunity	U.S. EPA, Air Division and Office of Environmental Justice, Children's Health Program	Agency for Toxic Substances and Disease Registry
Birmingham School District	UAB – School of Nursing	Black Warrior Riverkeepers
Housing Authority of the Birmingham District (North Birmingham Homes and Collegeville Center)	Alabama Department of Environmental Management (ADEM)	U.S. EPA, RCRA Division, Community Engagement Program
Birmingham Southern College	Jefferson County Department of Health	

Keep On Keeping On!

- **The First Law of Physics**: "Objects at rest have a tendency to stay at rest. Objects in motion have a tendency to stay in motion."
- **Keep Learning:** We will make the information more understandable.
- **Keep Organizing:** A community united can never be defeated!
- **Keep a Positive Dialogue** going with your industrial neighbors.

Keep On Keeping On!

- Keep the youth involved:
  - give them internet research to do at the library
  - encourage them to ask questions and find answers
- Keep meeting with the Walter Energy folks:
  - strive to ask better questions and get better answers
  - strive to better understand their “corporate culture”
- Keep spreading the word and gaining support:
  - Write letters to those that can bring resources
  - Encourage the Press!

Take Advantage of the Following

- U.S. EPA Office of Environmental Justice http://www.epa.gov/compliance/ej/grants/index.html
- U.S. EPA CARE program http://www.epa.gov/CARE/
- Environmental Support Network http://envsc.org/
- Southern Partners Fund http://www.spfund.org
- U.S. EPA Environmental Justice Website http://www.epa.gov/environmentaljustice/
- Southwest Network for Environmental and Economic Justice (Southwest Network) http://www.sneej.org/
- U.S. EPA, Using Dispute Resolution to Address Environmental Justice http://www.epa.gov/adr/case-study-report ADR in EJ.pdf

Good Quotes to Remember

- "An Informed Citizenry is the cornerstone of this democracy." -Thomas Jefferson
- "Well, at least I've got my health!" – Trad.
- "I ain't no ways tired!" – Trad.
- "If not us, then who? If not now, then when?"

WRAP UP AND NEXT STEPS

Community-Speceific
Information

Technical Assistance Services for Communities
Contract No.: EP-W-07-059
TASC WA No.: TASC-3-HQ-RCRA-001
Technical Directive No.: TASC-3-HQ-RCRA_001

Walter Coke Facility Community Technical Assistance Needs Assessment
May 2011

I. Introduction

The U.S. Environmental Protection Agency (EPA) Region 4 issued a Technical Directive under the Technical Assistance Services for Communities (TASC) contract to Skeo Solutions (the TASC prime contractor) to provide technical assistance and educational support to the community impacted by the Walter Coke Facility (the Facility) in Birmingham, Alabama.

The first step under the Technical Directive was to conduct phone interviews with residents of the Fairmont, Collegeville and Harriman Park neighborhoods to identify the community's potential technical assistance needs and develop this Technical Assistance Needs Assessment (TANA). During February and March 2011, TASC staff interviewed five residents. The interview questions are provided in Attachment 1. The interviews were conducted confidentially; the names of the interviewees are not included in this report. Additional community needs were identified during an April 27, 2011 site visit with EPA Region 4 staff. The multi-day site visit originally planned was truncated due to severe weather at the end of the first day.

This TANA summarizes the anecdotal findings of the assessment interviews and site visit meetings. The TANA concludes with a summary analysis and recommendations for TASC community assistance. The community concerns, needs and recommendations identified in this TANA represent a small sample of residents at two specific points in time. The technical assistance needs identified in this document may change while TASC is mobilized and interacting with a larger sector of the community and over time. It is also important to note that Walter Coke and EPA Region 4 RCRA Office may enter into agreements and adopt plans that will impact the recommendations made in this TANA.

Site Background and Cleanup

The area surrounding Walter Coke has been the location of heavy industrial use for many decades, and the Facility itself has been the site of coke plant activities for more than a century. Walter Coke, formerly Sloss Industries, began operations at the facility property in 1881, with coke plant operations underway in 1920. Today, Walter Coke produces furnace and foundry coke and slag fiber. Additional information on the history of the Facility is available at: http://www.walterenergy.com/operationscenter/coke/coke-history.html.

Walter Coke entered into a Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order on Consent with EPA in 1989 regarding off site contamination from the plant. Walter Coke recently completed an initial phase of a soil contamination evaluation in the

Fairmont, Collegeville and Harriman Park neighborhoods and is developing a cleanup plan for contaminated residential soils.

Concerns Raised by Residents Interviewed

Interviewees were asked to summarize their concerns regarding the Facility. The following is a synopsis of their responses, organized by topic. Similar comments made by multiple residents have been combined.

Particulates/Dust:

All interviewees have concerns about the past and current presence of dust/particulates emanating from the Facility that settle on community schools, homes, porches, yards, gardens and cars.

- Many residents are unable to hang clothes outside to dry due to the dust. Those that do are often concerned that the clothing may be coated in contaminants that can then come in contact with their skin.
- There is a perception that the dust is like a black cloud over the community that coats everything.
- The dust settles in local gardens and people are concerned that it may impact the food grown there.
- Residents are afraid to let their children play outside due to the risk of dust/particulate inhalation. There have been many instances of asthma in youth cited in the area.
- Residents do not understand why there is no adequate air monitoring going on in the communities that are proximate to the Facility.

Waste Mineral Wool Piles/Flame:

- There are many tall ash piles (the EPA term for these piles is "waste mineral wool piles") in the community that residents believe should be removed.
- On some nights, a bright flame (a flare) from the Facility lights up all homes in the area. Residents expressed concerns about the brightness of the light at night and the emissions from the flame.

Health Issues:

- Interviewees are concerned that there appears to be a high rate of cancer in the community. It was mentioned by residents that many community members suffer from respiratory issues, and several must use a breathing apparatus.
- Interviewees explained that there has been an increase in cases of asthma, both in young people and some adults.
- Interviewees are concerned about arsenic levels in the soil and the fact that not all residential yards were tested.
- Interviewees wonder if the testing done was "comprehensive": whether it looked for all of the harmful chemicals in the Facility's permitted discharge.

- Interviewees who have heard that the remediation plan calls for a "checkerboard" approach to soil replacement do not understand how yards on either side of their homes can be contaminated while their yard is considered to be free from contamination. "Spot" samples taken may have missed contamination in adjacent, untested portions of the yards.
- There is a mosquito issue in the community. Interviewees are concerned that standing water breeds mosquito-related illnesses.
- The broader community has not yet received direct information from Walter Coke regarding how the company is currently protecting the health of the community from pollution and/or plans to increase protection of the health of the community in the future (e.g., investment in pollution prevention or better technology).

Economic Issues:

- The majority of interviewees are aware of potential pollutants from the Facility. With limited resources, they are unable to move out of the neighborhoods.
- Interviewees noted that it is difficult to sell a home in the neighborhoods and have been told that home values are particularly low because of their proximity to the Facility and the ash piles.
- There are abandoned houses in the neighborhoods. The area has low desirability due to both the perception and reality (i.e., findings from recent studies) of contamination.
- Residents feel as though it is difficult to attract new businesses to the area due to the perception and reality (i.e., findings from recent studies) of contamination.
- Some residents must drive at least five miles to reach a grocery store.

School-Related Concerns:

- There is one new school in the community (the Hudson K-8 School). The community perceives that the school is contaminated, given that the new school and school site was constructed using contaminated dirt taken from the old school.
- Residents believe the Birmingham City School Board and/or the Birmingham City School District should provide more oversight and assistance to students residing in the neighborhoods regarding the perception and reality of contamination in the area. This could include ensuring the safety of children in relation to air and soil contamination at schools.[1]
- Interviewees stated that the community would like for the new G.W. Carver High School to be tested.[2]

[1] This is especially important in light of the recent airing of a documentary film about the presence of contamination in local schools and residential yards and what was referred to as "lax" oversight by regulatory agencies.
[2] EPA noted that the closed and abandoned old G.W. Carver High School was tested in 2009 and had unacceptable levels of contamination. School fencing was secured in 2010 to restrict access.

II. Community Needs

This section summarizes interviewees' information needs regarding facility-related environmental and health issues.

- Information on the contaminants/chemicals potentially present in the community from facility operations and how to protect the community's health.
- Information on the black dust/particulates, its constituents and its potential effects on humans and the environment.
- Information on the Facility's manufacturing process, pollution controls, pollution monitoring, byproducts and production schedule.
- Information on how the Jefferson County Health Department is regulating and monitoring air emissions from the Facility and how they are protecting residents' health.
- Information on how the community can collaborate/participate with EPA (or other regulatory agencies) in their decision-making processes with Walter Coke to ensure better and more equal protection of human health and the environment in the future.[3]
- Training on formal community organizing, increasing meeting attendance, methods for spreading information, assistance with grant proposals and the formation of an independent Community Advisory Group (CAG).
- Summaries of technical documents in layman's terms.
- Results from air monitoring tests conducted in the area.
- Results from soil testing conducted in local schools and residential yards.

III. Community Recommendations for Technical and Educational Assistance

This section summarizes the types of technical and educational assistance of potential interest to the community. The recommendations are organized by topic.

Soil Contamination Information:

- Interviewees were interested in better understanding the results of the soil sampling.
- Interviewees were also interested in potential dangers associated with a positive result for arsenic (or other contaminant) in a neighbor's yard when not all yards were tested.

Health and Risk Education:

- Interviewees requested information on the potential contaminants that are present in the dust/particulates that settle on clothes and gardens and the potential health effects of those contaminants.

[3] Possible examples of participation with agencies included submitting valid public comments to weigh in on EPA-proposed action-related documents and increasing dialogue with Jefferson County Health Department regarding local air pollution.

- Interviewees were interested in understanding if the increased incidences of cancer and asthma surrounding the Facility are related to chemicals present at the Facility.
- Interviewees requested general information on the contaminants at the Facility as well as an overview of the Facility's operation and production schedule.
- Some interviewees expressed interest in learning more about the materials present in the waste mineral wool piles, locally known as ash piles.
- Interviewees would like more information about the flare that is sometimes present at the Facility and about which chemicals are being burned off.

Community Group Organizing:

- Several interviewees expressed interest in learning more about community organizing and in particular the formation of a CAG that would include Walter Coke, but is not sponsored by the company.

IV. How to Best Communicate with the Community

Several community members interviewed do not have e-mail addresses or access to computers. The following non-electronic methods of communication/information distribution were recommended by the interviewees:

- Phone
- Mail
- Contact with EPA staff
- Networking with churches via church bulletins
- Door-to-door

V. Recommendations for TASC Community Assistance

It is important to understand the core issue that residents currently face regarding residential and school contamination and which appears to be at the root of many of their concerns and fears: the black particulate that settles over the community is both visible and ubiquitous. If the black particulate is the source of the contamination, and the soot is everywhere, how can some yards be contaminated and some yards not be contaminated?

Community residents interviewed expressed interest in access to understandable information regarding the potential contaminants present in their neighborhoods, the activities conducted and materials used at the Facility, and results from testing conducted to date. In addition, several community members expressed a desire to learn about community organizing, information distribution and the formation of a CAG.

Based on information gathering and analysis of the community interviews, the technical assistance services listed below could be provided to help address the community's stated needs and priorities. The fact sheets and information materials described below could be prepared and distributed prior to the proposed community information meeting and workshop.

1. **Community Fact Sheets** to address key information areas identified in the community interviews that are specific to Walter Coke, including:
   - Potential contaminants of concern based on Walter Coke's permitted discharge.
   - The composition of the waste mineral wool (ash) piles located in the community and any related health concerns.
   - An overview of the soil testing process and findings including:
     - A list of constituents evaluated.
     - Why the constituents tested were selected as opposed to other constituents that are known to be a part of the plant's emissions.
     - How the presence of airborne contaminants in soils could vary from yard to yard.

The fact sheets would be written in plain language and formatted for a community audience, referencing similar sites in other communities for comparison as appropriate.

2. **Community Information Meeting and Workshop(s)** staffed by experts in the recommendations discussed above to answer community members' questions. A workshop could also be held to build local organizational capacities, share strategies for successful information sharing, support community efforts to pursue grant opportunities and other resources, and provide information regarding the potential establishment of a CAG

3. **Facility Information Materials** to provide the community with an overview of the Facility's operations and production schedule, including feedstock, processes and byproducts, and to summarize any potential off site environmental or health risks associated with the Facility's operations. Specific information would need to be provided about the Facility's flare, including the compounds burned and their impact on air quality. Facility information should include Material Safety Data Sheets (MSDS) for reportable on-site chemicals and the most recent Toxics Release Inventory (TRI) performance data.

4. **Regulatory Agency Information and Materials** to provide the community with an overview of the relevant RCRA process, and an understanding of the air monitoring process including applicable regulations and permitting overseen by the Jefferson County Health Department and the Board of Education.

5. **Testing Results and Remediation Plan Updates** to provide a summary of all testing and findings completed to date. The agreement reached between Walter Coke and EPA Region 4 regarding residential remediation should be explained to the community in detail with ample opportunity for questions and answers to address community concerns.

6. **Increased Community Participation with Regulatory Agencies:**
   - Assist the community in organizing input and submitting valid public comments/concerns to EPA on upcoming 2011 documents related to future community soil sampling and cleanup activities.
   - Inform the community of the ongoing steps of the RCRA process at Walter Coke, highlighting opportunities for the community to submit their concerns and timely public comments.

- Assist the community in increasing dialogue with other regulatory agencies, such as the Jefferson County Health Department, Agency for Toxic Substances and Disease Registry (ATSDR), and Alabama Department of Environmental Management (ADEM) on topics such as the review of the Facility's current air permit, regulated and unregulated emissions, and monitoring.
- Discuss potential methods to increase direct, constructive dialogue with Walter Coke.

VI. TASC Contact Information

TASC Facilitator
Michael Lythcott
(732) 580-7532
tlc@lythcott.com

TASC Associate
Tiffany Reed
(847) 770-2753
treed@skeo.com

ATTACHMENT 1 – ASSESSMENT INTERVIEW QUESTIONS

Introduction:
Hello my name is Michael J. Lythcott and on the phone with me is Tiffany Reed. We are contractors working for the United States Environmental Protection Agency (EPA). Brian Holtzclaw and the Walter Coke Project staff at EPA Region 4 have asked us to call selected residents to better understand the communities' needs and issues with regards to the Walter Coke Facility. Would you be willing to answer some questions about your concerns surrounding the Facility?

Our discussion today will be confidential. Tiffany and I will prepare a summary of what we hear from all of the community members we speak with, but will not use your name in summarizing what is said. The purpose of this conversation is to give you the opportunity to candidly discuss your concerns and needs.

We work on a national contract with EPA called TASC, which stands for Technical Assistance Services for Communities. We are hoping to identify specific needs for technical or educational assistance in your community so that these needs can be addressed. We also want to let EPA know the most efficient ways to engage your community in discussions about the Walter Coke Facility.

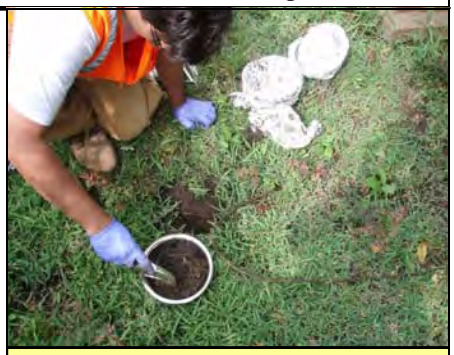
1. General contact information (phone, e-mail, address, title in the community, or who representing; how long lived near Walter Coke?)
2. What are your concerns about the Facility?
    a. Technical
    b. Social
    c. Safety/health & the Facility's environmental performance
    d. Economic
    e. Legal
3. What specific information do you want or feel a need to know about the Facility and its effects on your community? (topics below)
    a. Health concerns, for example:
        i. Smell, dust, fumes?
        ii. Exposure to harmful contaminants – what contaminants are present?
        iii. How to protect your health?
    b. Laws/Regulations that relate to the Facility, for example:
        i. What is RCRA [Resource Conservation and Recovery Act]?
        ii. How does it ensure protection of health and the environment?
        iii. How will the community be able to be involved?
        iv. What are the different roles of the county, state and federal agencies and how are they protecting our health and the environment?
    c. Testing results
        i. Findings from community testing of soil contamination in 2009
    d. Future Agency or contractor sampling
        i. How can we engage with the agencies during future sampling events?

4. What is the best way for you to receive this information? (meetings, newsletters, website, e-mails, etc.)
5. What types of technical and educational help would be beneficial for members of the community? Tell us if these are types of assistance you are interested in. Here are some examples. Which are most important to you?
    a. Understanding technical documents.
    b. Support in commenting on environmental plans related to the Facility.
    c. Understanding environmental health basics on chemicals of concern.
    d. Distribution of findings via understandable fact sheets.
    e. How to locally organize, communicate and collaborate better with state/federal agencies, the Facility and other concerned residents.
    f. Assistance from state or federal agencies for community training or education.
6. Do you have other suggestions for your community's technical assistance or education needs or issues?
7. Who else in the community would it be important for us to talk with to better understand the community's needs?

RESULTS OF COMMUNITY ENVIRONMENTAL SAMPLING AND PATH FORWARD ——
IN THE COLLEGEVILLE, HARRIMAN PARK AND FAIRMONT NEIGHBORHOODS, NORTH BIRMINGHAM, AL

Number 2 (CORRECTION—July 2011) **April 2011**

INTRODUCTION



An example of a soil sample being taken in a front yard.

The U.S. Environmental Protection Agency (EPA) is announcing to the community at large the results of environmental sampling conducted by Walter Coke (formerly, Sloss Industries) in the Summer of 2009. EPA previously released this information to community leaders and residents whose yards were sampled. EPA's goal is to keep the local community informed and engaged. Walter Coke agreed to sample yards, drainage areas and public areas in North Birmingham for chemicals of potential concern, namely arsenic (As) and Benzo(a)pyrene toxicity equivalents (BaP TEQ). The purpose was to investigate the presence of these chemicals of potential concern in soil. EPA provided oversight of these sampling activities in the adjacent neighborhoods of the facility.

FINDINGS

In the Summer of 2009, soil samples were collected at numerous properties. After an in-depth laboratory analysis of the soil samples, a Walter Coke sampling report, rigorous EPA review and comments, and EPA risk assessor evaluations, the results show some levels of As and BaP TEQ is present above EPA's cleanup levels at some of the school and residential properties sampled.

School Properties

EPA notified the school district verbally in Spring 2010, then formally in October 2010.

- **Riggins Alternative School:** EPA determined that BaP TEQ was above cleanup levels at several sampling points. Follow-up action included re-sampling, soil removal, and soil and grass replacement by Walter Coke.
- **Hudson K-8 School:** EPA determined that BaP TEQ was above cleanup levels at several sampling points for the former school. Follow-up action included re-sampling at the new school, soil removal, and soil and grass replacement by Walter Coke.
- **Carver High School:** EPA determined that BaP TEQ and arsenic was above the cleanup level. The school district has restricted access with security fencing until soil removal is implemented.
- **Calloway Head Start School:** BaP TEQ and arsenic were not detected at or above EPA's cleanup level.

Residential and Other Properties

From the overall sampling results of 76 properties (included residential yards, schools, Public Housing, rights-of-way, a church, and off-site Walter Coke property), EPA identified about 30% (previous version mistakenly stated 35%) of properties above cleanup levels in Collegeville, Harriman Park and Fairmont neighborhoods.

In November 2010, EPA and ATSDR (Agency for Toxic Substances Disease Registry—a health agency) held one-on-one information sessions with the residents of the properties that were sampled in 2009 to personally explain the results. A broader environmental information session is scheduled for May 19, 2011, to explain the sampling results, soil cleanup action, and future sampling to the community at large.

Internet Links

Be sure to visit http://www.epa.gov/region4/foiapgs/readingroom/index.htm as documents related to this sampling event become available.

Additional Actions:

- Walter Coke will be releasing a cleanup report for both Hudson K-8 and the Opportunity Academy at Riggins in early summer 2011.

School cleanup actions at Hudson K-8 School, March 2011.

- EPA reports that Walter Coke has agreed to the cleanup of 23 properties (previous version mistakenly stated 27 properties), which are above the soil cleanup levels. It is anticipated that soil removal and replacement will begin in summer 2011.
- EPA is working on a new legal document for Walter Coke. The purpose of the document is to extend the environmental soil assessment and cleanup in the neighborhoods surrounding the facility. Public comments on this document will be invited.
- ATSDR is making a final determination about the safety of gardening. This health agency is evaluating soil data during their "Health Consultation" process.
- Details of additional actions will be presented at the community meeting on May 19th, 2011.

Basis of Investigation

The Congressional law, the Resource Conservation and Recovery Act (RCRA) authorizes EPA to require facilities to examine the nature and extent of their potential pollution that may endanger human health or the environment. Currently, the lead regulatory program on this sampling matter is the EPA's RCRA Corrective Action program in the Southeast Region 4 Office in Atlanta.

Health Questions

The Agency for Toxic Substances and Disease Registry (ATSDR) is our lead federal agency on public health issues.

A one-on-one information session, November 2010.

For the public, ATSDR has created Fact Sheets on frequently asked health questions on Arsenic and Polycyclic Aromatic Hydrocarbons (PAHs), related to the two chemicals of potential concern. To view these 2 Fact Sheets produced by ATSDR on the internet, please refer to the following web-site pages:

Arsenic http://www.atsdr.cdc.gov/tfacts2.pdf

PAHs http://www.atsdr.cdc.gov/tfacts69.pdf

For More Information

Please contact the following individuals:

EPA Community Engagement

Brian Holtzclaw, (404) 562-8684 or by e-mail to holtzclaw.brian@epa.gov

ATSDR (Federal Health Agency)

Dana Robison; 770-488-3744 (office), or by e-mail to ihh6@cdc.gov

Walter Coke, Inc. Communications

Michael Monahan, (205) 745-2628 or by e-mail to mmonahan@walterenergy.com

Frequently Asked Questions

Number 2 – Corrected Version April 2011

Results of Community Environmental Sampling: Collegeville, Harriman Park and Fairmont Neighborhoods, North Birmingham, AL

Note: Please refer to EPA's Fact Sheet (Number 2) for a general overview.

TOP QUESTIONS

- **Where was the 2009 environmental sampling conducted?**
  In July 2009, the soil-sampling event was conducted at 76 selected properties located in the communities of Fairmont, Collegeville, and Harriman Park. Additionally, 4 local North Birmingham schools had soil testing: the former Carver High School, the former Hudson School, Riggins Alternative School, and the Calloway Head Start School.

- **What are the chemicals of potential concern for the recent 2009 sampling investigation?**
  The chemicals of potential concern in this investigation were Polycyclic Aromatic Hydrocarbons (PAHs), measured as Benzo(a)pyrene toxicity equivalents (BaP TEQ), and Arsenic.

- **What were the overall findings of the 2009 sampling investigation and 2010 re-sampling conducted by Walter Coke?**

  School Properties
  EPA determined that BaP TEQ was above soil screening levels at several sampling points at the Opportunity School at Riggins, former (now demolished) Hudson School and new Hudson School, and former Carver High School. EPA determined that arsenic was above the soil screening level at one sampling point at the former Carver High School and in the play area at the Former Hudson School. There was no exceedance of either chemical at the Calloway Head Start School. Laboratory results of the sampling investigation at the four schools were discussed both verbally (in April/May 2010) and in writing with the Birmingham City School District Superintendent and his staff (letter dated October 1, 2010). Coordination with the School District to address the findings is ongoing.

  The Hudson school property was re-sampled in August 2010 because of the construction activity that had taken place there as part of the new Hudson School. Re-sampling indicated that contaminants were present in soils on the side of the school and in back of the school at levels requiring cleanup.

  In March 2011, Walter Coke removed impacted soil from the front of the school and in the back of the school to a depth of two feet. Clean soil was placed in excavation and sod grass was planted over the soil.

In April 2011, Walter Coke is removing soils contaminated with PAHs around the Opportunity School at Riggins to a depth of two feet. Over 20,000 sq ft of soil will be removed.

Residential Properties

The overall findings of sampling of 76 properties (included 65 residential yards, Public Housing, rights-of-way, a church, drainage ditches, and off-site Walter Coke property) in Collegeville, Harriman Park and Fairmont neighborhoods are as follows:

Soil Sampling Results AT or ABOVE Screening Levels

Arsenic – 1 of 70 properties BaP TEQ – 24 of 70 properties

Note that 191 samples were collected at these 70 properties. For each property, 1-6 composite samples of soil were collected. The number depended upon on the layout of the yards on each property (some houses had no backyard, etc). EPA noted a property was "at" or "above" if any sample from the property was at or above the screening level for Arsenic or BaP TEQ.

- **What are soil screening levels?**

  The investigation compared detected concentrations of the 2 chemicals of potential concern in soil to screening levels. The soil screening levels are conservative risk-based values developed by EPA that are health-based. The levels used are those that may be associated with a 1 in 10,000 (1×10^{-4}) increased cancer risk over a lifetime. Based upon the sampling results compared to screening levels, and other factors, EPA will determine whether further investigation or cleanup is warranted. Being above a particular screening level indicates further evaluation may be necessary, but does not necessarily mean that any further action or cleanup is warranted.

- **What are soil cleanup levels?**

  A cleanup level is a concentration of one or more chemicals in which a risk of cancer or non-cancer health effects will be reduced or eliminated once removed. Cleanup levels are based on risk based exposure calculations. EPA has chosen a cleanup level for BaP TEQ at a concentration of 1.5 mg/kg or a risk level of 1E-4 or a 1:10,000 chance of developing a cancer. EPA has chosen a cleanup level for inorganic arsenic at 37.0 mg/kg with a hazard index of 1 or 1E-4 to 1E-5 risk range. Using these cleanup levels compared against the 2009 sampling results, EPA identified about 30% (or 23) properties above cleanup levels in the Collegeville, Harriman Park and Fairmont neighborhoods *(previous version stated 35%).*

- **What are the potential health effects of the chemicals of potential concern from this investigation (Arsenic and BaP TEQs)?**

  The Agency for Toxic Substances and Disease Registry (ATSDR) is EPA's lead federal agency on public health issues. To help answer health questions, please contact Dana Robison with ATSDR at (770) 488-3744, or the ATSDR Hotline at 1 (888) 422-8737.

  ATSDR has created Fact Sheets on frequently asked health questions on Arsenic and Polycyclic Aromatic Hydrocarbons (PAHs), related to the two chemicals of potential concern for which the soil was tested. To view information on the human health aspects of these chemicals, please refer to these 2-page Fact Sheets produced by ATSDR at the following

web-site pages:

Arsenic http://www.atsdr.cdc.gov/tfacts2.pdf
PAHs (BaP TEQ) http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=121&tid=25

- **What are next steps?**

Short Term
On November 3-5, 2010 EPA held "one-on-one" private Information Sessions with the property owners or renters of the properties that were sampled to answer questions about their sampling results letters. At the Information Sessions other organizations were present such as: Agency for Toxic Substance and Disease Registry (ATSDR), Alabama Department of Environmental Management (ADEM), the Jefferson County Department of Health (JCDH) and Walter Coke.

At a public forum on May 19, 2011, EPA presented the findings and planned next steps to the broader community.

Short-term plans include evaluating the need for additional sampling and potential cleanup. The public will be updated on any new developments.

Long-Term
Long-term plans include: 1) development of an overall environmental action plan with Walter Coke to address the chemicals of potential concern; 2) work with ATSDR on any public health related matters associated with the chemicals of potential concern; and 3) provide opportunities for the public to meaningfully engage in this process.

OTHER QUESTIONS

- **Which government agency was responsible for the oversight of the recent Community Environmental Sampling Event?**
The U.S. Environmental Protection Agency (EPA) is a federal agency whose mission is to protect human health and the environment. The Resource Conservation and Recovery Act (RCRA) authorizes EPA to require facilities to examine the nature and extent of their potential pollution that may endanger human health or the environment. Currently, the lead regulatory program on this sampling matter is the EPA's RCRA Corrective Action program located in the Southeast Region 4 Office in Atlanta, Georgia.

- **Who is Walter Coke, Inc.?**
Walter Coke (formerly Sloss Industries) has been operating in this area since 1920, processing coal to produce coke for fuel use in blast furnaces and foundries in the steel industry. Sloss Industries (now Walter Coke) entered into a RCRA Section 3008(h) administrative order on consent with EPA in 1989 to assess potential contamination regulated by RCRA on and/or off-site from operation of the facility. Walter Coke is cooperating with EPA in the soil evaluation in the Fairmont, Collegeville, and Harriman Park communities.

- **Is Walter Coke the source of the chemicals found in the soil samples?**
EPA believes that Walter Coke is at least partially responsible for the chemicals of potential

concern found in the soil samples. EPA may never reach a final determination on all of the sources of the chemicals of potential concern found in the soil samples. This area of Birmingham has been the location of other industries that could also have contributed to the detected chemicals of potential concern. In addition, a number of non-industrial sources, such as car, railroad and airplane exhaust, residential application of pesticides or use of other household or yard products, or ashes from grilling or home heating could also have contributed to the detected chemicals of potential concern.

- **How was the soil sampling conducted?**
  For each property, a composite soil sampling approach was used. The sampler took five individual samples from the selected property (e.g., front yard, back yard, garden), mixed the 5 samples together to form a composite sample for each yard, and then this composite sample was analyzed by a laboratory. In play areas and in vegetable gardens, separate soil samples were taken and not composited. EPA provided oversight during the sampling.

- **Why did it take until 2010 to release the 2009 sampling results?**
  On June 26, 2009, at a picnic and barbeque hosted by Walter Coke and EPA, the residents were given an outline of the residential sampling plan. In July 2009, the sampling event began. The time-consuming steps that followed the 2009 sampling event included a lengthy technical and administrative process. This included: an in-depth laboratory analysis and validation of the data; a draft sampling report submitted to EPA by Walter Coke; a rigorous EPA review and comments to the sampling report; an EPA risk assessor evaluation; determination of a risk screening level, and meetings between Walter Coke and EPA to evaluate the initial sampling results and discuss potential next steps. This process, which is necessary to ensure accuracy of the information, has taken time.

- **Where can I find more information?**
  As documents associated with this sampling become available on this EPA web-site, please refer to http://www.epa.gov/region4/foiapgs/readingroom/index.htm.

  The library-based information repository that has related materials to this sampling event may be viewed at the following location: *North Birmingham Regional Branch Library*; 2501 31st Ave North Birmingham, AL 35207 (205) 226-4025

For more information, please contact:

EPA Community Engagement:
Brian Holtzclaw, (404) 562-8684 or holtzclaw.brian@epa.gov

ATSDR (Federal Health Agency): Dana Robison (770) 488-3744 or DRobison@cdc.gov

Walter Coke, Inc.:
Mike Monahan at (205) 745-2628 or mmonahan@walterenergy.com

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Issue 2
October 2006

Understanding Units of Measurement

Terrie K. Boguski, P.E.

Technical environmental reports involving soil, water, or air contamination often report numerical values in units unfamiliar to people who don't routinely read these types of reports. The different units of measurement can be confusing. This brief is intended to help people understand measurement units they may see in technical environmental reports. Examples of typical units of measurement are given below.

Numbers
Million = 1,000,000
Billion = 1,000,000,000
Trillion = 1,000,000,000,000
One millionth = 0.000001
One billionth = 0.000000001
One trillionth = 0.000000000001

Mass
28 grams = about 1 ounce
1 kilogram (kg) = 1,000 grams
1 milligram (mg) = 1/1,000 gram = 0.001 gram
1 microgram (ug) = 1/1,000,000 gram = 0.000001 gram
1 nanogram (ng) = 1/1,000,000,000 gram = 0.000000001 gram
1 picogram (pg) = 1/1,000,000,000,000 gram = 0.000000000001 gram

Volume
One liter (L) = 1.06 quarts
One cubic meter (m^3) = 35.31 cubic feet (ft^3)
One cubic meter (m^3) = 1,000 liters (L)
One liter (L) = 1,000 milliliter (ml) = 1,000 cubic centimeters

Concentrations in Soil

Concentrations of chemicals in soil are typically measured in units of the mass of chemical (milligrams, mg or micrograms, ug) per mass of soil (kilogram, kg). This is written as mg/kg or ug/kg. Sometimes concentrations in soil are reported as parts per million (ppm) or parts per billion (ppb). Parts per million and parts per billion may be converted from one to the other using this relationship: 1 part per million = 1,000 parts per billion.

For soil, 1 ppm = 1 mg/kg of contaminant in soil, and 1 ppb = 1 ug/kg. A measurement of 6 mg/kg is the same as 6 ppm or 6,000 ppb, which is equal to 6,000 ug/kg.

Concentrations in Water

Concentrations of chemicals in water are typically measured in units of the mass of chemical (milligrams, mg or micrograms, ug) per volume of water (liter, L, l).

Concentrations in water can also be expressed as parts per million (ppm) or parts per billion (ppb). Parts per million and parts per billion may be converted from one to the other using this relationship: 1 part per million = 1,000 parts per billion.

For water, 1 ppm = approximately 1 mg/L (also written as mg/l) of contaminant in water, and 1 ppb = 1 ug/L (also written as ug/l). A measurement of 6 mg/L is the same as 6 ppm or 6,000 ppb, which is equal to 6,000 ug/L.

A way to visualize one part per billion (ppb) in water is to think of it as one drop in one billion drops of water or about one drop of water in a swimming pool. One part per million is about 1 cup of water in a swimming pool.

Occasionally, concentrations of chemicals in water may be written as grams per cubic meter (g/m^3). This is the same

as grams per 1,000 liters, which may be converted to milligrams per liter (mg/L). Therefore, 1 g/m^3 = 1 mg/L = 1 ppm. Likewise, one milligram per cubic meter (mg/m^3) is the same concentration in water as one microgram per liter (ug/L), which is about 1 ppb.

Concentrations in Air

Concentrations of chemicals in air are typically measured in units of the mass of chemical (milligrams, micrograms, nanograms, or picograms) per volume of air (cubic meter or cubic feet). However, concentrations may also be expressed as parts per million (ppm) or parts per billion (ppb) by using a conversion factor. The conversion factor is based on the molecular weight of the chemical and is different for each chemical. Also, atmospheric temperature and pressure affect the calculation.

Typically, conversions for chemicals in air are made assuming a pressure of 1 atmosphere and a temperature of 25 degrees Celsius. For these conditions, the equation to convert from concentration in parts per million to concentration in milligrams per cubic meter (mg/m^3) is as follows:

Concentration (mg/m^3) = 0.0409 x concentration (ppm) x molecular weight

To convert from mg/m^3 to ppm, the equation is as follows:

Concentration (ppm) = 24.45 x concentration (mg/m^3) ÷ molecular weight

The same equations may be used to convert micrograms per cubic meter (ug/m^3) to parts per billion (ppb) and vice versa:

Concentration (ug/m^3) = 0.0409 x concentration (ppb) x molecular weight

Or, concentration (ppb) = 24.45 x concentration (ug/m^3) ÷ molecular weight

Here is an example. The molecular weight of benzene is 78. If the concentration of benzene in air is 10 mg/m^3, convert to the units of ppm by multiplying 24.45 x 10 mg/m^3 ÷ 78 = 3.13 ppm.

Note: Sometimes you will see chemical concentrations in air given in concentration per cubic feet (ft^3) instead of concentration per cubic meter (m^3). The conversion from cubic feet to cubic meter and vice versa is as follows: 1 ft^3 = 0.02832 m^3 and 1 m^3 = 35.31 ft^3.

ABOUT THE AUTHOR
Terrie K. Boguski, P.E., is the Assistant Technical Director of the CHSR at Kansas State University (tboguski@ksu.edu).

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ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC

CAS # 7440-38-2

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

❑ Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
❑ Arsenic cannot be destroyed in the environment. It can only change its form.
❑ Rain and snow remove arsenic dust particles from the air.
❑ Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
❑ Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

❑ Ingesting small amounts present in your food and water or breathing air containing arsenic.
❑ Breathing sawdust or burning smoke from wood treated with arsenic.
❑ Living in areas with unusually high natural levels of arsenic in rock.
❑ Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.

❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

❑ If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Fact Sheet

Arsenic in the Environment

Washington State Department of Health

This fact sheet provides information about arsenic in the environment, how it could affect your health, and ways to reduce the likelihood of health problems by reducing your exposure to environmental arsenic. Inside you will find details about:

Arsenic in the Environment

In the past, arsenic was commonly used as a poison to kill rodents, insects, and plants. It has no odor or taste, and just 60 milligrams of arsenic (about one-sixth the size of an aspirin tablet) added to food or drink could be fatal for an adult. Although it is rarely used today as a human poison, arsenic in the environment has become a public health concern in many parts of Washington State. Everyone has daily exposure to arsenic because it is a naturally occurring chemical element that is normally found in small amounts in water, soil, indoor house dust, air, and food. But when natural or human activities have caused greater than normal amounts of arsenic to collect in the environment, the risk of developing health problems can be increased.

Environmental arsenic is a public health issue in Washington State because:

- Drinking water in some parts of the state contains arsenic at levels that could increase the risk of health problems and that exceed legal standards established to protect public health.

- Soil in some parts of the state contains arsenic at levels that could increase the risk of health problems and that exceed legal standards established to protect public health.

- Arsenic-treated wood has been commonly used in outdoor structures such as playground equipment and decks, and regular contact could increase the risk of health problems.

Potential Sources of Arsenic Exposure

Soil and Dust

Soil in Washington State typically contains less than 7 parts of arsenic per million parts of soil (often abbreviated as 7 ppm). For comparison, 7 ppm is equivalent to adding the weight of a car key (about one-half ounce) to the weight of a sport utility vehicle (about 4500 pounds).

Past emissions from smelters in Tacoma and Everett and past use of arsenic-containing pesticides on agricultural crops have left higher than normal levels of arsenic across hundreds of square miles of soil in Washington. Levels in many areas exceed 100 ppm and can sometimes range up to several thousand ppm. This arsenic tends to bind strongly to soil and will likely remain near the surface for hundreds of years as a long-term source of exposure. The Washington State Department of Ecology has established a cleanup level of 20 ppm for arsenic in soil at most hazardous waste sites.

Water

Drinking water in Washington typically contains less than 3 parts of arsenic per billion parts of water (often abbreviated as 3 ppb). For comparison, 3 ppb is about equal to adding one teaspoon to an acre of water that is 4 feet deep.

As of 2003, the health standard for arsenic in public drinking water supplies is 50 ppb. A recent change in the federal Safe Drinking Water Act requires community water systems serving more than 25 people to reduce the level of arsenic in their water to 10 ppb by January 2006. Each year, community water systems must tell customers what level of arsenic, if any, has been detected in their water and, if the level exceeds 5 ppb, provide information about possible health effects of arsenic. Some counties in Washington have adopted rules governing arsenic in private wells, although such wells are not regulated under state or federal laws.

Drinking water can come from underground aquifers (ground water) or surface water sources (rivers and lakes). Levels of arsenic in ground water in some areas of the state exceed 10 ppb.

This is usually associated with underground aquifers located in rock or soil that have a naturally high content of arsenic. Arsenic from the rock or soil dissolves into the water that gets pumped out of the ground for use as drinking water. In Washington, very few surface water sources have arsenic concentrations that exceed 10 ppb.

It is unusual for arsenic contamination from an industrial or agricultural site to reach an aquifer, although it does happen occasionally. Most arsenic from Tacoma Smelter emissions and from pesticide applications (both of which began more than a century ago and left arsenic on the surface of the ground) is still in the top foot of the soil column. Arsenic binds strongly to soil and does not travel downward toward aquifers very quickly. However, there have been rare circumstances where water in shallow aquifers has become contaminated.

Treated Wood

Most "treated wood" contains arsenic in the form of chromated copper arsenate (CCA) to help prevent deterioration from fungus and insects. People can be exposed to the arsenic because it continually leaches to the surface of the wood. Young children playing on decks or playground equipment can get arsenic on their hands, which can then be swallowed if they put their hands in their mouths. Food placed directly on a picnic table made of treated wood can pick up some of the arsenic. Arsenic-treated wood should not be burned because breathing the smoke can result in serious health effects. The wood treatment industry has voluntarily agreed to stop using arsenic for most types of treated wood by the end of 2003, but it will be many years before existing CCA treated wood structures will be replaced with alternative materials.

Food

All foods normally contain some arsenic, but food arsenic has not been studied well enough to allow us to understand its potential to cause health problems. Most arsenic in food is in chemical forms called "organic arsenic" which aren't expected to be harmful.

Exposure to Environmental Arsenic

Arsenic has to be absorbed into your body to cause health problems. There are three main ways this can occur:

- Swallowing (ingesting) water, food, soil, or other things that contain arsenic.
- Skin or eye contact with water, soil, or other things that contain arsenic.
- Breathing (inhaling) air, dusts, or fumes that contain arsenic.

The risk to someone's health depends on the exposure to arsenic from all of these sources combined. More exposure increases the likelihood that health problems will occur. Reducing exposure reduces the risk.

Swallowing Arsenic

The majority of exposure to environmental arsenic occurs by swallowing arsenic that is present in water, soil, dust, and food. Swallowing even small amounts of arsenic-contaminated water or soil over time could lead to a variety of health problems. Much of the arsenic contained in food and water is absorbed into the body. People normally swallow small amounts of soil and dust (and any arsenic they contain). Young children often put hands, toys, pacifiers, and other things in their mouths, and these may have dirt or dust on them that can be swallowed. Soil sticking to home-grown vegetables will be swallowed when the produce is eaten. Adults may ingest soil and dust through activities such as gardening, mowing, construction work, and dusting. Airborne soil and dust from such activities usually consist of relatively large particles that get trapped in the nose, mouth, and throat and are then swallowed, rather than breathed into the lungs.

Skin Contact with Arsenic

Arsenic is not absorbed very well through the skin. Therefore, exposure from skin contact alone, such as bathing in arsenic-contaminated water, is unlikely to cause health problems.

Breathing Arsenic

Except for rare circumstances (such as workplace exposure or from burning arsenic-treated wood), inhalation exposure and the risk of developing health problems from breathing arsenic is typically small compared to ingested arsenic.

Health Effects of Arsenic

Arsenic can cause many different health problems in people. The types of health problems that may occur are influenced by many things including:

- The amount of arsenic to which a person is exposed.
- The length of time exposure occurs.
- An individual's sensitivity to the harmful effects of arsenic.

It is difficult to predict how arsenic will affect someone. Amounts that cause serious health problems for some people may have no effect on others. Also, two people with similar exposures may develop totally different health problems.

Short-term Exposure to Large Amounts of Arsenic

Swallowing relatively large amounts of arsenic (even just one time) can cause mild symptoms, serious illness, or death. Milder effects may include swelling of the face, nausea, vomiting, stomach pain, or diarrhea. Serious effects may include coma, internal bleeding, or nerve damage causing weakness or loss of sensation in the hands, arms, feet, or legs.

Levels of arsenic in Washington soil and water are generally too low to cause health effects from short-term exposure except under extremely unusual circumstances.

Long-term Exposure to Small Amounts of Arsenic

Long-term ingestion (greater than 6 months) of smaller amounts of arsenic that can be found in the environment has the potential to cause many different health problems. Illnesses strongly linked to this type of exposure include bladder cancer, lung cancer, non-melanoma skin cancer, liver cancer, prostate cancer, kidney cancer, cardiovascular disease, diabetes mellitus, damage to peripheral nerves, and changes to the pattern of color or thickness of the skin.

Many of these health problems, such as cancer, diabetes, and cardiovascular disease, are common illnesses that affect many people and have several possible causes besides arsenic. Even in areas with relatively high levels of arsenic in soil and water, we expect that most cases of these health problems will not be the result of arsenic exposure, but due to other factors such as diet, genes, lifestyle, preexisting illness, and other chemicals. At the same time, arsenic can increase the risk of developing these illnesses and is likely to contribute to some of the cases.

Medical Testing to Evaluate Your Exposure to Arsenic

Several types of tests are available to measure exposure to arsenic. Each test has certain limitations that should be considered when deciding whether to be tested, which test to use, and how to interpret the results.

Most arsenic stays in the body only a short time. Measuring the level of arsenic in urine is the best way to evaluate exposure that occurred in the last 1 - 2 days. Two types of urine tests are available. The most

common test measures the total amount of arsenic and does not distinguish between the toxic "inorganic" forms of arsenic that are of health concern and the less toxic "organic" forms that make up the majority of arsenic in seafood and other foods. High test results could occur by eating foods with high levels of the relatively nontoxic organic arsenic compounds 1 - 2 days before the test. The second type of test, for "speciated" arsenic, measures exposure to just the toxic inorganic forms of arsenic and is better for evaluating exposures relevant to your health.

Measurement of arsenic levels in hair or fingernails can be useful to evaluate longer-term exposure, but these tests are usually difficult to interpret because:

- There are no standardized procedures for conducting the tests.
- There are no widely accepted standard values to distinguish "normal" from "elevated" test results.

Reducing Your Exposure to Arsenic

There are ways to reduce your exposure if your drinking water or soil contains greater than normal amounts of arsenic. The following paragraphs provide a few suggestions for reducing exposure to arsenic-contaminated water, soil, or CCA-treated wood and tell where to get more detailed information.

Reducing Exposure to Arsenic-Contaminated Drinking Water

Many water filters on the market today are designed to improve the taste and remove odors from drinking water but do not remove arsenic.

There are, however, home water treatment systems available that are capable of removing arsenic from drinking water. Point-of-entry equipment, commonly referred to as whole-house systems, treat all the water used in the house and are commonly located near where the water service line enters the house. Point-of-use systems treat water at a single tap, such as a kitchen sink faucet.

NSF International, a not-for-profit public health and safety company provides product testing and certification services of home water treatment products. DOH recommends that you only install NSF certified home water treatment systems in your home. Some NSF certified products may not be effective in all cases. Testing after installation and routine maintenance should be performed to ensure that the system is removing arsenic from the water.

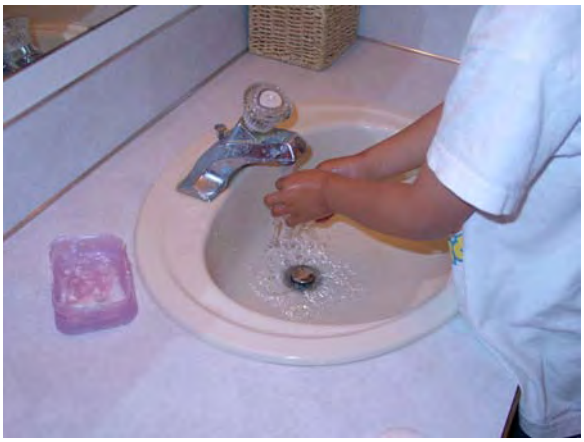
Bottled water is another option for reducing your exposure to arsenic in drinking water. However, bottled water can contain up to 50 ppb arsenic until 2006. DOH recommends that you ask the bottled water company about the arsenic levels, if any, contained in their product.

For more information about home water treatment systems, visit the NSF web site at http://www.nsf.org/.

For more information about arsenic in drinking water, visit the DOH web site at http://www.doh.wa.gov/ehp/dw or call the DOH, Division of Drinking Water toll free line at 800-521-0323.

Reducing Exposure to Arsenic-Contaminated Soil

Although anyone can be exposed to arsenic in soil, young children who are in close contact with dusty floors and outdoor dirt are more likely than others to swallow contaminated soil and dust that gets on their hands and toys. Reducing their exposure involves covering, removing, or avoiding contaminated soil, and washing children's hands and faces with soap and water when they get dirty. Contaminated soil can be brought inside the home by the wind and on shoes and pets. Taking off your shoes before coming inside, keeping pets clean, and regular damp mopping and dusting will help keep indoor dust levels down.



Adults can reduce exposure to contaminated soil when gardening or doing yard work by dampening dusty soils (or wearing a dust mask) in dry conditions, wearing gloves, and washing up with soap and water before eating. Vegetables and fruits grown in contaminated soil should be washed thoroughly before eating.

For more information on ways to reduce your exposure to arsenic-contaminated soil, call the DOH Office of Environmental Health Assessments at 877-485-7316 or visit the following web site: http://www.metrokc.gov/health/hazard/resultsfaq.htm#precautions

Reducing Exposure to CCA-Treated Wood

Washing children's hands with soap and water after they have played on CCA-treated wood structures will reduce their exposure to the arsenic that leaches out of the wood. Sealing CCA-treated wood with an oil-based stain every one or two years can help reduce exposure by reducing the arsenic residues at the surface of the wood. Do not burn CCA-treated wood because the smoke is extremely hazardous. If you plan to build play equipment or other outdoor structures, ask your lumber supplier about alternatives to CCA-treated wood.

For more information about CCA-treated wood and ways to reduce your exposure, call the DOH Office of Environmental Health Assessments at 877-485-7316 or visit the following web site: http://www.dph.state.ct.us/Publications/BCH/EEOH/pressurtr.pdf

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Public health agencies in Washington provide critical programs and services for all people in the state – from drinking water protection to disease prevention. The public health network coordinates at the local, statewide and national level to keep our communities healthy and safe. The work of public health includes:

- **Essential programs for improving health:** Programs such as immunizations, communicable disease prevention, and chronic disease and injury prevention help individuals and communities stay healthy.

- **Information that works:** Resources such as educational and training programs, community health reports and statewide health and safety information provide individuals and communities information they can use to make good decisions.

Protecting you and your family every day: Services such as drinking water and air quality monitoring, septic system inspections, restaurant inspections, disease prevention and planned community crisis response ensure individual and community health and safety.

The Department of Health is an equal opportunity agency. If you need this publication in an alternative format, please call 1-800-527-0127 (voice) or 1-800-833-6388 (TDD relay service). For additional copies of this publication, call the Office of Environmental Health Assessments at 1-877-485-7316. This and other publications are available on the Internet: at: http://www.doh.wa.gov/ehp/factsheets.htm

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Multilateral Investment Guarantee Agency

Environmental Guidelines for

Coke Manufacturing

Industry Description and Practices

Coke and coke by-products (including coke oven gas) are produced by the pyrolysis (heating in the absence of air) of suitable grades of coal. The process also includes the processing of coke oven gas to remove tar, ammonia (usually recovered as ammonium sulfate), phenol, naphthalene, light oil, and sulfur before being used as fuel for heating the ovens. This document covers the production of metallurgical coke and the associated by-products, using intermittent horizontal retorts.

In the coke making process, bituminous coal is fed (usually after processing operations which control the size and quality of the feed) into a series of ovens; the ovens are sealed and heated at high temperatures in the absence of oxygen, usually in cycles lasting 14 to 36 hours. Volatile compounds that are driven off the coal are collected and processed to recover combustible gases and other byproducts. The solid carbon remaining in the oven is coke which is taken to the quench tower, where it is cooled with a water spray, or alternatively cooled by circulating an inert-gas (nitrogen), also known as dry quenching. Coke is screened and sent to a blast furnace or for storage.

Coke oven gas is cooled and by-products are recovered. Flushing liquor is formed from the cooling of coke oven gas and it contains tar. Liquor from primary coolers and flushing contains tar which is sent to a tar decanter. Further removal of tar from coke oven gas is by using an electrostatic precipitator. It is sent for storage. Ammonia liquor is also separated from the tar decanter and sent for wastewater treatment after ammonia recovery. Coke oven gas is further cooled in a final cooler. Naphthalene is removed in the separator on the final cooler and then light oil is removed from the coke oven gas. Light oil is fractionated to recover benzene, toluene, and xylene. Some facilities may include an on-site tar distillation unit. The Claus process is normally used for sulfur recovery from coke oven gas.

During the coke quenching, handling, and screening operation, coke breeze is produced which is either reused on-site (e.g., sinter plant) or sold off-site as a by-product.

Waste Characteristics

The coke oven is a major source of fugitive air emissions. The coking process emits: particulate matter (PM), volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), methane (approximately 100 grams per metric ton (g/t) of coke), ammonia, carbon monoxide, hydrogen sulfide (from 50 to 80 g/t of coke from pushing operations), hydrogen cyanide, and sulfur oxides (SO_x) (30% of sulfur in the feed). Significant amount of VOCs may also be released from by-product recovery operations.

For every ton of coke produced, approximately 0.7 to 7.4 kilograms (kg) of PM, 2.9 kg of SO_x (with a range of 0.2 to 6.5 kg SO_x), 1.4 kg of nitrogen oxides (NO_x), 0.1 kg of ammonia, and 3 kg of VOCs (including 2 kg of benzene) may be released into the atmosphere without a vapor recovery systems. Coal handling operations may account for about 10% of the particulate load. Coal charging, coke pushing, and quenching are major sources of dust emissions.

Wastewater is generated at an average rate ranging from 0.3-4 cubic meters (m^3) per ton of coke processed. Major wastewater streams are generated from the cooling of the coke oven gas and the processing of ammonia, tar, naphthalene, phenol, and light oil. Process wastewater may contain: 10 milligrams per liter (mg/L) of benzene, 1,000 mg/L of biochemical oxygen demand measured over five days (BOD_5) (4 kg/t of coke), 1,500-6,000 mg/L of chemical oxygen demand (COD), 200 mg/L of total suspended solids, and 150-2,000 mg/L of phenols (0.3-12 kg/t of coke). Wastewaters also contain PAHs at significant concentrations (up to 30 mg/l, ammonia (0.1-2 kg nitrogen/t of coke), and cyanides (0.1-0.6 kg/ton of coke).

Coke production facilities generate process solid wastes excluding coke breeze (averaging 1 kg per metric ton of product), most of which contain hazardous components such as benzene and PAHs. Waste streams of concern include residues from coal tar recovery (typically 0.1 kg/t coke), tar decanter (0.2 kg/t coke), tar storage (0.4 kg/t coke), light oil processing (0.2 kg/t coke), wastewater treatment (0.1 kg/t coke), naphthalene collection and recovery (0.02 kg/t coke), tar distillation (0.01 kg/t coke), and sludges from biological treatment of wastewaters.

Pollution Prevention and Control

Pollution prevention in coke making is focused on reducing coke oven emissions and developing cokeless iron and steel making techniques. The following pollution prevention and control measures should be considered:

General

- Use cokeless iron and steel making processes, such as the, direct reduction process, to eliminate the need to manufacture coke.
- Use beneficiation (preferably at the coal mine) and blending processes which improve the quality of coal feed to produce coke of desired quality and reduce emissions of sulfur oxides and other pollutants.
- Use enclosed conveyors and sieves for coal and coke handling. Use sprinklers and plastic emulsions to suppress dust formation. Provide wind breaks where feasible. Store materials in bunkers or warehouses. Reduce drop distances.
- Pre-heat and use high grade coal to reduce coking time, increase throughput, reduce fuel consumption, and minimize thermal shock to refractory bricks.

Coke Oven Emissions

- *Charging*. Dust particles from coal charging should be evacuated by the use of jumper-pipe systems and steam injection into the ascension pipe, or controlled by fabric filters.
- *Coking*. Use large ovens to increase batch size and reduce the number of chargings and pushings, thereby reducing the associated emissions. Reduce fluctuations in coking conditions including temperature. Clean and seal coke oven openings to minimize emissions. Use mechanical cleaning devices (preferably automatic) for cleaning of doors, door frames, and hole lids. Seal lids using a slurry. Use a low leakage door construction preferably with gas sealings.
- *Pushing*. Emissions from coke pushing can be reduced by maintaining a sufficient coking time thus avoiding the so-called "green push." Use sheds and enclosed cars. Alternatively, consider traveling hoods. The gases released should be removed and passed through fabric filters.
- *Quenching*. Where feasible, use dry instead of wet quenching. Filter all gases extracted from the dry quenching unit. If wet quenching, is used, provide interceptors (baffles) to remove coarse dust. When wastewater is used for quenching, the process transfers pollutants from the wastewater to the air, requiring subsequent removal. Reuse quench water.
- *Conveying/sieving*. Enclose potential dust sources, and filter evacuated gases.

By-product Recovery

- Use vapor recovery systems to prevent air emissions from light oil processing, tar processing, naphthalene processing, and phenol and ammonia recovery processes.

- Segregate process water from cooling water.
- Reduce fixed ammonia content in ammonia liquor (by using caustic soda and steam stripping).
- Recycle all process solid wastes (including tar-decanter sludge) to the coke oven.
- Recover sulfur from coke oven gas. Recycle Claus tail gas into coke oven gas system.

Target Pollution Loads

Implementation of cleaner production processes and pollution prevention measures can provide both economic and environmental benefits. The following production-related targets can be achieved by adopting Good Industrial Practices.

Air Emissions

Emissions should be reduced to the following target levels:

Air Emissions Per Unit of Production

Parameter	*Maximum value (kg/t of coke)*
VOCs	0.3
Benzene	0.1
Particulate matter	0.15
Sulfur oxide (SO_x)	0.5
Nitrogen oxide (NO_x)	0.6

Wastewater

The Generation rate for wastewater should be less than 0.3 m^3 per metric ton of coke.

Solid and Hazardous Wastes

New coke plants should not generate more than 1 kg of process solid waste (excluding coke breeze and biosludges) per metric ton of coke.

Treatment Technologies

Air Emissions

Air emission control technologies include scrubbers (removal efficiency of 90%), and baghouses/electrostatic precipitators (ESPs) (with removal efficiencies of 99.9%). Baghouses are preferred over venturi scrubbers for controlling particulate matter emissions from loading and pushing operations because of the higher removal efficiencies. ESPs are effective for final tar removal from coke oven gas.

Wastewater Treatment

Wastewater treatment systems include screens and settling tanks to remove total suspended solids, oil, and tar; steam stripping to remove ammonia, hydrogen sulfide, and hydrogen cyanide; biological treatment; and final polishing with filters.

The following levels should be achieved:

Target Wastewater Loads per Unit of Production

Parameter	*Maximum value (grams/t of coke produced unless otherwie noted)*
COD	100
Benzene	0.015
Benzo(a)pyrene	0.009
Naphthalene	0.0008
Nitrogen (total)	12
Cyanide (free)	0.03
Phenol	0.15
Wastewater	0.3 m^3/t of coke produced

Solid Waste Treatment

All process hazardous wastes (except coke fines) should be recycled to coke ovens. Wastewater treatment sludges should be dewatered. If toxic organics are detectable, dewatered sludges are to be charged to coke ovens or disposed in a secure landfill or an appropriate combustion unit.

Emission Guidelines

Emission levels for the design and operation of each project must be established through the Environmental Assessment (EA) process, based on country legislation and the *Pollution Prevention and Abatement Handbook* as applied to

local conditions. The emission levels selected must be justified in the EA and acceptable to MIGA.

The following guidelines present emission levels normally acceptable to the World Bank Group in making decisions regarding provision of World Bank Group assistance, including MIGA guarantees; any deviations from these levels must be described in the project documentation.

The guidelines are expressed as concentrations to facilitate monitoring. Dilution of air emissions or effluents to achieve these guidelines is unacceptable.

All of the maximum levels should be achieved for at least 95% of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours.

Air Emissions

Benzene should not be more than 5 milligrams per normal cubic meter (mg/Nm^3) in leaks from light oil processing, final cooler, tar decanter, tar storage, weak ammonia liquor storage, and tar/water separator. VOC emissions should be less than 20 mg/Nm^3. Particulate matter emissions from the stacks should not exceed 50 mg/Nm^3. Sulfur recovery from coke oven gas should be at least 97% but preferably over 99%.

Liquid Effluents

The following effluent levels should be achieved:

Effluents from the Coke Manufacturing Industry

Parameter	*Maximum value milligrams per liter (mg/L)*
BOD_5	30
COD	150
Total suspended solids	50
Oil and grease	10
Phenol	0.5
Benzene	0.05
Dibenz(a,h)anthracene	0.05
Benzo(a)pyrene	0.05
Cyanide (total)	0.2
Nitrogen (total)	10
Temperature increase	less than or equal to 3°C[1]

[1] The effluent should result in a temperature increase of no more than 3 degrees Celsius at the edge of the zone where initial mixing and dilution takes place. Where the zone is not defined, use 100 meters from the point of discharge.

Note: Effluent requirements are for direct discharge to surface waters.

Solid and Hazardous Wastes

Solid hazardous wastes containing toxic organics should be recycled to a coke oven or treated in a combustion unit with residues disposed in a secure landfill.

Ambient Noise

Noise abatement measures should achieve either the following levels or a maximum increase in background levels of 3 dB(A). Measurements are to be taken at noise receptors located outside the project property boundary.

Ambient Noise

	Maximum Allowable L_{eq} (hourly), in dB(A)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The emission requirements given here can be consistently achieved by well-designed, well-operated and well-maintained pollution control systems.

Monitoring and Reporting

Stack air emissions should be monitored continuously for particulate matter. Alternatively, opacity measurements of stack gases could suffice. Fugitive emissions should be monitored annually for VOCs. Wastewater discharges should be monitored daily for flow rate and for all parameters, except dibenz(a,h)anthracene and benzo(a)pyrene. The latter should be monitored at least on a monthly basis or when there are process changes. Frequent sampling may be required during start-up and upset conditions.

Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Records of monitoring results should be kept in an acceptable format. These should be reported to the responsible authorities and relevant parties, as required, and provided to MIGA if requested.

Key Issues

The following box summarizes the key production and control practices that will lead to compliance with emission guidelines:

- Use cokeless iron and steel making processes, such as, the direct reduction process for iron making to eliminate the need for coke manufacturing.
- Where feasible, use dry quenching instead of wet quenching.

- Use vapor recovery systems on light oil processing, tar processing/storage, naphthalene processing, and phenol and ammonia recovery operations
- Segregate process and cooling water..
- Recycle process solid wastes to the coke oven
- Recover sulfur from coke oven gas.

Further Information

The following are suggested as sources of additional information (these sources are provided for guidance and are not intended to be comprehensive):

Bounicore, A.J. and W.T. Davis. 1992. *Air Pollution Engineering Manual*. New York: Van Nostrand Reinhold.

Technical Note on the Best Available Technologies to Reduce Emissions into Air from Coke Plants. 1993.

Study on the Technical and Economic Aspects of Measures to Reduce the Pollution from the Industrial Emissions of Cokeries. 1992.

US Environmental Protection Agency (EPA). 1982. *Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Subcategory*. EPA 440/1-82/024.

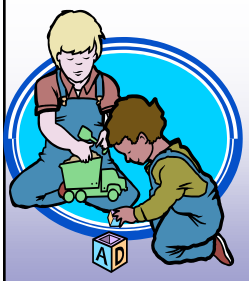
US General Printing Office (GPO). August 18, 1992. *Federal Register*. Vol. 57, No. 160.

World Bank, Environment Department. 1995. "Industrial Pollution Prevention and Abatement: Coke Manufacturing." Draft document.

World Health Organization (WHO). 1989. *Management and Control of the Environment*. Publication No. WHO/PEP/89.

Environmental Health Tips

For communities with soil contamination



Discourage children from playing in bare soil, eating soil and putting objects in their mouths.

Control dust and soil in homes so you can help reduce or prevent exposure to contaminated dust and soil.

For example:

Change air filters

If you have a vegetable garden, wash and peel vegetables before eating them

After playing outside, make sure children wash their hands frequently and especially before eating.

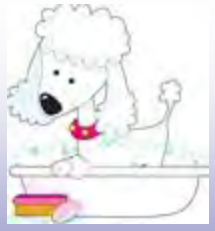
Remove shoes before entering home

Don't eat food, chew gum, or smoke when working in the yard

Frequently clean the entrance to your home

Wash children's toys regularly with warm soapy water

Damp mop floors and wipe counters and furniture regularly



Wash dogs regularly

Note: The above is a limited list of actions one can take to help reduce exposure.

Resources/Internet Links:

- North Birmingham Regional Branch Library, 2501 31st Ave North, Birmingham, AL 35207—repository where related materials to sampling event may be viewed
- Urban Gardening: http://www.epa.gov/brownfields/urbanag/steps.htm
- Southeast Pediatric Environmental Health Specialty Unit (PEHSU): http://aoec.org/PEHSU/faq.html and http://www.sph.emory.edu
- Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov/
- EPA Reading Room: www.epa.gov/region4/foiapgs/readingroom/rcra_community/walter.html

EPA

EPA/542/F-10/011

REUSING POTENTIALLY CONTAMINATED LANDSCAPES:

Growing Gardens in Urban Soils

This fact sheet provides communities and individuals with general urban gardening information about:

- **Common contaminants that can be found in urban soil.**
- **Ways to identify contaminants and reduce exposure.**
- **Improving soils and growing plants in mildly contaminated soil.**
- **Additional resources and technical assistance.**

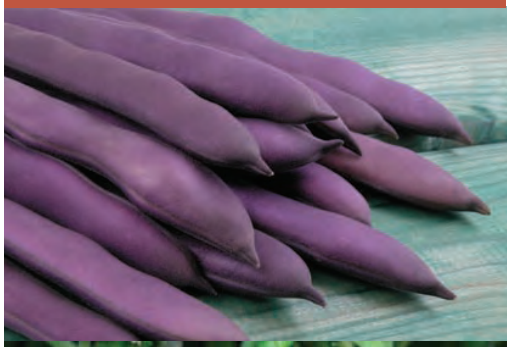
Introduction

Communities throughout the country are turning to urban agriculture and gardening as a reasonable option to increase their access to healthy, nutritious, and low-cost produce. Some of the sites that communities are using for urban gardens were previously home to industrial and commercial operations. A garden on abandoned land can become a new community asset by improving the visual look of a neighborhood and potentially increasing nearby property values. Community gardens provide many benefits, including healthier lifestyles by increasing activity levels, providing fresh produce, growing community pride, and nurturing social interactions and cooperation among people.

For communities interested in gardening on a site that might be contaminated, it is important to first determine the health and suitability of the soil at the site. It is a common gardening practice to test soil for characteristics such as pH and nutrient availability. When creating a garden on land with an industrial or commercial history, it is highly recommended that communities consider the site's land use history and test the soil accordingly for potential contamination. Knowledge of soil health and potential contamination are keys to helping communities identify and correct problems so that each urban garden is safe and productive.

The possibility of contamination at a garden site should not keep you from planning an urban garden there. This fact sheet presents steps that you can take to find out and address potential contamination at your site to help create a safe and healthy garden for your community.

More information for the urban gardener on soil science, soil amendments, plants, contaminants and their health effects, and additional links is available on EPA's CLU-IN website: www.clu-in.org/ecotools/urbangardens.cfm.



U.S. Environmental Protection Agency
Office of Superfund Remediation and Technology Innovation

Soil Quality

Q: Why Is Healthy Soil Important for Your Garden?

A: Healthy soil is essential for plants to grow in your garden. When a property has been used for industrial or commercial activities, the soil is often nutrient deficient, highly compacted and potentially contaminated. These soils can be improved and made healthy again so that your garden plants can grow and thrive. Healthy soil holds water and contains beneficial organisms, plant nutrients, and organic matter.

Soil Nutrients

Soil nutrients are vital for healthy soil and must be available for plants to grow. Soil tests will help you determine the existing nutrients available in your soil and indicate which nutrients and nutrient amounts need to be added. Mineral nutrients such as nitrogen, phosphorus, potassium (NPK), and calcium can occur naturally in the soil, but often need to be applied to maintain a healthy balance. Soil nutrients may be added in various forms, including: fertilizer and lime (available in most gardening stores) and organic matter such as grass clippings, leaves, and compost.

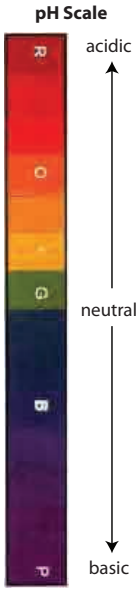
Physical Properties of Soil

The physical properties of soil determine how well nutrients are available to plants. Soil contains a combination of sand, rock, silt, clay, air, and organic matter, which affects its ability to hold nutrients and water.

You can improve the physical quality of your soil by leveling and loosening the soil and adding organic matter such as compost and manure. These additions can increase the amount of water that sandy soils can absorb or hold and can improve the drainage of clay soils.

Soil pH

Soil pH affects the amounts and types of nutrients available to plants through their roots. The pH scale goes from 0 to 14; a pH of 7 is neutral. A lower number means a more acidic soil, while a higher number means a more basic or alkaline soil. Certain nutrients are less available to plants in soils where the pH is too low or too high. When a soil's pH is near neutral, nutrients are more readily available to plants, and microbial populations in the soil increase. A soil test will tell you the pH of your soil. Based on this information, you will be able to determine whether soil amendments (soil additions) are needed to change the pH of your soil to meet your gardening needs. You can raise the pH of soil by adding lime or wood ash. You can lower the pH of soil to make it more acidic by using fertilizers containing ammonium-nitrate or specialty fertilizers for "acid-loving" plants that contain ammonium sulfate or sulfur-coated urea.



For more information on amendments that can be used to improve soil quality, see Techniques for Addressing Soil Contamination in the Resources section in this fact sheet, page 11.

Contaminants

A soil contaminant is an element or chemical present in the soil at a level that could possibly pose health risks. In a few areas of the country, element levels may be naturally high. In many cases, human activities have increased the soil levels of many elements and chemicals and also spread them out more widely. Lead, cadmium, arsenic, zinc, and polycyclic aromatic hydrocarbons (PAHs) are contaminants commonly found in any urban environment. In addition, other contaminants can also be found in areas near former commercial or industrial properties. Table 1 lists sources of contamination that are commonly found on sites with a commercial or industrial history.

Table 1. Common Sources of Contamination[1]

General Source	Examples of Previous Site Uses	Specific Contaminants
Paint (before 1978)	Old residential buildings; mining; leather tanning; landfill operations; aircraft component manufacturing	Lead
High traffic areas	Next to heavily trafficked roadways or highways; near roadways built before leaded fuel was phased out	Lead, zinc, polycyclic aromatic hydrocarbons (PAHs)
Treated lumber	Lumber treatment facilities	Arsenic, chromium, copper
Burning wastes	Landfill operations	PAHs, dioxins
Contaminated manure	Copper and zinc salts added to animal feed	Copper, zinc
Coal ash	Coal-fired power plants; landfills	Molybdenum, sulfur
Sewage sludge	Sewage treatment plants; agriculture	Cadmium, copper, zinc, lead, persistent bioaccumulative toxins (PBTs)
Petroleum spills	Gas stations; residential/commercial/industrial uses (anywhere an aboveground or underground storage tank is or has been located)	PAHs, benzene, toluene, xylene, ethyl benzene
Pesticides	Widespread pesticide use, such as in orchards; pesticide formulation, packaging and shipping	Lead, arsenic, mercury, chlordane and other chlorinated pesticides
Commercial/industrial site use		PAHs, petroleum products, solvents, lead, other heavy metals (such as arsenic, cadmium, chromium, lead, mercury and zinc)
Dry cleaners		Stoddard solvent and tetrachloroethene
Metal finishing operations		Metals and cyanides

EPA's Toxic Release Inventory (TRI) can provide information to communities about sites where contaminants were released into the environment. The Envirofacts database allows users to enter location information, such as zip code, address or county location, to get information about releases in their area. The database is available online at: www.epa.gov/enviro.

1 Adapted from Heinegg, A., Maragos, P., Mason, E., Rabinowicz, J., Straccini, G. and Walsh, H. (2000) Urban Agriculture and Soil Contamination, available at: http://cepm.louisville.edu/Pubs_WPapers/practiceguides/PG25.pdf.

What Are Soil Background Levels?

Background levels are the naturally occurring levels of elements and chemicals found in any soil. Background levels differ depending on the region of the country in which you live. In some areas background levels for certain elements and chemicals may be higher. Contact your local extension service or state environmental agency (see Technical Assistance in the Resources section, page 10) for help in learning more about elemental background levels for the soil in your neighborhood.

More information on soil background levels in the United States is available at: http://pubs.usgs.gov/of/2005/1253/pdf/OFR1253.pdf.

Contaminants continued

Q: How Do I Know if My Property is Contaminated?

A: You can conduct a formal environmental assessment (study) of the land you are interested in using for urban gardening. There are two types of assessments: Phase I and Phase II Environmental Assessments. A Phase I assessment includes a review by a trained environmental professional of historical site uses, interviews with neighbors and, if possible, site owners, and a visual site inspection to determine the potential for and type of contamination at a site. If a Phase I assessment determines that there is potential for contamination at the site, a Phase II assessment is conducted to sample for contaminants and locate any impacted areas.

For more information on Phase 1 and Phase 2 assessments, contact your local and state environmental agencies. Some local governments may even be able to provide you with a Phase I or Phase II environmental assessment or have qualified environmental professionals on staff who can conduct the assessment.

Q: What if My Community Needs Help with Site Assessments, Sampling or Cleanup?

A: Federal funding is available to government entities to conduct brownfields (property where reuse may be complicated due to on-site contamination) assessments. Working with local officials to apply for an EPA brownfields grant can provide money for your community to assess or clean up the property you are interested in as well as address other properties.

What you need to know to get started in applying for brownfields grants can be found at: www.epa.gov/brownfields/grant_info/assess/assessment_factsheet.pdf.

Biosolids

Biosolids are the nutrient-rich organic materials resulting from the treatment of sewage sludge (the name for the solid, semi-solid or liquid untreated residue generated during the treatment of domestic sewage in a treatment facility). When treated and processed, sewage sludge becomes biosolids, which are tested for safety to be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth. Only biosolids that meet the strictest state and federal standards can be approved for use as a fertilizer.

More information on how biosolids have been used to solve problems on potentially contaminated lands is available at: www.cluin.org/ecotools/soil.cfm.

More information on biosolids is available at: http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm.

More information for the urban gardener on soil science, effects, and additional links is available on EPA's CLU-IN

Exposure Pathways

Q: How Could I Come into Contact with Contaminants while Gardening?

A: An exposure pathway is the way that a contaminant comes into contact with people. If a site assessment concludes that contaminants are present, the next step is to think about potential contaminant impacts as you work the soil to garden or eat the food you grow. There are two human exposure pathways to soil contaminants: the *soil-to-human pathway* and the *soil-to-plant-to-human pathway*.

Soil-to-Human Exposure Pathway

While gardening, the greatest risk of exposure to contaminants is from contaminated soil getting into your mouth or by breathing in contaminated dust. For example, children playing in the garden may directly eat soil through hand-to-mouth play, or people may eat plants without first washing them to remove soil and dust. Skin contact (dermal exposure) with soils containing contaminants such as PAHs, chromium and trichloroethylene (TCE) can pose health risks.

Soil-to-Plant-to-Human Exposure Pathway

Some edible plants do take up and accumulate contaminants. A plant's uptake of contaminants depends on many factors, including the type of plant and the pH and organic content of the soil. However, research shows that there is minimal risk of exposure from eating plants grown in contaminated soils. To reduce concerns of exposure from eating plants, wash produce thoroughly before eating to remove potential soil contamination. Root vegetables have a higher potential for accumulating contaminants. In some cases, it may be prudent to avoid growing edible plants in soils with high contaminant concentrations.

What Are EPA Soil Screening Levels (SSLs) and Can SSLs Be Used as Limits for Urban Gardening?

EPA's SSLs were developed to determine if the soil at Superfund (program that allows EPA to clean up hazardous waste sites) sites warrants further study, investigation or *possibly* cleanup depending on how a site is being used (for example, for residential or commercial purposes). These screening levels look at several *soil-to-human* exposure pathways, including: direct ingestion, dermal exposure, and inhalation. EPA's general guidance states that if an SSL is not exceeded for a pathway of concern, the user may eliminate that pathway from further investigation. While EPA does not have SSLs for gardening, some states may decide that residential SSLs are appropriate to use for gardening purposes, or they may establish appropriate levels specific to each site.

Wise Urban Gardening

In general, the benefits of urban gardening greatly outweigh the risks. By following the recommendations and best practices listed below, you will decrease your likelihood of exposure to contaminants that are commonly found in urban soils located on sites with past industrial and commercial uses.

Q: What Can I Do to Lower the Chances of Coming into Contact with Contaminants that May Be in Present in my Soil?

A: If you find that the soil in which you want to garden is contaminated, you may want to first consult with your state and local environmental agencies and EPA's Technical Assistance to Brownfields (TAB) program (see Technical Assistance in the Resources section, page 10) to learn about how to find professional site cleanup specialists who can recommend the best techniques for reducing high levels of contaminants. The following techniques are commonly used to eliminate exposure to soil contaminants:

- **Build raised beds.**
- **Use soil amendments to stabilize contaminants in soil.** Adding a thick layer of organic matter to your soil provides a physical barrier to contamination. Soil amendments have also been used to bind contaminants so that they are no longer mobile or bioavailable. Soil amendments improve the overall soil quality for growing plants and are a good addition to any soil.
- **Remove all contaminated soil and replace it with clean soil.** Make sure the replacement soil is clean by asking the supplier for proof that the soil that was tested to be contaminant-free.
- **Use phytotechnologies,** which utilize plants to extract, degrade, contain or immobilize contaminants in soil. However, using phytotechnologies to clean up contaminants can take many years, is not effective for every contaminant, and generally requires special handling for the disposal of plants used. Information on specific contaminants that can be remediated using phytotechnologies is available at: www.cluin.org/download/remed/phytotechnologies-factsheet.pdf.

More information for the urban gardener on soil science, effects, and additional links is available on EPA's CLU-IN

Build Raised Beds and Container Gardening

Building raised beds and growing plants in containers is the most common way to reduce the chances of coming into contact with contaminants in urban gardens. These gardening techniques are preferred because the clean soil and organic matter used to build the raised beds creates a physical barrier between the gardeners/plants and possible contamination in the ground soils. Raised beds can be built for permanent or seasonal use.

How to build raised beds:

- Place a layer of landscape fabric on top of the ground soil before adding the clean soil and organic matter. The fabric layer creates a barrier beneath the soil in the bed that prevents plant roots from entering the ground soil below the bed.
- Build a frame to hold the clean soil for a permanent raised bed. Ask for non-treated lumber when getting wood to build the frame.

See the National Gardening Association's how-to video on "Making a Raised Bed Garden," available at: www.garden.org/howtovideos/index.php?page=video2.

Even when you are using raised bed and container gardens to address contamination, airborne contaminants, soil dust, or soil splashback from other areas may still enter the raised beds. Consider covering walkways and other areas of exposed soil with mulch, grass, or other groundcover to help reduce dust migration and splashback onto crops and protect against human exposure when gardening.

Bioavailability

The risks associated with contaminant levels in soil may also be much lower than expected based on test results because of the bioavailability of the contaminant in the soil. Bioavailability of a contaminant is the amount of contaminant that can be taken up by your body. It depends on the characteristics of the site and the soil. For example, for soils rich in lead, treatment with phosphate and compost has been shown to reduce the bioavailability of soil lead, decreasing the risk of exposure to people .

Phytotechnologies and Lead

Q: Lead is a common contaminant in urban soils. Can I use phytoremediation to remove lead from the soil at my site?

A: No. Phytoremediation of lead in soils is ineffective since lead is generally not available for plant uptake. However, the use of soil amendments is an effective way to reduce potential exposure.

soil amendments, plants, contaminants and their health
website: www.clu-in.org/ecotools/urbangardens.cfm.

Best Practices in the Garden

Building raised beds and mulching pathways is an excellent way to reduce the chance of coming into contact with potential contaminants. The recommendations below can add another layer of protection if you have raised beds or decide to do in-ground planting.

- Locate gardens away from old painted buildings and roads with heavy traffic.
- Use a thick layer of organic material such as compost or mulch. Place landscape fabric between ground soil and new, clean soil.
- Watch over small children to stop them from eating soil through hand-to-mouth play.
- Wash hands immediately after gardening and before eating to avoid accidentally eating soil.
- Wear gloves as a barrier between your hands and the soil.
- Throw away the outer leaves of greens, especially from the bottom of plants, before washing. Soil particles are most likely to be located on the outer leaves of leafy plants.
- Wash produce using running water.
- Avoid bringing contaminated soil into the home by:
    - Cleaning tools, gloves and shoes before bringing them indoors.
    - Putting highly soiled clothes in a bag before bringing them indoors and washing them promptly in a separate load.
    - Washing off excess dirt from crops, especially root crops and leafy vegetables, before bringing them indoors.
- Peel vegetables, especially root vegetables, which are in direct contact with soil.

More information for the urban gardener on soil science, effects, and additional links is available on EPA's CLU-IN

Steps You Can Take to Reduce Potential Risk from Contaminants When Growing Vegetables:

- Add high rates of compost and other organic soil amendments to the soil (up to 50:50 by volume) in order to dilute soil contaminant concentrations, improve the physical properties of soil and plant growth, and make contaminants less available for plants to take up.
- Garden in raised beds or containers to separate the garden from the contaminated soil.

To learn about safe levels of soil contamination and the cleanup requirements of sites used for gardening or farming in your area, contact your state environmental agency or cooperative extension services.

Contact information is provided under *Technical Assistance* in the *Resources* section, page 10.

Choosing Crops

In general, plants that produce fruiting bodies (for example, tomatoes, squash, apple and pear trees, and berries) are most appropriate for growing in potentially contaminated soil. Root and tuber crops (for example, carrots, potatoes and onions) are often the least appropriate plants to grow in potentially contaminated soil, as the edible portions of the crops are in direct contact with the soil. Vegetables with large outer leaves (for example, cabbage, lettuce and collard greens) are easily contaminated by dust and soil splashback, so careful washing of these plants is necessary.

Conclusion

There are many effective ways to reduce or eliminate any risk from gardening on potentially contaminated land. Gardening provides many benefits to communities and individuals. The information in this fact sheet is designed to help you understand the steps that your community can take to create healthy garden conditions for growing a variety of delicious and nutritious crops. So go dig, plant, harvest and enjoy!

soil amendments, plants, contaminants and their health website: www.clu-in.org/ecotools/urbangardens.cfm.

Case Study
LIBERTY LANDS
Philadelphia, Pennsylvania

Twenty years ago, the Northern Liberties neighborhood was the only zip code in Philadelphia without a community green space. Several tanneries contaminated the neighborhood. EPA conducted removal actions and cleaned up the site. Neighborhood residents worked with the City of Philadelphia to find resources for reusing the site. EPA provided soil testing and other technical assistance to ensure that the site was safe for reuse as a park and community garden. Hundreds of hours of donated time, monthly meetings, outreach and fundraising efforts resulted in Liberty Lands community park becoming a reality. The park opened in 1996 and includes 37 garden plots and a composting area, an herb and butterfly garden, a children's playground, open space for community events, and community art and sculpture. The park is at the center of a revitalized community, surrounded by new residential and commercial redevelopment.

For more information, visit www.epa.gov/brownfields/success/libertylandspass.pdf.

Resources for Urban Gardeners

Technical Assistance

1. Local agricultural cooperative extension services can help with interpreting soil quality results (i.e., pH and nutrients testing) and provide a list of local environmental departments or laboratories that test for soil contaminants. U.S. Department of Agriculture extension services are listed online at: www.csrees.usda.gov/Extension/index.html.

2. EPA's Technical Assistance to Brownfields (TAB) program can help with questions regarding Phase I and Phase II Environmental Assessments. The TAB website is available at: www.epa.gov/brownfields/tools/index.htm#tab. In addition, several TAB providers have experience working with communities to explore urban agricultural opportunities. These providers include:
   - Kansas State University: www.engg.ksu.edu/chsr/outreach/tab.
   - Center for Creative Land Recycling (especially in California and Colorado): www.cclr.org.

3. State and tribal brownfields programs may be able to help with information specific to your state or tribe. To find your state brownfields program, visit: www.epa.gov/brownfields/state_tribal/state_map.htm. To find your tribal brownfields program, visit: www.epa.gov/brownfields/state_tribal/tribe_progs.htm.



Additional Resources

General Information

More information about creating an urban garden is available at: www.epa.gov/brownfields/urbanag/.

More information on soil science, soil amendments, plants, contaminants and their health effects, and additional links can be found on EPA's CLU-IN website, available at: www.clu-in.org/ecotools/urbangardens.cfm.

Soil Quality

More information on soil health is available at:

- EPA's Hazardous Waste Cleanup Information website: www.clu-in.org/ecotools/soil.cfm.
- Cornell's Waste Management Institute website: http://cwmi.css.cornell.edu/soilquality.htm.
- Local agricultural cooperative extension services website: www.csrees.usda.gov/extension.

Contaminants

The EPA Sector Notebook Series is a set of profiles containing information on specific industries. The notebooks can help your community identify types of contaminants often associated with specific commercial and industrial land uses. The notebooks are available at: www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/index.html.

EPA's Toxics Release Inventory System provides useful information about the history of individual sites: www.epa.gov/tri/.

Information about the health effects of particular contaminants is available at:

- The Agency for Toxic Substances and Disease Registry (ATSDR): www.atsdr.cdc.gov/substances/index.asp.
- EPA's Integrated Risk Information System (IRIS): www.epa.gov/IRIS.
- The Risk Assessment Information System: http://rais.ornl.gov.

In addition, EPA's Superfund Redevelopment Initiative website has a web page where reuse questions can be submitted: www.epa.gov/superfund/programs/recycle/contact/index.html.

Techniques for Addressing Soil Contamination

For more information on techniques for addressing soil contamination:

- EPA fact sheet: *Soil Amendments for Remediation, Revitalization and Reuse Tools: Fact Sheet*, available at: www.clu-in.org/download/remed/540R07013.pdf.
- EPA paper: *The Use of Soil Amendments for Remediation, Revitalization and Reuse*, available at: available at: www.clu-in.org/download/remed/epa-542-r-07-013.pdf.
- EPA paper: *Urban Agriculture and Soil Contamination: An Introduction to Urban Gardening*, available at: available at: http://cepm.louisville.edu/Pubs_WPapers/practiceguides/PG25.pdf.
- EPA fact sheet on brownfields redevelopment and local agriculture, available at: available at: www.epa.gov/brownfields/success/local_ag.pdf.
- EPA's fact sheet on phytotechnologies, available at: www.cluin.org/download/remed/phytotechnologies-factsheet.pdf.

Funding Opportunities

More information on funding sources for brownfields assessment, cleanup, revolving loans and environmental job training is available at: www.epa.gov/brownfields/grant_info/index.htm.

EPA's fact sheet on how to apply for Brownfields Assessment Grants is available at: www.epa.gov/brownfields/grant_info/assess/assessment_factsheet.pdf.

Learning about and taking steps to assess and address potential contamination can help you to ensure that your urban garden area is safe and productive. You can reap the benefits for years to come.

EPA
United States
Environmental Protection
Agency

United States Environmental Protection Agency
Office of Superfund Remediation and Technology Innovation (5204P)
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

EPA 542/F-10/011 | Spring 2011 | www.epa.gov/brownfields/urbanag/

Soil-to-Root Transfer and Translocation of Polycyclic Aromatic Hydrocarbons by Vegetables Grown on Industrial Contaminated Soils

Joëlle Fismes, Corinne Perrin-Ganier, Pascal Empereur-Bissonnet, and Jean Louis Morel*

ABSTRACT

Polycyclic aromatic hydrocarbons (PAHs) are possible contaminants in some former industrial sites, representing a potential risk to human health if these sites are converted to residential areas. This work was conducted to determine whether PAHs present in contaminated soils are transferred to edible parts of selected vegetables. Soils were sampled from a former gasworks and a private garden, exhibiting a range of PAH concentrations (4 to 53 to 172 to 1263 and 2526 mg PAHs kg^{-1} of dry soil), and pot experiments were conducted in a greenhouse with lettuce (*Lactuca sativa* L. var. Reine de Mai), potato (*Solanum tuberosum* L. var. Belle de Fontenay), and carrot (*Daucus carota* L. var. Nantaise). At harvest, above- and belowground biomass were determined and the PAH concentrations in soil were measured. In parallel, plates were placed in the greenhouse to estimate the average PAH-dust deposition. Results showed that the presence of PAHs in soils had no detrimental effect on plant growth. Polycyclic aromatic hydrocarbons were detected in all plants grown in contaminated soils. However, their concentration was low compared with the initial soil concentration, and the bioconcentration factors were low (i.e., ranging from 13.4×10^{-4} in potato and carrot pulp to 2×10^{-2} in potato and carrot leaves). Except in peeled potatoes, the PAH concentration in vegetables increased with the PAH concentration in soils. The PAH distribution profiles in plant tissues and in soils suggested that root uptake was the main pathway for high molecular weight PAHs. On the opposite, lower molecular weight PAHs were probably taken up from the atmosphere through the leaves as well as by roots.

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous soil contaminants originating from natural and anthropogenic sources (Edwards et al., 1982). In general, these nonpolar and hydrophobic molecules with two or more benzene rings persist in the environment. Several PAHs have been shown to be carcinogenic and/or mutagenic (USEPA, 1985; Edwards, 1988), and human exposure to PAHs can occur through different environmental pathways, including internal absorption through food and water consumption (Edwards et al., 1982; Wild and Jones, 1992; Empereur-Bissonnet, 1996). Former industrial sites, such as coking plants and gasworks sites, may contain variable concentrations of PAHs. These sites represent a potential source for food chain contamination if they are converted to residential uses where gardening occurs.

Plant uptake of pollutants may occur through various pathways, including root uptake and atmospheric deposition from gaseous or particulate forms (Edwards, 1988; Simonich and Hites, 1995). It is generally reported that PAHs are transferred to plants from particle-phase deposition on the waxy leaf cuticle or by uptake in the gas phase through the stomata (Larsson and Sahlberg, 1981; Kipopoulou et al., 1999). However, as PAHs are lipophilic molecules, they are able to pass through the cuticle by solubilization in waxes (Keymeulen et al., 1991; Kipopoulou et al., 1999), but they are also strongly kept by Van der Waals or covalent bonds. Because of this, low molecular weight PAHs are easier than high molecular weight to penetrate waxy leaf cuticle (Bauer et al., 1997). On the other hand, there are conflicting reports in the literature concerning the extent of root uptake and translocation of PAHs to shoots (Gunther et al., 1967; Harms, 1975; Ellwardt, 1977; Edwards, 1988; Preusser et al., 1993; Simonich and Hites, 1995; Chaîneau et al., 1997). In fact, recovered PAHs in plants are either adsorbed on root suberine cortical zones (lipophilic constituants) or absorbed by root cells and subsequently transferred to the aerial parts (Briggs et al., 1982; Edwards, 1988; Sims and Overcash, 1983). Root uptake of non-ionized chemicals (described by the root concentration factor, RCF) is generally well correlated with lipophilicity (log K_{ow}, the water–octanol partition coefficient), with RCF being the maximum at log $K_{ow} > 3$ (Briggs et al., 1982, 1983; Ryan et al., 1988). However, most of these molecules are adsorbed on but not absorbed by roots. Only low molecular weight PAHs were able to migrate to shoots when high molecular weight PAHs were strongly adsorbed on the root epidermis (Wild and Jones, 1992; Larsson and Sahlberg, 1981; Kipopoulou et al., 1999). The transfer in the xylem is also correlated with the lipophilicity of PAHs (Paterson et al., 1990; Goodman et al., 1992). Finally, a relationship exists between the transpiration stream concentration factor (TSCF) and the log K_{ow}, with TSCF being very low (<0.4) at log $K_{ow} > 3$ (Briggs et al., 1982; Ryan et al., 1988; Burken and Schnoor, 1998).

This work was undertaken to determine whether the PAHs resulting from historical contamination due to former industrial activities (i.e., gasworks) can be subject to a soil-to-root transfer and subsequent translocation to edible organs. A pot experiment was set up where three vegetables (lettuce, potato, and carrot) were grown and soils and plant parts were analyzed for the 16 USEPA PAHs listed in Table 1. To discriminate between root uptake and other contamination pathways (dust-associated PAHs and gaseous PAHs), the average PAH deposition with dust particles was quantified, and the distribution of the 16 USEPA PAHs in plants was compared with that in the soil where the plants were grown.

Joëlle Fismes, Corinne Perrin-Ganier, and Jean Louis Morel, Laboratoire Sols et Environnement, UMR 1120, ENSAIA-INPL/INRA, 2 avenue de la Forêt de Haye, BP 172, 54 505 Vandoeuvre lès Nancy cedex, France. Pascal Empereur-Bissonnet, Service des Etudes Médicales, EDF-GDF, 22-28 rue Joubert, 75 009 Paris, France. Received 31 July 2001. *Corresponding author (jean-louis.morel@ensaia.inpl-nancy.fr).

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Abbreviations: PAH, polycyclic aromatic hydrocarbon.

Table 1. Concentrations of the 16 USEPA polycyclic aromatic hydrocarbons (PAHs) in the five soils used in this study.

USEPA PAH	Soil				
	PAH_1	PAH_2	PAH_3	PAH_4	PAH_5
	mg kg^{-1} dry soil				
Two-ring					
Naphtalene	0.022	0.223	0.619	9.933	19.327
Three-ring					
Acenaphthylene	0.000	0.000	0.000	0.000	0.000
Acenaphtene	0.003	0.040	0.076	0.124	0.291
Fluorene	0.018	0.231	0.559	10.730	21.669
Phenanthrene	0.200	2.380	4.343	84.529	168.450
Anthracene	0.052	0.948	2.987	37.067	79.872
Four-ring					
Fluoranthene	0.526	6.232	2.973	206.116	389.074
Pyrene	0.464	5.208	17.410	145.946	272.422
Benzo(*a*)anthracene	0.362	4.417	15.514	116.071	234.542
Chrysene	0.356	3.541	12.091	84.955	171.367
Five- or six-ring					
Benzo(*b*)fluoranthene	0.719	7.842	26.540	157.047	326.789
Benzo(*k*)fluoranthene	0.395	5.030	15.531	93.478	196.053
Benzo(*a*)pyrene	0.443	7.285	21.955	144.072	299.429
Dibenzo(*ah*)anthracene	0.073	0.731	2.157	13.340	26.783
Benzo(*ghi*)perylene	0.410	4.887	14.558	83.762	170.074
Indenopyrene	0.301	3.920	13.437	75.788	149.644

MATERIALS AND METHODS

Soil Samples and Analysis

Soil samples were collected from a former gasworks site and a private garden, both located in eastern France and presenting comparable physical and chemical characteristics. Preliminary sampling and analysis were performed to select a set of soil samples showing a gradient of PAH concentrations. Soils were sampled in the upper horizon (0–20 cm), air-dried, and sieved (5 mm). Finally, five soils presenting a gradient of pollution were sampled: soil PAH_1 with 4 mg 16 USEPA PAHs kg^{-1} dry soil, soil PAH_2 with 53 mg 16 USEPA PAHs kg^{-1} dry soil, soil PAH_3 with 172 mg 16 USEPA PAHs kg^{-1} dry soil, soil PAH_4 with 1263 mg 16 USEPA PAHs kg^{-1} dry soil, and soil PAH_5 with 2526 mg 16 USEPA PAHs kg^{-1} dry soil (the concentrations of the individual 16 USEPA PAHs are given in Table 1). Soils were analyzed for water holding capacity (saturated soil compression at 0.01 MPa for 24 h), particle-size distribution (pipette method; NF [French norm] X31-107) (AFNOR, 1994), pH (1:2.5 in H_2O; NF X31-103), total $CaCO_3$ (Drouineau–Gallet method; NF X31-106), total organic carbon (Anne method, by sulfochromic oxidation; NF X31-109), total nitrogen (Kjeldahl method; NF X31-111), extractable phosphorus (Olsen method), and cation exchange capacity (Metson method; NF X31-130) (Table 2). Total Cd, Cu, Ni, Pb, and Zn (by acid oxidation; NF X31-151), and ammonium acetate–extractable Cu and Zn (ammonium acetate–EDTA extraction; NF X31-120) also were measured. Soils were calcareous, and exhibited large differences in organic C according to the PAH concentration (2.18% in PAH_1 to 9.45% in PAH_5). All nutrients were at sufficient levels for plant growth except Mg, which showed an unbalanced content in comparison with K (competition between the two elements for plant absorption) in PAH_1, PAH_2, and PAH_3, and P, which was at low concentration in PAH_4 and PAH_5. Metals (i.e., Zn, Ni, Pb, and Cd) were present at concentrations frequently recorded in garden soils in Europe (Morel and Schwartz, 1999; Schwartz et al., 2000).

Table 2. Physical and chemical characteristics of the soils used in this study.

Characteristic	Soil				
	PAH_1	PAH_2	PAH_3	PAH_4	PAH_5
Clay, %	24.7	33.4	24.8	22.4	24.5
Silt, %	42.4	33.3	37.1	35.7	35.9
Sand, %	32.9	33.3	38.1	41.9	39.6
WHC†, %	27.1	30.7	33.6	31.3	33.7
Organic matter, %	3.8	10.6	13.4	15.5	16.3
Organic carbon, %	2.2	6.2	7.8	9.0	9.5
pH	7.9	7.9	7.8	8.1	8.1
Total $CaCO_3$, %	12.1	13.8	28.1	14.2	14.2
P_2O_5 Olsen, ‰	0.5	0.2	0.3	0.1	0.1
CEC‡, cmol kg^{-1}	15.9	16.6	16.4	15.4	16.0
Total Ca^{2+}, cmol kg^{-1}	36.5	42.5	40.7	38.4	38.7
Total Mg^{2+}, cmol kg^{-1}	1.4	1.0	1.3	1.8	1.7
Total K^+, cmol kg^{-1}	1.5	0.6	1.0	0.7	0.7
Total Cu, mg kg^{-1}	45.2	65.5	65.4	33.1	36.4
Total Zn, mg kg^{-1}	203.8	148.2	161.2	201.4	212.6
Total Ni, mg kg^{-1}	45.3	39.7	37.1	37.8	37.3
Total Pb, mg kg^{-1}	111.5	173.0	169.0	134.0	129.7
Total Cd, mg kg^{-1}	0.5	0.3	0.5	1.1	0.9

† Water holding capacity.
‡ Cation exchange capacity.

Plants

Three plant species commonly cultivated in private gardens and representing various types of edible parts (roots, leaves, and tubers) were chosen: lettuce, potato, and carrot.

Pot Experiments

An amount of 5300 g dry soil was introduced in 10-L plastic pots containing a 3-cm gravel layer. Then, 300 g of composite soil were sampled from each pot and PAH measurement was performed on each soil sample individually. Five lettuce seedlings pre-germinated on compost material were transplanted at the five- or six-leaf stage, and arranged in line in each pot. The soil surface was then covered with a metal grid to avoid contact with aerial plant parts. Carrot seeds were sown directly in pots at a 0.5- to 2-cm depth at a rate of about 50 seeds per pot. After germination, excess seedlings were removed to keep five plants per pot. Two pre-germinated potato tubers were planted per pot at a 6- to 7-cm depth. Soils were watered at 80% of the water holding capacity with nutrient solutions which brought 11 mg N kg^{-1}, 8 mg P_2O_5 kg^{-1}, 41 mg K_2O kg^{-1}, and 3 mg CaO kg^{-1} to lettuce; 19 mg N kg^{-1}, 9 mg P_2O_5 kg^{-1}, and 6 mg K_2O kg^{-1} to potatoes; and 5 mg N kg^{-1}, 28 mg P_2O_5 kg^{-1}, and 46 mg K_2O kg^{-1} to carrots. Five replicates were prepared per each treatment, and pots were arranged in split-plot blocks in a greenhouse (22°C minimum temperature; 12 h of light). Soils were irrigated daily to maintain the mois-

ture content at 80% of the field moisture capacity. Two applications of 10 mg N kg^{-1} were made on carrots on Day 55 and Day 77. Also, 9 mg MgO kg^{-1} were added to potatoes at 37 d. Plant height (potato and carrot), number of leaves (lettuce and carrot), length of the main leaf (potato and carrot), and leaf area (lettuce) were measured periodically. Plants were harvested on Day 25 for lettuce, Day 60 for potato, and Day 90 for carrot. Shoots were separated from roots and tubers, and all plant parts were washed with tap water to remove adherent soil particles. Fresh biomass was measured. All carrots and half of the total potatoes were peeled with a kitchen peeler (0.2-mm-thick peel) in order to quantify PAHs only in edible pulp of carrots and in both edible pulp and edible peel of potatoes (some consumers eat unpeeled potatoes). The various plant parts were dried at 75°C for 12 h, weighed, and mixed prior to PAH analysis. Polycyclic aromatic hydrocarbons were measured in the intact potatoes and in peeled potatoes, and PAH contents in peels were obtained by difference because the weight of potato peels was too low to allow direct PAH measurements. Composite soil samples were collected from each pot after harvest and air-dried. Polycyclic aromatic hydrocarbon analysis was performed on each soil sample. Bioconcentration factors (BCF = PAH concentration in fresh parts of plant/PAH concentration in dry soil) were calculated for each pot at harvest.

Estimation of Dust Deposition of Polycyclic Aromatic Hydrocarbons

Four pairs of stainless steel plates (50 cm^2) covered with a silicone gel were placed horizontally on poles at the start of the pot experiment. They were placed at the same level as lettuce leaves, and along the series of pots bearing the lettuce culture. They were collected at the same time as lettuce harvest (25 d). Dust was removed with a dichloromethane–hexane (50/50 v/v) solvent and its content in PAHs was determined. In parallel, the length of the five major lettuce leaves was measured at planting, after 10 d, and at harvest, and the leaf surface was calculated assuming that leaves were (i) ellipses from planting to the seven-leaf stage and (ii) circles to the end of the experiment.

Analysis of Polycyclic Aromatic Hydrocarbons in Soils and Plant Tissues

Five grams of soil and plant samples were extracted with a 50-mL mixture of 50% hexane and 50% dichloromethane (v/v) in a Dionex (Sunnyvale, CA) Model 200 accelerated solvent extractor at a pressure of 13.6 MPa and a temperature of 100°C during 8 min. After each extraction, the extraction cells were automatically rinsed with the same mixture. Solvent extracts were then evaporated to dryness and dissolved in 1 mL acetonitrile. All extracts were filtered prior to analysis with cellulose filter units and then analyzed for the 16 USEPA PAHs by high performance liquid chromatography (HPLC) with ultraviolet (UV) and fluorescence detection. The system consisted of an automatic injector, a high-pressure pump, and a C18 Vydac (Hesperia, CA) column. A programmable fluorescence detector and a UV detector were used. Chromatography was performed at 30°C. Replicate analyses gave an error in the ±5 to 10% range.

All PAH analyses were run with quality assurance procedures at the IRH-Environnement laboratory (Nancy, France). Growth parameters and PAH contents in soils and in plant tissues were subject to variance analysis and statistically compared according to the Tukey's test at the 0.05 probability level.

RESULTS

Plant Growth and Biomass Production

No phytotoxicity symptoms were observed for plants regardless of the PAH concentration in soil, except Mg deficiency in potatoes, which was alleviated by the addition of MgO on Day 40, on all potato soils. Leaf emergence of the three species was linear during plant development. The leaf area and the aerial biomass of lettuce increased between 10 and 25 d after replanting. Shoot heights of carrots and potatoes increased between 20 and 45 d, then reached plateaus. The PAH_2 and PAH_3 soils were more favorable to the development of lettuce leaves than other soils (PAH_1, PAH_4, and PAH_5) with a production of 2.76 g dry matter per plant in PAH_2 and 2.97 g dry matter per plant in PAH_3 against 2.09 g dry matter in PAH_1, 1.88 g dry matter in PAH_4, and 2.28 g dry matter in PAH_5. Also, a reduction in lettuce root biomass was recorded in PAH_4 (0.36 g dry matter per plant) and PAH_5 (0.39 g dry matter per plant) against 0.49 g dry matter in PAH_1, 0.45 g dry matter in PAH_2, and 0.47 g dry matter in PAH_3. High PAH concentrations in soil (superior than 1200 mg kg^{-1}) corresponded with greater vegetative development of potatoes (4.6 g dry matter per plant in PAH_4 and 4.0 g dry matter per plant in PAH_5, against 2.8 g dry matter in PAH_1, 3.9 g dry matter in PAH_2, and 3.4 g dry matter in PAH_3). They corresponded also to greater development of both above- and belowground organs of carrots (3.1 g dry matter leaves per plant in PAH_4 and from 1.7 to 2.3 g dry matter in other soils; 2.7 g dry matter roots in PAH_4 and 3.5 g dry matter roots in PAH_5 against 1.4 to 2.1 g dry matter in other three soils).

Polycyclic Aromatic Hydrocarbons in Vegetables

The 16 USEPA PAHs were present in above- and belowground parts of the three vegetables cultivated on all soils (Fig. 1). However, total concentrations of PAHs in leaves were low (from 0.2 to 2.7 mg kg^{-1} dry matter) and showed no significant difference among the three vegetables for a given soil. Concentrations in plants tended to increase with PAH concentration in soils over the range of concentrations tested. The increase was significant in leaves of lettuce and potatoes grown on soils containing more than 1200 mg PAHs kg^{-1} dry soil. The concentration in lettuce roots was greater than in leaves (up to 22 mg PAHs kg^{-1} dry matter). Very low concentrations were found in peeled potatoes, with a maximum of 0.35 mg kg^{-1} dry matter, but higher values were recorded in the peels, ranging between 0.44 and 0.61 mg kg^{-1} dry matter. However, the PAH concentration in peeled and intact potatoes was independent of the PAH concentration in soils. The PAH concentration in peeled carrots significantly increased from 0.03 to 0.1 mg kg^{-1} dry matter with the degree of soil contamination. Bioconcentration factors showed very low values and were inversely proportional to the total PAH concentration in soil (Table 3). It varied from 0.06×10^{-3} (PAH_5) to 3.3×10^{-3} (PAH_1) in lettuce leaves and from 0.08×10^{-2} (PAH_5) to 1.4×10^{-2} (PAH_1) in let-

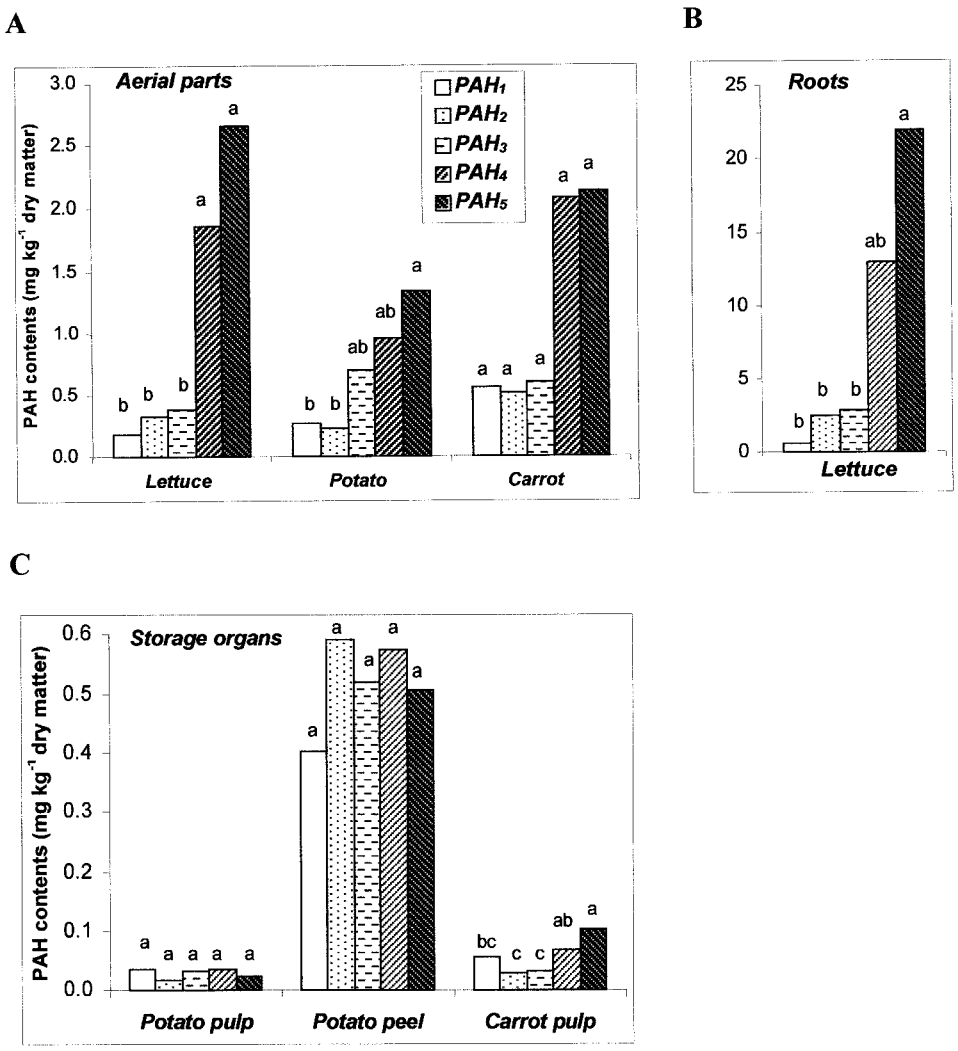

Fig. 1. Concentration of the 16 USEPA PAHs in (*A*) aerial parts of lettuce, potato, and carrot, (*B*) roots of lettuce, and (*C*) storage organs of potato and carrot, after growth in soils showing a gradient of PAH concentration (PAH_1 to PAH_5). Bars are mean values of five replicates. Bars affected by the same letter are not significantly different at the 5% probability level (Tukey's test).

tuce roots, from 0.01×10^{-2} (PAH_5) to about 2×10^{-2} (PAH_1) in potato and carrot leaves, and from about 0.01×10^{-4} (PAH_5) to 13×10^{-4} (PAH_1) in pulp of potatoes and carrots; in potato peels, bioconcentration factor increased from 0.02×10^{-3} (PAH_5) to 13.7×10^{-3} (PAH_1).

Distribution of Polycyclic Aromatic Hydrocarbons in Soils and Vegetables

The 16 USEPA PAHs were grouped according to the number of aromatic rings (i.e., two, three, four, and five or six rings) (Fig. 2). Their distribution in the soils was independent of the origin and the history of the soils collected from the garden or the industrial site. The PAH profiles in the lettuce root samples were fairly similar to those of the soil. High molecular weight PAHs dominated in both soils and lettuce roots. However, profiles were different between soils and lettuce leaves. The low molecular weight PAHs in lettuce leaves in the slightly polluted soils (PAH_1, PAH_2, and PAH_3) were in higher proportion than in the corresponding soils, and the percentage of low molecular weight PAHs de-

Table 3. Bioconcentration factors (BCF) in lettuce, carrot, and potato. AP, aerial parts; RO, roots; PAH, polycyclic aromatic hydrocarbon; PPu, potato pulp; PPe, potato peels.

	BCF (mg PAH kg^{-1} fresh plant/mg PAH kg^{-1} dry soil)						
	Lettuce		Potato			Carrot	
Soil	AP	RO	AP	PPu	PPe	AP	RO
PAH_1	3.30×10^{-3}	1.39×10^{-2}	1.70×10^{-2}	10.00×10^{-4}	11.70×10^{-3}	2.05×10^{-2}	13.40×10^{-4}
PAH_2	0.44×10^{-3}	0.49×10^{-2}	0.10×10^{-2}	0.40×10^{-4}	1.54×10^{-3}	0.16×10^{-2}	0.50×10^{-4}
PAH_3	0.16×10^{-3}	0.14×10^{-2}	0.11×10^{-2}	0.27×10^{-4}	0.40×10^{-3}	0.06×10^{-2}	0.20×10^{-4}
PAH_4	0.08×10^{-3}	0.08×10^{-2}	0.02×10^{-2}	0.02×10^{-4}	0.04×10^{-3}	0.03×10^{-2}	0.07×10^{-4}
PAH_5	0.06×10^{-3}	0.08×10^{-2}	0.01×10^{-2}	0.01×10^{-4}	0.02×10^{-3}	0.01×10^{-2}	0.04×10^{-4}

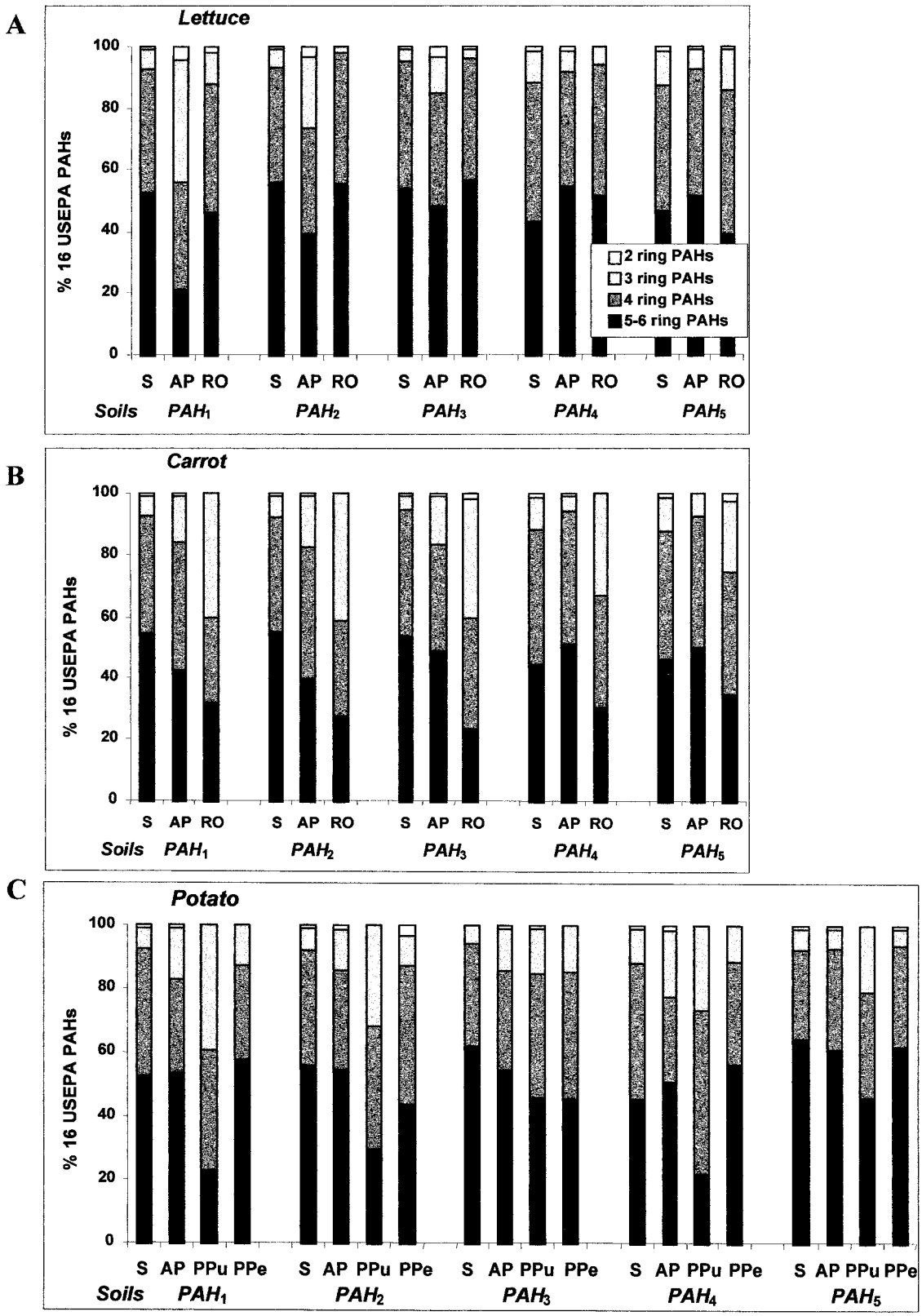

Fig. 2. Distribution of the different PAH groups (number of aromatic rings) in (*A*) lettuce, (*B*) carrot , and (*C*) potato. S, soil; AP, aerial parts; RO, roots; PPu, potato pulp; PPe, potato peels.

Table 4. Deposition of polycyclic aromatic hydrocarbons (PAHs) on plates during lettuce growth.

		PAH concentration in dust				
		PAH groups				
Total dust deposition	Average daily dust deposition	Two rings	Three rings	Four rings	Five or six rings	16 USEPA PAHs
mg	mg m^{-2} d^{-1}	mg kg^{-1}				
9.0	75	0.24	1.31	2.44	4.40	8.38

creased with increasing soil contamination. Proportion of compounds with three and four aromatic rings increased while proportion of compounds with five aromatic rings decreased in pulp of potatoes and carrots as compared with soils and potato peels. The distribution of PAHs was similar in potato peels and in soils, with a predominance of high molecular weight PAHs, while low molecular weight PAHs were dominant in potato pulp.

Deposition of Polycyclic Aromatic Hydrocarbons on Plates

Mass of particles deposited on plates during 25 d reached 75 mg m^{-2} d^{-1} (Table 4). The estimation of the surface of lettuce aboveground parts allowed the calculation of the dust deposition during the experiment, assuming a similar deposition to that on plates. The average surface of lettuce was 80 cm^2 at planting and 700 cm^2 at harvest. Hence, deposition evolved from 0.6 (0.008 m^2 × 75 mg m^{-2} d^{-1}) to 5.25 mg d^{-1} (0.07 m^2 × 75 mg m^{-2} d^{-1}), or a total average deposition of 73 mg dry particles per lettuce [(0.6 mg d^{-1} + 5.25 mg d^{-1})/2 × 25 d]. The average PAH concentration in dust was 8.38 mg kg^{-1} dry deposit. The average total deposition was 0.61 μg PAHs per lettuce (8.38 mg kg^{-1} × 73 × 10^{-6} kg). Therefore, the aerial PAH supply was negligible compared with the PAH concentration in lettuce, which varied from 0.4 (PAH_1) to 10.4 (PAH_5) mg PAHs per plant. Despite a higher contribution of PAH aerial deposition for lettuce cultivated on the slightly polluted soils (1.6‰ in PAH_1) than on highly polluted soils (0.06‰ in PAH_5), this contamination pathway remained negligible.

DISCUSSION

It has been shown that plants growing on PAH-contaminated soils may contain PAHs in their tissues (Edwards et al., 1982; Wild and Jones, 1992; Kipopoulou et al., 1999) which may originate from volatile compound absorption by leaves in the surrounding air, deposition of contaminated soil particles (splash), and dust on leaves, followed by retention in cuticle or penetration through it, and soil-to-root transfer followed by subsequent translocation by the transpiration stream. The soil-to-root transfer of PAHs has been demonstrated from hydroponic experiments (Durmishidze et al., 1974; Edwards et al., 1982) and spiked soils (Edwards et al., 1982; Edwards, 1988). However, the contribution of root uptake to PAH content in plants remains unclear. In this work, we have demonstrated that PAHs in soils contaminated by former industrial activities can be detected at significant amounts in both above- and belowground parts of vegetables. The PAH concentrations in plants were similar to values provided by the literature (e.g., Larsson and Sahlberg, 1981) and, except in potatoes, they tended to increase with increasing PAH concentration in soil. Also, evidence is given that most of the PAHs recovered in the upper plant organs resulted from a soil-to-root transfer and subsequent root-to-shoot translocation. Indeed, in the greenhouse, all plants were in contact with a similar atmosphere (i.e., a similar source of volatile and dust-bearing PAHs). If this was the only PAH source, plants would exhibit a similar PAH concentration, as the leaf surface presented only slight variation within a given species. Also, using the plate system, we have shown that only a small portion of the PAHs recovered in leaves could be attributed to an aerial deposition of PAH-bearing dust. In general, the accessibility and availability of organic pollutants as PAHs may become more difficult during aging (Chung and Alexander, 1998). In this study, sieving the soil broke aggregates and may have increased the availability of PAHs. However, the bioconcentration factor calculated for all plant parts was very low, varying from 10^{-4} to 10^{-2}, compared with values obtained in carrots and lettuce grown on industrial areas (Northern Greece) (from 0.13 to 3.2 in carrot cores and from 0.11 to 8.3 in lettuce leaves) (Kipopoulou et al., 1999). However, dry leaf–air bioconcentration factors (m/m) recorded in azalea leaves submitted to different organic pesticide vapors exhibited higher values, ranging from 1.8 (hexachlorobenzene) to 1.9 × 10^5 (DDT) (Bacci et al., 1990).

No detrimental effect on plant growth was recorded, probably because of the low concentration of volatile compounds. In fact, Chaîneau et al. (1997) and Sims and Overcash (1983) indicated that toxicity of PAHs decreased with time because of the evaporation of naphtalene, which is 20 times more toxic than heavier PAHs. The soil drying and sieving favored the volatilization of volatile compounds (PAHs with two or three rings presenting a low Henry constant) and probably contributed to reduced soil toxicity. A reduction in tuber biomass in some soils was recorded, possibly due to an unfavorable soil structure (PAH_1 presented a high apparent density with limited gaseous fraction) or a competition for photoassimilates between vegetative growth and tuberization (PAH_4 and PAH_5 favored aerial biomass production). On the contrary, greater growth (potatoes, carrots) was observed at concentrations in soil greater than 1200 mg PAH kg^{-1}, possibly due to a stimulating effect that has been already noticed (e.g., increase in algae cell height [Gräf, 1965] and increase in yield of cabbage [+20%], tobacco [+100%], and rice [+300%] in the presence of benzo(*a*)pyrene [Gräf and Nowak, 1966]). The higher the molecular weight, the stronger

the stimulation, and high molecular weight PAHs, which exhibit a structure close to that of gibberelline, were supposed to act as growth-promoting substances (Gräf and Nowak, 1966).

Despite a very different vegetative system among the three species, the PAH concentration was similar in the leaves. Also, since the three vegetables produced a similar aerial dry biomass during their growth, we infer a passive transport of PAHs from soil to leaves driven by the transpiration flux.

Concentrations of PAHs in peeled potatoes were very low and were not correlated with the PAH concentration in soils. The PAH contents in whole tubers were greatly higher than those of peeled tubers. Chiou et al. (2001) and Kipopoulou et al. (1999) ascribed this to the fact that the peels have higher lipid contents than the pulp. Therefore, storage organs like potatoes filled by transfer of assimilates from leaves via the phloem vessels, and lipophilic organic pollutants, including PAHs, are barely transported by the phloem since it is water based (Simonich and Hites, 1995; Kipopoulou et al., 1999). In peeled carrots, PAH concentrations were directly related to the PAH contents in soil, as carrots are simultaneously roots and storage organs. Moreover, carrots have a high lipid content and oil channels in the roots, which have been reported to give greater potential for the uptake of nonpolar chemicals (Edwards, 1988; Ryan et al., 1988; Wild and Jones, 1992; Kipopoulou et al., 1999).

The comparison of the PAH distribution in both plants and soils showed a higher abundance of the high molecular weight PAHs, in contradiction with the literature (e.g., Larsson and Sahlberg, 1981; Wild and Jones, 1992; Kipopoulou et al., 1999). The low persistence of the low molecular weight PAHs in soil restricts their availability from uptake in the long term. As the lettuce roots were carefully washed, their high PAH content was not due to the contamination by adherent soil particles. Indeed, Larsson and Sahlberg (1981) demonstrated that washing vegetables had little effect on phenanthrene levels, but considerably reduced the levels of high molecular weight PAH compounds. However, it is possible that part of the PAHs measured in lettuce roots was due to their strong adsorption on the root epidermis. Similar profiles between soils and lettuce roots may be due to adsorbed PAHs. In fact, root peels are mainly made of suberin, a polyester with phenolic and aromatic functions presenting a lipophilic pole (Kolattukudy, 1980) able to strongly adsorb PAHs (Briggs et al., 1982; Schwab et al., 1998). The proportion of light PAHs in plant leaves decreased with the degree of soil contamination. Low molecular weight PAHs were simultaneously assimilated from the atmosphere through the leaves and from the soil through the roots, while high molecular weight PAHs were essentially taken up by roots and translocated to aerial parts. The different PAH distribution observed in soils and in storage organs suggested that only low molecular weight PAHs are transported in the phloem. In addition, Kipopoulou et al. (1999) indicated that the low molecular weight PAHs are more able to move from the peel tissues into the core of carrots.

CONCLUSION

Vegetables growing on a soil material contaminated by former industrial activities (i.e., historically contaminated soils) may contain PAHs in their tissues at significant concentrations. However, in the range of soil contamination tested, the bioconcentration factor was very low and probably overestimated as, in general, pot experiments exaggerate the availability of pollutants. The PAHs in plants originated from both the atmosphere and the soil, but the soil-to-root transfer was predominant in the range of concentrations tested. The leaves of the three plant species tested in this study responded similarly to the soil contamination, but the PAH translocation from leaves to storage organs (i.e., potato tubers and carrot roots) was negligible. Germination of seeds and growth of plants were not significantly affected by the presence of PAHs even at high concentrations in soil. Therefore, despite a significant soil-to-root transfer of PAHs, vegetables can grow in soils heavily contaminated without harmful effects on the biomass production or other signs of phytotoxicity.

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VOICES FROM THE GRASSROOTS

The environmental justice movement is comprised largely of small, democratically run grassroots groups. Many of the groups may or may not have environment in their names. Nevertheless, they are truly environmental groups that are grounded in the community. It is also important to note that the vast majority of the grassroots groups are led by women-a significant deviation from the leadership of national environmental groups.

Most people of color activists were pressed into duty because of environmental threats to their family, home, community, and workplace. With meager financial resources, grassroots groups have defied all odds. They have stayed together, persevered, and in many instances, won their battle. The groups are also sharing their stories, tactics, strategies, and resources with other groups facing similar up-hill struggles.

The vignettes in this section typify the work of grassroots environmental justice groups- individuals who are on the front line of the environmental justice movement. From New York to Los Angeles and many communities in between, poverty and racism place millions of Americans in double jeopardy. From the wilderness areas of Alaska to the beaches of Puerto Rico, grassroots groups are fighting for just, healthy, and sustainable communities. They are demanding fair and equitable treatment in the application of environmental, health, employment, housing, transportation, and civil rights laws and regulations.

These stories provide thoughtful insights about the on-the-ground struggle for environmental and economic justice. For them, the environment is everything; where they live, work, play, go to school, worship, as well as the natural world. It is important that their stories be told. Similarly, it is important that their stories be told through the voices of those who are making history. A major environmental justice principle demands that people “speak for themselves.” The voices of these environmentalists need to be heard and respected. These voices are the heart and soul of the modern environmental movement. They provide a vision for the environmental movement in the new millennium.

Relocation from "Mount Dioxin"

Margaret Williams

I am a retired Pensacola, Florida schoolteacher. For the past five years my community has been involved in a campaign to get our residents relocated from the environmental and health hazards posed by the nation's third largest Superfund site, the Escambia Wood Treating site. The Escambia Treating Company (ETC) Superfund site is located in a mixed industrial and residential area in north central Pensacola, Florida. The poisonous chemicals released from the site may have been responsible for more than 40 deaths due to cancer.

The Escambia Treating Company operated from 1943 to 1982, using creosote and pentachlorophenol (PCP) to treat wood for use as utility poles and foundation pilings. Few environmental precautions were taken. Wastes were placed in an unlined landfill, in an unlined containment pond, and in unlabeled drums. Former workers tell us that the treatment cylinders (pressure cookers used to saturate the wood with pentachlorophenol) would sometimes fly open, releasing hundreds of gallons of toxic solution; they tell of being sent to pump out creosote and PCP which had pooled in yards north of the plant after heavy rains flooded the waste ponds and to distribute sand over the contaminated areas.

The U.S. Environmental Protection Agency (EPA) data confirms that dangerous levels of dioxins have migrated into some residents' yards. The elevation of the site, which is more than 60 feet above much of downtown Pensacola, and conditions during the plant's operation suggest that storm water runoff often carried contaminants well beyond the closest residential neighborhoods.

Ceasing operations in 1982, the plant was abandoned and left in great disarray. The plant had leaking drums, a lab full of broken equipment and open containers, an overturned electrical transformer, and crumbling asbestos insulation around a boiler. It also left soil, sludge, and groundwater contamination from 40 years of wood preserving activities. By the mid-eighties, the extent of the contamination was becoming obvious and the site was abandoned through bankruptcy in 1991.

The Escambia Treating site was dubbed "Mount Dioxin" because of the 60-feet high mound of contaminated soil dug up from the neighborhood. The contaminated mountain of dirt was covered with a black plastic wrap. The L-shaped mound holds 255,000 cubic yards of soil contaminated with dioxins, one of the most dangerous compounds ever made.

Citizens Against Toxic Exposure or CATE, a neighborhood organization formed to get relocation, went into battle with the U.S. EPA officials over a relocation plan. CATE demanded a total relocation of all residents in the impacted neighborhood. On the other hand, EPA first proposed to move only 66 households most affected by the site. After prodding from CATE, the EPA then added 35 more households for a total cost of $7.54 million.

The original government plan called for some 257 households, including an apartment complex, to be left out. CATE refused to accept any relocation plan unless everyone was moved. The partial relocation was tantamount to partial justice. CATE took its campaign on the road to the EPA's National Environmental Justice Advisory Council or NEJAC. The group was successful in getting the EPA's National Environmental Justice Advisory Council (NEJAC) Waste Subcommittee to hold a Superfund Relocation Roundtable in Pensacola. At this meeting, CATE's total neighborhood relocation plan won the backing of more than 100 grassroots organizations. The EPA nominated the Escambia Treating Superfund site as the country's first pilot program to help the agency develop a nationally consistent relocation policy that would consider not only toxic levels but also welfare issues such as property values, quality of life, health and safety.

On October 3, 1996, EPA officials agreed to move all 358 households from the contaminated site at an estimated cost of $18 million. EPA officials deemed the mass relocation as "cost efficient" after city planners decided to redevelop the area for light industry rather than clean the site to residential standards. This decision marked the first time that an African American community had been relocated under EPA's giant Superfund program. It was hailed as a landmark victory for environmental justice.

As of November 1999, some families have successfully negotiated purchase prices for their property and are moving into homes in uncontaminated neighborhoods. Many, however, are feeling pressured to accept inadequate compensation for their homes and to settle for shabby or even unsafe replacement homes. The EPA had agreed to discount the presence of the Escambia Treating Company site in the appraisals but is refusing to make the appraisals available to the homeowners. Low buyout offers indicate that the neighborhoods' industrial setting, nearby sources of pollution, and racial segregation are affecting valuations.

Homeowners who have already moved for health reasons are being financially penalized. And, upkeep for contaminated (therefore non-credit worthy) homes by (often ill) owners is being unfairly reflected in buyout offers which should fund replacement housing. CATE is eager to see the relocation process completed, but the group is also determined that residents receive enough to acquire equivalent (but safe) homes without financial loss. CATE intends to prevent any cleanup activities before all are relocated and to be sure the remediation protects public health from all possible routes of exposure. Meanwhile, the condition of the cover on "Mt. Dioxin" is a very critical concern, not only for the relocation neighborhoods, but also for the rest of Pensacola.

CATE will continue to be actively involved in ETC cleanup sites, which have profound importance for area surface water and drinking water sources, and in seeking health treatment for exposed residents, especially preventive care.

Margaret Williams is a founding member of the Pensacola-based Citizens Against Toxic Exposure community based organization.

Surviving Chicago's 'Toxic Doughnut'

Hazel Johnson

I am a mother of seven children and nine grandchildren. I have been a resident of the Altgeld Gardens community for 37 years. Altgeld Gardens is a public housing development located on the Southeast side of Chicago. I became a community representative, taking children on field trips to the amusement park and other places, during the summer months. I volunteered at the local parent school council and was elected to the Altgeld Local Advisory Council.

I started People for Community Recovery (PCR) in 1979. It was started as a group of women organizing on environmentally-related health problems in this community. PCR was incorporated October 25, 1982. Our organization is one of the first African American grassroots community-based environmental organizations in the Midwest. Our mission is to address multiple exposures to harmful toxins and pollutants surrounding public housing. For the past 20 years, I have been active in environmental issues in my community and other communities of color around the country. I got involved in environmental issues while watching the news and learned that the Southeast side of Chicago had the highest incidence of cancer of any community in the city.

Later, I connected with the city and state health departments. These agencies mailed me many reports on environmental problems in Southeast Chicago. PCR conducted its own land use survey of the neighborhood. We began knocking on my neighbors' doors asking them to fill out the health survey. We learned that people were suffering with severe health problems, including asthma, cancer, skin rashes, kidney and liver problems. To no one's surprise, we found alarming patterns. The Southside neighborhood, Altgeld Gardens in particular, was surrounded by all kinds of polluting industries, landfills, incinerators, smelters, steel mills, chemical companies, paint manufacturing plants, and a municipal sewage treatment facility. My neighborhood is also surrounded by more than 50 abandoned toxic waste dumps. We live in a "toxic doughnut."

Despite poor environmental conditions in our community, this did not discourage our group from wanting to learn more about the environmental conditions and the possible impact on residents' health. PCR began organizing residents to get the neighborhood cleaned up and treated fairly. For the past decade, we pressured corporate polluters, the city, and state officials to make them aware of their negligence and make them accountable. It has not been easy going up against the giant corporations, but we are fighting a life-and-death struggle. Through perseverance and dedication, we have successfully brought the needed attention to the environmental issues in Southeast Chicago. We have to fight for our children. We have educated ourselves on environmental issues and the health threats from nearby polluting industry. We have not waited for government to come in and determine the "cause" of our illnesses. We may not have Ph.D. degrees, but we are the 147;experts" on our community.

In 1992, PCR undertook its own health survey of 825 Altgeld Gardens' residents. We were joined by volunteers from the University of Illinois School of Public Health (designed the survey instrument), Clareitian Medical Clinic (conducted training of interviewers), and St. James Hospital, (designed of the graphs). Their goal was to follow up on the long-standing anecdotal evidence of health problems. The results of the survey were no surprise. In addition to heightened risks of troubled pregnancies, the survey revealed a high incidence of chronic pulmonary disease, which includes emphysema and chronic bronchitis. Thirty-two percent of men and 20 percent of the women surveyed had asthma. Sixty-eight percent of those surveyed indicated that they experienced health problems that disappeared when they left Altgeld Gardens. More than 37 percent of the respondents cited noxious odor when asked to comment generally on their most common complaint.

The environmental justice work that we started in Chicago has allowed me to testify before Congress and meet two Presidents of the United States. Our group has sponsored “toxic tours” of the community with dignitaries from around the world. We have hosted two environmental conferences. We are often asked to speak at universities and colleges, at workshops and training programs about urban environmental pollution and racism. Our environmental justice work has kept us busy. More importantly, it has paid off.

PCR’s organizing efforts persuaded the Chicago Housing Authority and Chicago Board of Education to remove asbestos from the homes and schools in Altgeld Gardens. We assisted elderly tax-paying residents of Maryland Manor, another Chicago housing development, in getting water and sewage services. Our group also shut down a nearby hazardous waste incinerator and fought to get a comprehensive health clinic in the southside neighborhood.

PCR along with other people of color grassroots groups took their struggle to the Rio Earth Summit where they were joined in solidarity with other brothers and sisters around the world who are experiencing similar environmental and economic injustices. It did not take me long to realize that the environmental, economic, and health problems in the favelas of Rio de Janeiro looked a lot like the problems in my Southside Chicago neighborhood.

Our organization is growing and maturing, and we are still learning. In 1992, PCR was a recipient of the President’s Environmental and Conservation Challenge medal, the nation’s highest environmental award. That was a great honor. However, the biggest award and honor I could get from government officials right now is for them to “do the right thing,” by making the polluters clean up their act on the Southside.

PCR has formed alliances and coalitions with national environmental and civil rights organizations as well as other local grassroots environmental groups. We see ourselves as an integral part of the environmental and economic justice movement. Poor people and people of color must empower themselves to become politically active. Everything is political. We must learn how fight for environmental justice at home and abroad. No one will save our communities but us.

Hazel Johnson is the founder of People for Community Recovery and a resident of Chicago’s Altgeld Garden.

St. James Citizens Defeat Shintech

Emelda West

My home, community, and environment are under siege from industrial polluters who have turned the 85-mile stretch along the Lower Mississippi River into a toxic wasteland. From my home in Convent, Louisiana, located on the winding Mississippi River Road, I have witnessed my community undergo a transformation from sugar cane plantations to one heavily dominated and devastated by the petrochemical industry.

Convent is an unincorporated community in St. James Parish. More than 80 percent of Convent residents are African Americans. Over 2,000 people live in Convent. The community gets its name from the Convent of Sacred Heart, a catholic school for the daughters of plantation owners that existed in the 1800s. St. James Parish was established on March 31, 1807 and was one of the first 19 parishes in the state. During that time, the chief economic source in St. James was agriculture developed by slave labor. Today, there are just a few sugar cane fields and the sites of many of the old plantations are now occupied by industrial facilities. The plantation system has been replaced with industrial plants.

St. James Parish is located in the center of Louisiana's infamous "Cancer Alley," an area of the Mississippi River from Baton Rouge to New Orleans. Over the years, I have heard dozens of companies moving into my community promising jobs to local residents. Many of my neighbors could actually walk to work because the plants are so close to their homes. However, few community African American Convent residents are actually hired. The community has an extremely high unemployment rate. The average annual income of local residents is only $6,000. Over 40 percent of the population of Convent live below the poverty line.

More than 130 petrochemical facilities release over 70 percent of all the toxic pollution in the state, which totals 17,585,979 pounds annually. There are 17 industrial facilities in St. James Parish that are responsible for this high pollution level. On the northern border of St. James Parish is Ascension Parish--the number one parish in the state for the highest release of toxic pollution (51.5 million pounds annually).

Nearly half of the 17 million pounds of toxic pollution in St. James Parish comes from four facilities. These facilities are the biggest polluters in the parish and all operate within three miles of Convent residents: IMC-Agrico-Faustina, IMC-Agrico-Uncle Sam, Star Enterprise (now Motiva), and Chevron Chemical.

Today, the Mississippi River is so polluted that the fish is not safe to eat. Although our drinking water comes from the Mississippi River, residents who can afford to buy bottled water and install filters do so. However, this added expense places a hardship on the region's low-income residents. Industrial pollution has also kept many of us from gathering fruits and planting vegetable gardens. These losses have created more poverty because we are now forced to rely solely on wage income in a community with high unemployment.

In addition to toxic pollution released every day, we have no protection against chemical accidents. There are 36 residential streets in Convent that are within three miles of six industrial plants. All of these streets are narrow dead end streets. Evacuation is a problem because there is usually only one way in and one way out of these streets that are poorly paved and not much wider than a vehicle. Because the streets are so narrow, several trailer homes have burned because the fire trucks were too wide for the streets and could not be driven to the trailer homes. We have a volunteer fire department. Volunteers have to leave their jobs in order to respond to an emergency.

We are very concerned about the children who attend our two elementary schools, Romeville Elementary School on the east bank and Fifth Ward Elementary on the West Bank. Romeville is less than a mile away from Zen Noh grain elevator, and both schools are within three miles of most of the largest industrial polluters in the parish. Each school has more than 300 mostly African American students. School buses pass by several plants twice a day. Our children, who live and go to school in Convent, are exposed to the industrial pollution on a daily basis. They are also threatened by the risk of a chemical accident.

St. James Citizens for Jobs and the Environment was formed in the home of Mr. & Mrs. Clifford Roberts in September 1996. Before the organization was formed, I received a phone call from Mrs. Pat Melancon informing me that Shintech Inc. had proposed to purchase the last three plantations in Convent (Wilton, St. Rose, and Helvetia) consisting of 3,500 acres. The land was needed for the proposed Shintech Complex. The addition of this complex would contribute 600,000 more pounds of airborne toxins to the area and discharge over six million gallons of wastewater into the Mississippi River on a daily basis.

The grassroots struggle against Shintech began with a community organization, made up of working poor residents from a town in the industrially devastated St. James Parish. The St. James Parish residents, mainly African-Americans, decided to use the courts to block the Shintech Corp., the U.S. subsidiary of a Japanese multinational, from constructing a $700 million polyvinyl chloride plant in their community. Polyvinyl chloride is associated with the production of dioxin, considered one of the most lethal synthetic chemicals known.

I joined the struggle against the Japanese company because environmental justice in Convent was long overdue. The Shintech struggle was an environmental justice case because African Americans and poor people in Convent would be disproportionately impacted by the plant siting. The confrontation between the community and Shintech took on an added dimension when Louisiana Governor Foster became involved. Governor Foster criticized the community's efforts to block Shintech, charging them with

undermining his administration's efforts to bring economic development to poor communities in the state.

The community argued that despite the Governor's good intentions, they did not want the pollution. They also pointed to the fact that they were not given a guarantee that St. James residents would be used to fill those jobs. The residents cited previous industrial development efforts that did not result in jobs for the local community. The governor expressed his determination to see the Shintech project go through. The St. James residents, unable to afford private legal counsel, sought the services of Tulane University's Environmental Law Clinic, the only environmental law clinic in the state and one of only two in the South.

Local residents concentrated their efforts on addressing environmental racism. Since the mid-1980s, environmental and civil rights activists have charged that polluting industries have deliberately selected poor communities of color for their operations. The lower Mississippi River corridor (between New Orleans and Baton Rouge) is home of a heavy concentration of industrial waste dumpsites, chemical factories, landfills, industrial waste incinerators, grain elevators, and a host of other hazards.

President Clinton issued Executive Order 12898 in 1994. The Shintech case was a litmus test of the Clinton Administration's policy, indicating to the nation how strenuously the administration intends to enforce its ban on environmental racism. The relentless community pressure forced the EPA to conduct its own equity analysis. The community did not rely on the government for its information. Professor Beverly Wright of the Deep South Center for Environmental Justice at Xavier University conducted an independent study for the Convent residents.

The heroes of the struggle are individual leaders who live in communities in "Cancer Alley." They stood with us and never gave up. These leaders included black and white residents working together. Community activists such as Pat Melancon, Dee Simmons, Gloria Roberts, and Amos Favorite kept the issue on the community's radar. We also had assistance from attorneys and environmental advocates such as Bob Kuehn of Tulane and Mary Lee Orr of Louisiana Environmental Action Now (LEAN). We were able to galvanize national environmental (Greenpeace), civil rights (Commission for Racial Justice), entertainment (Bonnie Raitt, Danny Glover, Aaron Neville, Stevie Wonder), and political (Congressional Black Caucus) support around the Shintech struggle.

In June of 1998 after ongoing pressure by the Louisiana Association of Business and Industry, the State Supreme Court, which regulates the state's university law clinics, issued a highly controversial ruling seen as undermining the legal rights of working poor people in the state. The Supreme Court's ruling stated that university law clinics were now barred from representing community organizations unless 51 percent of its members are indigent (making less than $16,000/yr. for a family of four) or if the organization has an affiliation with a national organization.

Since most community organizations are not made up of a majority of indigent families, this ruling makes it difficult, if not impossible, for the working poor to obtain lawyers to defend themselves. In effect, this ruling blocks their access to the legal system. A huge outcry condemning the decision has been heard across the state from public interest lawyers and civil rights and environmental activists as

well as from a variety of journalists and politicians. The decision was compared in the press to similar decisions made during the early civil rights era, which blocked the NAACP from bringing civil rights cases to court.

In Louisiana, as around the country, university law clinics are among the most common ways for working poor people to obtain legal representation. The student lawyers in these clinics, under the careful supervision of their law professors, represent persons and /or community organizations which otherwise would not be able to afford attorneys. Because the cases they bring have the potential to drag on for years, hiring private attorneys would cost tens of thousands, if not hundreds of thousands of dollars. Legal clinics have become essential to the ability of working poor people to go to court to defend their rights. They are now an essential component of American democracy, which safeguard and enhance the principle of equal protection under law.

In spite of the court's decision, the St. James Citizens for Jobs and the Environment continued the fight. In June 1998, a three-member delegation, two Louisiana residents (I was one of the delegates) and a Greenpeace representative, visited the Shintech Headquarters in Tokyo to submit protest documents. We accused Shin-Etsu Chemical Company of environmental racism. We argued that the industrial complex would pose a health hazard, exacerbating damage to an already overly polluted region.

On September 18, 1998, short of three years, Shintech withdrew its plan to build a polyvinyl chloride plastics plant in St. James Parish. This was a major victory for the citizens and the environmental justice movement. Environmental justice activists vowed to continue the fight to keep the plastics industry from expanding in Louisiana.

Emelda West is a 75-year-old great grandmother, environmental activists, and a long-time resident of Convent, Louisiana.

Environmental Justice Leaders Plead Their Case at the United Nations

Margie Richard

My name is Margie Eugene Richard. I am president of Concerned Citizens of Norco. My hometown is located in the southeastern section of Louisiana along the Mississippi River. In 1926 the Royal Dutch Shell Company purchased 460 acres of the town called Sellers and began building its oil refinery. When Shell purchased the town of Sellers, which is now Norco, they displaced African American families from one section to another.

We are now surrounded by 27 petrochemical and oil refineries, refineries for which Norco received its name: Norco is an acronym for New Orleans Refinery Company. Our town is approximately one mile in radius and home to 5,000 residents. There are four streets near the plants occupied by African Americans,Washington, Cathy, Diamond, and East. My house is located on Washington Street and is only three meters away from the 15-acre Shell chemical plant expanded in 1955. Norco is situated between Shell Oil Refinery on the east and Shell Chemical plant on the west. The entire town of Norco is only half the size of the oil refineries.

Nearly everyone in the community suffers from health problems caused by industry pollution. The air is contaminated with bad odors from carcinogens, and benzene, toluene, sulfuric acid, ammonia, xylene and propylene- run-off and dumping of toxic-substance also pollute land and water.

My sister died at the age of 43 from an allergenic disease called sarcoidosis, a disease which affects 1 in 1,000 people in the United States, yet in Norco there are at least 5 known cases in fewer than 500 people of color. My youngest daughter and her son suffer from severe asthma; my mother has breathing problems and must use a breathing machine daily. Many of the residents suffer from sore muscles, cardiovascular diseases, liver, blood and kidney toxicant. Many die prematurely from poor health caused by pollution from toxic chemicals.

Please indulge me while I share with you a few stories that embody some of our fears, because these tragedies can happen at any moment without notice. In the early 70s a pipeline at Shell Chemical Company exploded and killed Mrs. Helen Washington and Joseph Jones. Mrs. Washington was inside her home asleep and her fellow neighbor, Joseph, was cutting grass in his backyard; they both died from burns sustained from the explosion.

In 1988, an explosion at the Shell Oil Refinery plant created a nightmare. Houses collapsed, people suffered from numerous health problems and many lost their lives. The Shell explosion effected people up to 60 kilometers away. In 1994 an acid spill at Shell Oil Refinery plant caused property and health damage. May 10, 1998 a lime truck inside Shell Chemical plant exploded and spilled the lime into the community. And, on December 8, 1998 the Shell Chemical plant spilled methyl ethyl ketone and other harmful substance into the community. There have been many other accidents.

Daily, we smell foul odors, hear loud noises, and see blazing flares and black smoke that emanates from those foul flares. The ongoing noisy operations the endless traffic of huge trucks contributes to the discomfort of Norco citizens. We know that Shell and the U.S. government are responsible for the environmental racism in our community and other communities in the US and many communities throughout this world. There must be an end to industry pollution and environmental racism.

Even as U.S. citizens, we are not protected from environmental racism in the United States of America by our government. I would like to see justice in action that leads to an end to this struggle. Norco and many other communities of color across our nation suffer the same ills. We are not treated as citizens with equal rights according to U.S. law and international human rights law, especially the Convention on the Elimination of All Forms of Racial Discrimination, which our government ratified as the law of the land in 1994. I am bringing these issues before you to increase international support to end support of

these human rights violations by the United States, and: 1) to propose actions that protect communities of color from being dumping places for industrial waste, because these deadly toxic substances cause poor health and problems that contribute to low and poor social economic conditions; and 2) to change the way human beings are mistreated by multinational corporations worldwide.

Margie Richard is president of Concerned Citizens of Norco. This testimony was presented at the United Nations Commission on Human Rights, Geneva, Switzerland in April, 1999.

Tools and Resources for Community Empowerment

The resources in this fact sheet can also be found on EPA Region 4's Environmental Justice (EJ) website: http://www.epa.gov/region4/ej/resources.html

Guidance

A Citizen's Guide To Using Federal Environmental Laws to Secure Environmental Justice
http://www.epa.gov/Compliance/ej/resources/reports/annual-project-reports/citizen_guide_ej.pdf
"This report illustrates how citizens can use existing authorities within federal pollution laws to help ensure that communities of color and low - income communities do not bear a disproportionate share of pollution."

Environmental Justice Strategy (EPA HQ)
http://www.epa.gov/compliance/resources/publications/data/planning/strategicplan/ej/index.html

Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses, April 1998 (EPA HQ)
http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_epa0498.pdf

Title VI - Draft Guidance Documents (EPA HQ)
http://www.epa.gov/ocrpage1/extcom.htm

National Environmental Justice Advisory Council (NEJAC)
http://www.epa.gov/environmentaljustice/nejac/index.html

Tools

Tool Kit for Assessing Potential Allegations of Environmental Justice
http://www.epa.gov/compliance/ej/resources/policy/ej-toolkit.pdf

Report an Environmental Violation
http://www.epa.gov/compliance/complaints/index.html

EJView
A mapping tool that allows users to create maps and generate detailed reports based on the geographic areas and data sets they choose.
http://epamap14.epa.gov/ejmap/entry.html

General Information

Environmental Justice Homepage
http://www.epa.gov/environmentaljustice/

Plan EJ 2014 Strategic Plan
http://www.epa.gov/environmentaljustice/plan-ej/index.html

Environmental Justice Action Plans
EPA's Environmental Justice Action Plans establish measurable commitments that address the Agency's national environmental justice priorities.
http://www.epa.gov/compliance/ej/resources/reports/actionplans.html

Regulatory Information
On this website, you can search for regulatory information that relates to you, your business, and the environmental concerns currently facing your world. We can direct you to Federal Register publications, ways to comment on our regulations, significant guidance documents, and much more.
http://www.epa.gov/lawsregs/

EJ Guidance Under the National Environmental Policy Act
http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_ceq1297.pdf

Not in My Backyard: Executive Order 12898 and Title VI as Tools for Achieving Environmental Justice
http://www.usccr.gov/pubs/envjust/ej0104.pdf

The FHWA maintains links to other websites, reports, publications, and media tools about environmental justice, community impact assessment, public involvement, and transportation.
http://www.fhwa.dot.gov/environment/ejustice/lib/index.htm

Lawyers Committee for Civil Rights
http://www.lawyerscommittee.org/projects/environmental_justice/

The Center for Community Action and Environmental Justice
A 501(c)(3) non-profit organization with its main office located in Riverside, California. The Center's goal is to bring groups of people together to find opportunities for cooperation, agreement and problem solving. The Center works with community groups in developing and sustaining democratically based, participatory organizations that promote involvement of a diverse segment of the community in ways that empower.
http://www.ccaej.org/

The EnviroLink Network
A non-profit organization which has been providing access to thousands of online environmental resources since 1991.
http://www.envirolink.org/

Scorecard
The subject of environmental justice is important, sensitive, and hard to measure. Advocates make a strong case that poor communities and communities of color can bear more than their share of environmental burdens - but in which places, and to what extent? Scorecard profiles environmental burdens in every community in the U.S., identifying which groups experience disproportionate toxic chemical releases, cancer risks from hazardous air pollutants, or proximity to Superfund sites and polluting facilities emitting smog and particulates. Environmental justice analyses are also available in spanish.
http://www.scorecard.org/community/ej-index.tcl

Center for Diversity & the Environment
Provides strategic direction on diversifying the environmental movement.
http://www.environmentaldiversity.org/

Principles of Environmental Justice
Drafted by delegates to the First National People of Color Environmental Leadership Summit. This summit was held on October 24-27, 1991, in Washington, D.C.
http://www.ejnet.org/ej/principles.html

Deep South Center for Environmental Justice at Dillard University
http://www.dscej.org/

Environmental Justice Resource Center at Clark Atlanta University
http://www.ejrc.cau.edu/Welcome.html

"Voices from the Grassroots"
A series of essays that "provide thoughtful insights about the on-the-ground struggle for environmental and economic justice."
http://www.ejrc.cau.edu/voicesfromthegrassroots.htm

Environmental Justice Initiative at Michigan State University
http://eji.snre.umich.edu/

Environmental Justice Case Studies by University of Michigan Students
http://www.umich.edu/~snre492/cases.html

FOR MORE INFORMATION, PLEASE CONTACT:

Brian Holtzclaw
Community Engagement Coordinator
U.S. EPA RCRA Division
404-562-8684
holtzclaw.brian@epa.gov

United States Environmental Protection Agency
Office of Environmental Justice

Office of Enforcement and Compliance Assurance
(2201A)

June 2006

http://www.epa.gov/compliance/environmentaljustice/grants/ej-cps-grants.html

Environmental Justice Collaborative Problem-Solving Cooperative Agreement Program FACT SHEET

Background

For the first time in 2003, the Office of Environmental Justice (OEJ) launched the Environmental Justice Collaborative Problem-Solving Cooperative Agreement (EJ CPS) program. To find out the latest information on the EJ CPS program visit: http://www.epa.gov/compliance/environmentaljustice/grants/ej-cps-grants.html. This website also provides a description of the current projects that have been awarded.

The EJ CPS program requires selected applicants, or recipients, to use the Environmental Justice Collaborative Problem-Solving Model (EJ CPS Model) as part of their projects. The purpose of the EJ CPS Model is to assist affected communities so that they can develop proactive, strategic, and visionary approaches to address their environmental justice issues and to achieve community health and sustainability.

The key elements of the EJ CPS Model are:

- Issue Identification, Visioning, and Strategic Goal-Setting;
- Community Capacity-Building and Leadership Development;
- Development of Multi-Stakeholder Partnerships and Leveraging of Resources;
- Consensus Building and Dispute Resolution;
- Constructive Engagement with Other Stakeholders;
- Sound Management and Implementation; and
- Evaluation.

The New Request for Applications period will be open from June 22, 2006 to 11:59pm October 23, 2006.

Request for Applications

On February 1, 2006, OEJ released the Request for Applications (RFA) for the EJ CPS Program. The EJ CPS Program is of a national scope, and therefore, the purpose of the RFA was to make one assistance agreement award per region. The RFA closed on March 31, 2006; however, the EJ CPS program was cancelled and no awards were made because OEJ did not receive enough applications to meet its national program objectives.

On June 22, 2006, a new announcement for the EJ CPS will be released. Significant changes to the RFA have been made in an effort to solicit more applications. Some of these changes include:

- The definition of "eligible applicant"
- The contents of the application package
- The format of the workplan
- The Threshold Eligibility Criteria

Any organization that applied under the earlier RFA must submit a new application.

Eligible Applicants

An eligible applicant MUST BE either:

(1) a 501(c)(3) non-profit organization as designated by the Internal Revenue Service; OR

(2) a non-profit organization, recognized by the state, territory, commonwealth, or tribe in which it is located.

In addition, an eligible applicant must be able to demonstrate that it has worked directly with, or provided services to, the affected community. An "affected community," for the purposes of this assistance agreement program, is a community that is disproportionately impacted by environmental harms and risks and has a local environmental and/or public health issue that is identified in the proposal.

A “non-profit organization,” means any corporation, trust, association, cooperative, or other organization that:

(1) is operated primarily for scientific, educational, service, charitable, or similar purposes in the public interest;
(2) is not organized primarily for profit; and
(3) uses its net proceeds to maintain, improve, and/or expand its operations.

The focus of this assistance agreement program is to build the capacity of community-based organizations to address environmental and/or public health issues at the local level. Therefore, for this assistance agreement program, the term “non-profit organization” EXCLUDES:

- colleges and universities;
- hospitals;
- state and local governments and federally-recognized Indian tribal governments;
- quasi-governmental entities (*e.g.*, water districts, utilities)*;
- national-, multi-state-, or state-wide- organizations with chapters;
- non-profit organizations that engage in lobbying activities as defined in Section 3 of the Lobbying Disclosure Act of 1995; and
- those non-profit organizations which are excluded from coverage under paragraph 5 of OMB Circular A-122 (see OMB Circular A-122, paragraph 5 at http://www.whitehouse.gov/omb/circulars/a122/a122_2004.html

* Generally, a quasi-governmental entity is one that: (1) has a close association with the government agency, but is not considered a part of the government agency; (2) was created by the government agency but is exempt from certain legal and administrative requirements imposed on government agencies; or (3) was not created by the government agency but performs a public purpose and is significantly supported financially by the government agency.

For More Information

If you would like more information about the EJ Collaborative Problem-Solving Program, please call the Office of Environmental Justice’s 24-hour hotline (1-800-962-6215) or visit the website at: http://www.epa.gov/compliance/environmentaljustice/grants/ej-cps-grants.html

EPA's Commitment to Environmental Justice

On November 4, 2005, United States Environmental Protection Agency (EPA) Administrator Stephen L. Johnson issued a memorandum reaffirming EPA's commitment to environmental justice for all people, regardless of race, color, national origin, or income. Environmental justice means not only protecting human health and the environment for everyone, but also ensuring that all people are treated fairly and are given the opportunity to participate meaningfully in the development, implementation, and enforcement of environmental laws, regulations, and policies.

Because minority and/or low-income communities frequently may be exposed disproportionately to environmental harms and risks, EPA works to protect these and other burdened communities from adverse human health and environmental effects of its programs, consistent with existing environmental and civil rights laws and regulations, as well as through the implementation of Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and/or Low-Income Populations," Feb. 11, 1994).

The memorandum identified eight national environmental justice priorities and directed the integration of environmental justice considerations into EPA's planning and budgeting processes, including into the Agency's Strategic Plan for Fiscal Years 2006-2011. This cooperative agreement program (Program) focuses on one of those eight priorities, which is the use of collaborative problem-solving to address local environmental and/or public health issues. Each remaining priority involves a specific issue, including: (1) reducing asthma attacks; (2) reducing exposure to air toxics; (3) increasing compliance with regulations; (4) reducing the incidence of elevated blood lead levels; (5) ensuring that fish and shellfish are safe to eat; (6) ensuring that water is safe to drink; and (7) revitalizing contaminated sites (please note that this Program cannot be used to fund Brownfields projects).

EPA will continue to fully implement its programs, policies, and activities to ensure that they do not adversely affect populations with critical environmental and/or public health issues, including minority and/or low-income communities.

United States Environmental Protection Agency
Enforcement and Compliance (2201A)
January 2010
Office of Environmental Justice (OEJ)

Environmental Justice Fact Sheet

National Environmental Justice Advisory Council

BACKGROUND

EPA's commitment to environmental justice began in 1992, as a response to public concerns, when the Agency created an Office of Environmental Justice and implemented a new organizational infrastructure to integrate environmental justice considerations into EPA's policies, programs, and activities. In 1993, the Agency established the National Environmental Justice Advisory Council (NEJAC) in order to obtain independent advice and recommendations from all stakeholders involved in the environmental justice dialogue.

Obtaining Stakeholder Advice

The NEJAC was established by charter pursuant to the Federal Advisory Committee Act (FACA) on September 30, 1993. The charter for the NEJAC provides the Administrator with advice and recommendations with respect to integrating environmental justice considerations into EPA's programs, policies, and day-to-day activities.

The NEJAC consists of members from community-based groups; business and industry; academic and educational institutions; state and local governments; tribal governments and indigenous organizations; and non-governmental and environmental groups. The Council meets once each year and provides a forum focusing on human health and environmental conditions in all communities, including minority populations and low-income populations.

EPA'S COMMITMENT TO ENVIRONMENTAL JUSTICE

In her January 23, 2009, "Opening Memorandum to EPA Employees," Administrator Lisa Jackson noted that public trust in the Agency demands that we reach out to all stakeholders fairly and impartially, that we consider the views and data presented carefully and objectively, and that we fully disclose the information that forms the bases for our decisions." In this memo, the Administrator stated that EPA must take special pains to connect with those who have been historically underrepresented in EPA decision-making, including the disenfranchised in our cities and rural areas, communities of color, native Americans, people disproportionately impacted by pollution, and small businesses, cities and towns working to meet their environmental responsibilities.

In her remarks to the NEJAC on July 21, 2009, Administrator Jackson further noted that the advice and recommendations of the NEJAC will be especially pertinent to the Agency as it seeks to place greater emphasis on implementation and the integration of environmental justice considerations into all programs, policies, and activities. She stated that environmentalism is not only about protecting wilderness or saving polar ice caps. As important as those things are, environmentalism is also about protecting people in the places where they live, and work, and raise families. It's about making our urban and suburban neighborhoods safe and clean, about protecting children in their schools, and workers at their jobs.

The issues around environmental justice are often complex and involve strongly divergent viewpoints. The NEJAC provides an environment for all parties to express their concerns and to formulate independent, cogent, and timely advice and recommendations to EPA on major public policy issues. In this way, the NEJAC assists in integrating environmental justice into EPA's policies, programs, and activities.

NEJAC ACCOMPLISHMENTS

As a committee consisting of representatives of broad spectrum of stakeholders, the NEJAC has developed consensus proposals to the Agency for creative and collaborative strategies to better address the human health and environmental protection needs of disadvantaged and underserved communities and to ensure that the goal of environmental justice is being integrated in Agency policies, programs, and priorities.

From **1993 to 1996**, the NEJAC produced a number of products and provided consensus advice to help the Agency focus its environmental justice agenda. For example, the initial draft of EPA's Environmental Justice Strategy required by Executive Order 12898 was reviewed and substantive recommendations made; the Office of Solid Waste and Emergency Response's Facility Siting Criteria document was reviewed; the Model Plan for Public Participation was published and distributed widely; and a public forum protocol was developed and subsequently used as the model for the first Interagency Public Meeting on Environmental Justice held January 19 and 20, 1995, in Atlanta, Georgia. During the summer of 1995, public dialogues were conducted in five major cities concerning possible solutions to urban crises resulting from the loss of economic opportunities caused by pollution and the relocation of businesses. These dialogues were intended to provide an opportunity, for the first time, for environmental justice advocates and residents of impacted communities to systematically provide input regarding issues related to the EPA's Brownfields Economic Redevelopment Initiative. In May 1996, the NEJAC and EPA co-sponsored a Roundtable on Superfund Relocation issues in Pensacola, Florida, to help EPA determine how relocation should be considered during any cleanup decision. The first NEJAC/EPA Enforcement Roundtable was held in San Antonio, Texas.

During the **1997 to 1999** period, the second NEJAC/EPA Enforcement Roundtable was held in Durham, North Carolina; the US-Mexico Border XXI program proposal was reviewed; and the Agency's enforcement and compliance work plan was commented on. In an effort to provide guidance to EPA regarding international

issues related to environmental justice, the first Roundtable on Environmental Justice on the U.S./Mexico Border was held August 19 to 21, 1999 in National City, California. The objectives of that Roundtable were to define and trace the evolution of the national and international environmental justice issues; identify environmental justice issues along the joint U.S./Mexico border; provide an overview of current border programs and explore ways to address concerns; develop environmental justice border policies; and identify existing enforcement and cleanup processes.

During the **1999 to 2007** period, NEJAC restructured its meetings from addressing site-specific issues to addressing national policy issues:

- **Permitting:** What factors should be considered by a federal agency, as well as state or local agencies with delegated permitting authority in the decision making process prior to allowing a new facility to operate in a community that already may have a number of such facilities?
- **Community Based Health Models:** Is there a direct correlation between the environment and the public health problems of the resident of communities that are located in close proximity to multiple pollution-generating facilities?
- **EJ Integration in Federal Programs:** How have the Federal agencies succeeded in integrating environmental justice into their programs, operations, policies, and activities pursuant to Executive Order 12898?
- **Fish Consumption:** How should the EPA improve the quality, quantity, and integrity of our Nation's aquatic ecosystems in order to protect the health and safety of people consuming or using fish, aquatic plants, and wildlife?
- **Pollution Prevention:** How can EPA promote innovation in the field of pollution prevention, waste minimization, and related areas to more effectively ensure a clean environment and quality of life for all peoples, including low-income, minority and tribal communities?
- **Cumulative Risk:** To ensure environmental justice for all communities and tribes, what short- and long-term actions should the Agency take in proactively implementing the concepts contained in its Framework for Cumulative Risk Assessment?
- **Enhancing Stakeholder Involvement:** What mechanisms will most effectively: ensure continuation of timely, relevant and cogent public policy advice on environmental justice issues/concerns; enable impacted communities to continue to raise concerns to government agencies; support continued partnership-building and problem-solving capacity among EPA's regulatory partners and other environmental justice stakeholders; and promote opportunities for training and sharing lessons learned for all stakeholders involved in the environmental justice dialogue?

In August 2007, the NEJAC incorporated public teleconference calls as a way to expand public participation at its meetings. In addition to its public face-to-face meetings, the NEJAC has held four public meetings via teleconference call from late 2007 through 2009. It anticipates it will hold two such calls each year.

In recent meetings, the following issues have been discussed and reports of recommendations submitted to the Administrator:

- **Goods Movement and Air Quality –** How can the Agency most effectively promote strategies, in partnership with federal, state, tribal, and local government agencies, to identify, mitigate, and/or prevent the disproportionate burden on communities of air pollution resulting from goods movement activities?
- **Green Business and Sustainability:** How can the EPA enhance its efforts to engage the private sector - business and industry - in a meaningful dialogue to strengthen the links between environmental justice, green business, and sustainability.
- **State EJ Assistance**: What mechanism can EPA use select, fund, and implement State Cooperative Agreement projects that will result in meaningful and measurable environmental and/or public health improvements in communities disproportionately exposed to environmental harms and risks.
- **School Air Toxics Monitoring**: How can EPA ensure that its communication materials about the Agency's monitoring effort appropriately address the concerns of environmental justice communities and are accessible to those communities?

PUBLIC MEETINGS

Because NEJAC is chartered under FACA, it is required to hold public meetings to receive comments, questions, and recommendations regarding environmental justice issues. Each NEJAC meeting includes a minimum of two hours for members of the public to register and make statements before the NEJAC. Time for public comment also has been allotted during public teleconference calls. All comments are recorded and maintained as a part of the public record of each meeting. Each meeting record is available to the public on the Internet (*see box below*) or in Room 2224, Ariel Rios Building, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20004. In some cases, hard copies are available.

MEMBERSHIP

Careful consideration is given to the appointment of each member to ensure that the point of view of every stakeholder group is represented. Members have staggered terms, and the membership is rotated to provide the widest participation possible by the greatest number of stakeholders.

INTERNET ACCESS

Information about the NEJAC, including reports and publication is available on the Internet (*see the box below*), where you will be prompted to select a variety of options for information about NEJAC. You will be given an opportunity to add your name to the Office of Environmental Justice's mailing list and be able to "link" to other sites of interest.

NEJAC KEY POINTS OF CONTACT

Chair	*Mr. Richard Moore*
Designated Federal Officer (DFO)	*Ms. Victoria Robinson*
	202-564-6349

To get the most up-to-date information about the NEJAC:
Go online at:
http://www.epa.gov/compliance/environmentaljustice

Community Resources
Revision 1; 7/7/11

Readers Note: *Below is a preliminary list of key resources and ideas that can assist environmental justice (EJ) communities. This will be updated for the North Birmingham community as needed.*

1. Public Grants

Here are some federal grants that many grassroots community groups have used to better their communities.

U.S. EPA Environmental Justice (EJ)
http://www.epa.gov/compliance/ej/grants/index.html
The 2 grants called, the EJ small grant and the Collaborative Problem-Solving grants, are about providing financial assistance to eligible organizations to build collaborative partnerships, to identify the local environmental and/or public health issues, and to envision solutions and empower the community through education, training, and outreach.

U.S. EPA CARE program.
http://www.epa.gov/CARE/
This is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities get on the path to a renewed environment. Note that the CARE Resource Guide is very comprehensive, which can be found at http://www.epa.gov/osp/care/library/CARE_Resource_Guide.pdf

2. Private Grants and Resources

Here are some private organizations that many grassroots community groups have used to better their communities.

Environmental Support Network
http://envsc.org/
This private foundation's mission is to promote the quality of the natural environment, human health, community sustainability and social justice by building the capacity of environmental justice groups and their allies. They offer technology resources support (computers) as well as training for new EJ groups to solidify.

Southern Partners Fund
http://www.spfund.org/
Southern Partners Fund is a Foundation created to serve Southern communities and organizations seeking social, economic and environmental justice by providing them with financial resources, technical assistance and training, and access to systems of information and power.

3. General Community-Based Resources

U.S. EPA Environmental Justice Web-site
http://www.epa.gov/environmentaljustice/
This web-site features a host of resources for communities. A very popular resource is the EJ Collaborative Problem-Solving Model, which can be found at

http://www.epa.gov/compliance/ej/resources/publications/grants/cps-manual-12-27-06.pdf (A DVD accompanies this resource.) The National EJ Advisory Council (NEJAC) is discussed at www. epa.gov/environmentaljustice/nejac/index.html; this link has a host of key recommendations at www.epa.gov/environmentaljustice/nejac/recommendations.html. Other tools are located at http://www.epa.gov/compliance/ej/resources/index.html

U.S. EPA Community Engagement and Community Involvement Programs
Refer to http://www.epa.gov/oswer/engagementinitiative/ and
http://epa.gov/superfund/community/index.htm and
http://epa.gov/superfund/community/toolkit.htm. These sites speak to the need for meaningful community engagement while protecting the environment.

U.S. EPA HUD-DOT Partnership for Sustainable Communities
http://www.epa.gov/smartgrowth/partnership/tools.html
This "Tools and Key Resources for Sustainable Communities" is also a comprehensive list of useful tools and key resources (funding, etc).

Clark Atlanta University Environmental Justice Resource Center
http://www.ejrc.cau.edu/
This popular web-site covers many items and resources related to EJ, such as the principles, "heroes and sheroes" of EJ, EJ Federal Executive Order, and provides many links to articles and reports.

4. Preliminary Environmental Justice Networking Ideas

Some of these EJ networks may provide lessons learned for how their communities overcame environmental challenges:

a. Southwest Network for Environmental and Economic Justice (Southwest Network)
http://www.sneej.org/
A people of color and Native/Indigenous, intergenerational, multi-issue, regional, bi-national organization comprising 60 grassroots community-based, native, labor, youth and student groups and organizations working for environmental and economic justice in the southwest and western U.S. and northern Mexico. The Southwest Network was established in 1990 as a vehicle for regional and national empowerment created by and for grassroots organizations.

b. Indigenous Environmental Network http://www.ienearth.org/
A network of Indigenous Peoples empowering Indigenous nations and communities towards sustainable livelihoods demanding environmental justice and maintaining the Sacred Fire of their traditions.

c. Coalition of Communities for Environmental Justice http://cocej.webs.com/
A network of 15 grassroots groups based out of Mississippi, stretching to TN, FL and AL.

5. Alternative Dispute Resolution

These references speak to the need for communities to successfully dialogue and negotiate with industry. These links consolidate lessons learned and present advice regarding community-corporate negotiation for future generations of activists, community-based organizations, regulators, elected officials, and researchers.

Environmental Law Institute, "Environmental Laws and Alternative Dispute Resolution: Tools for Environmental Justice"
http://www.eli.org/pdf/community_resource_center/ADR_handbook.pdf

U.S. EPA, Using Dispute Resolution to Address Environmental Justice
http://www.epa.gov/adr/case-study-report%20ADR%20in%20EJ.pdf

For a Healthier Environment -- Who Do You Call?

General Contacts

Jefferson County Department of Health—Air Pollution Control **205-930-1276**

- Open burning complaints
- Air quality complaints

Alabama Dept. of Environmental Management (ADEM) **334-271-7700**

- Solid Waste Complaints—Illegal dumping or Unauthorized Landfills
- Drinking water quality

Birmingham Jefferson County Animal Control **205-591-6522**

Greater Birmingham Humane Society **205-942-1211**

Community Environmental Protection **205-930-1230**

- Vector complaints—flies, mosquitoes, cockroaches, fleas, ticks, rats and mice
- Dog bite complaints
- Solid waste complaints—garbage, sewage, plumbing deficiencies and animal feces

Office of Public Works **205-254-6314**

- Missed trash service, brush pick-up, abandoned vehicles, overgrown vacant lots, pot holes

Storm Water Management Hotline (Weekends: 205-254-2039; M-F 7-6pm call 311)

- Spills
- Excessive runoff
- Soil erosion
- Malfunctioning storm drains

Traffic Engineering Department **205-254-6372**

- Malfunctioning traffic signals, missing or damaged traffic sign, street light out

National Response Center (NRC) **1-800-424-8802**

The NRC is the sole federal point of contact for reporting all hazardous substances and oil spills.

Contacts for Walter Coke facility & neighborhoods

Walter Coke, Inc. Communications: Michael Monahan, (205) 745-2628

Walter Coke Hotline: 1-855-892-5837 (toll free)

EPA Community Engagement: Brian Holtzclaw, (404) 562-8684 (office); or (404) 821-0697 (cell) or holtzclaw.brian@epa.gov

Agency for Toxic Substances and Disease Registry (ATSDR), Federal Health Agency: Dana Robison, MPH; (770) 488-3744 or ihh6@cdc.gov

Southeast Pediatric Environmental Health Specialty Unit – At Emory University (children's health): Robert J. Geller, MD; (404) 727-9428 or rgeller@emory.edu