BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

EMERGENCY RULEMAKING REGARDING	)	
REGULATIONS OF COKE/COAL BULK	)	R14-020
TERMINALS	)	(Rulemaking – Air)
35 ILL. ADM. CODE PART 213	)	

NOTICE OF FILING

TO: Mr. John T. Therriault
Clerk of the Board
Illinois Pollution Control Board
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601
(VIA ELECTRONIC MAIL)

Ms. Marie E. Tipsord
Hearing Officer
Illinois Pollution Control Board
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601
(VIA U.S. MAIL)

(PLEASE SEE ATTACHED SERVICE LIST)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board KCBX TERMINALS COMPANY'S RESPONSE IN OPPOSITION TO THE ILLINOIS EPA'S PROPOSAL AND MOTION FOR EMERGENCY RULEMAKING AND REQUEST FOR HEARING, AFFIDAVIT OF DAVE SEVERSON and AFFIDAVIT OF MICHAEL ESTADT, a copy of which is herewith served upon you.

Respectfully submitted,

KCBX TERMINALS COMPANY

Respondents,

Dated: January 21, 2014

By: /s/ Katherine D. Hodge
One of Its Attorneys

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THIS FILING SUBMITTED ON RECYCLED PAPER

CERTIFICATE OF SERVICE

I, Katherine D. Hodge, the undersigned, hereby certify that I have served the attached KCBX TERMINALS COMPANY'S RESPONSE IN OPPOSITION TO THE ILLINOIS EPA'S PROPOSAL AND MOTION FOR EMERGENCY RULEMAKING AND REQUEST FOR HEARING, AFFIDAVIT OF DAVE SEVERSON and AFFIDAVIT OF MICHAEL ESTADT upon:

Mr. John T. Therriault
Clerk of the Board
Illinois Pollution Control Board
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601

via electronic mail on January 21, 2014; and upon:

Ms. Marie E. Tipsord
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by depositing said documents in the United States Mail, postage prepaid, in Springfield, Illinois, on January 21, 2014.

/s/Katherine D. Hodge
Katherine D. Hodge

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

EMERGENCY RULEMAKING REGARDING	)	
REGULATIONS OF COKE/COAL BULK	)	R14-20
TERMINALS	)	(Rulemaking – Air)
35 ILL. ADM. CODE PART 213	)	

KCBX TERMINALS COMPANY'S RESPONSE IN OPPOSITION TO ILLINOIS EPA'S PROPOSAL AND MOTION FOR EMERGENCY RULEMAKING, AND REQUEST FOR HEARING

NOW COMES KCBX TERMINALS COMPANY ("KCBX"), by and through its attorneys, HODGE DWYER & DRIVER, for its Response in Opposition to the Illinois Environmental Protection Agency's ("Illinois EPA") Proposal and Motion for Emergency Rulemaking ("Motion"), and Request for Hearing, and states as follows:

I. INTRODUCTION

There is no emergency here. Because there is no emergency, KCBX and other businesses adversely impacted by the Illinois EPA's proposed emergency rule should be afforded a full and fair opportunity to provide meaningful responses and comments to the proposed rule. Indeed, the following evidence shows that no emergency exists to justify abandoning the normal rulemaking procedures of the Illinois Administrative Procedure Act ("APA"):

- Although the supposed emergency emanates from Cook County, the officials on site there have not given any indication that the issue needs to be addressed in an emergency fashion. To the contrary, the City of Chicago is considering its own on-point regulations without seeking to accelerate the prescribed timetable, and recently extended the deadline for comments on its proposed ordinance.

- The U.S. Environmental Protection Agency ("USEPA") does not perceive any such emergency. To the contrary, the USEPA has specifically approved the air monitoring that KCBX is putting in place to monitor any fugitive dust emissions from KCBX's facilities in order to collect data to determine whether future action is necessary.

- The City of Chicago and the USEPA have good reason not to be raising false alarms about an emergency. They well recognize that KCBX has a new $10 million state-of-the-art dust suppression system in place at its South facility to safeguard against fugitive dust, and a similar system at its North facility. These safeguards include an array of dust control best management practices including water cannon sprays, water trucks, weather monitoring, pile management and grooming, surfactant and encrusting agent addition, water spray bars on fixed conveyor transfer points, truck wheel washes, and protocols to suspend operations, if necessary.

- All available scientific evidence confirms the absence of any emergency:

  - Petroleum coke ("pet coke") has been in use, primarily as a fuel, for decades without significant impacts;

  - Scientific literature and studies to date identify low risk to human health posed by pet coke. Indeed, recent summary reports from the USEPA and the Congressional Research Service indicate that potential emissions of airborne particulate matter from pet coke dust pose no identified risk to human health;

  - KCBX has provided the Illinois EPA and others with test results from soil and surface sampling in the neighborhoods around KCBX's facilities. The samples were collected and tested in accordance with ASTM and EPA methods by independent environmental professionals and laboratories. These test results show no evidence of key chemical indicators of pet coke or coal on surfaces or in soil in the neighborhoods surrounding the KCBX facility; and

  - Air monitoring approved by USEPA will be in place at both of KCBX's facilities to detect future emissions, such that they can be promptly addressed as and if they may arise.

- The event that precipitated this regulatory push was a dust cloud that occurred in August 2013 during a severe windstorm before KCBX South had commissioned its state-of-the-art dust suppression system. Given that the system was put into service in November 2013, no fair-minded observer would think that such an occurrence presents an emergency that the State of Illinois must rush to address through an emergency rule nearly six months later, without so much as affording the standard 45-day rulemaking comment period.

In light of this evidence, the claim of "emergency" is altogether incredible and incapable of withstanding judicial scrutiny. Nevertheless, KCBX is prepared to offer expert testimony in further support of this evidence if the Illinois Pollution Control Board ("Board") believes it needs any additional information to conclude that there is a complete lack of any emergency in this case.

This evidence also shows that no undue delay or material prejudice would result if KCBX and other affected entities are afforded the protections of the normal rulemaking process. Indeed, the only undue delay or material prejudice the Illinois EPA alleges is that the proposed emergency amendments must be implemented to "address inadequately controlled emissions and discharges." See Motion at ¶17. As detailed above, KCBX South's state-of-the-art dust suppression system already is effectively controlling emissions. In fact, with this new dust suppression system operational, no dust emissions were observed during a severe wind storm on November 17, 2013, that included tornadoes throughout the state and caused a two-hour delay of the Chicago Bears game. This is proof positive that KCBX's new dust suppression system is working.

Moreover, without the normal time to respond fully to the Illinois EPA's Proposal and Motion, KCBX will be prejudiced and suffer severe irreparable harm. Quite simply, the emergency rules proposed by the Illinois EPA will have a profound negative impact on KCBX and other businesses operating in the State of Illinois. For KCBX, significant and costly construction and planning will have to occur to comply with the proposed emergency rules. Further, compliance with the proposed emergency rules, as drafted, is technically infeasible. Not allowing KCBX sufficient time to comment on the substance of and justification for such onerous rules causes it prejudice and severe irreparable harm. In particular, proceeding on the proposed timetable will deny KCBX the ability to build a full and fair record by expanding and following up on the points set forth herein as it proposes to do if the Board allows adequate time.

Finally, Illinois EPA proposed these emergency rules without any input from the regulated community. Indeed, to KCBX's knowledge, the Illinois EPA conducted no outreach to any affected facilities for input on substance or emergency justification. The Illinois EPA, however, did consult with at least one non-regulated entity regarding the proposed emergency rules. According to the National Resource Defense Council ("NRDC") website, the NRDC "sent a list of proposed improvements yesterday [i.e., January 15, 2014] to Illinois EPA concerning the draft emergency regulations (on which there is no formal public comment), some adopted but most not."[1] Clearly, an unregulated entity should not be given an opportunity to comment when entities that are most directly impacted by and subject to the proposed regulations do not have such an opportunity. Such selective solicitation of comments infringes upon the due process rights of the regulated entities like KCBX.

Given the opportunity, KCBX would utilize the additional time of a normal rulemaking process to provide the Illinois EPA with the "data, views, arguments, or comments" that Illinois law affords entities like KCBX in such process. 5 ILCS 100/5-6, 5-40. That data and commentary from KCBX would include a detailed discussion and explanation of the evidence cited above, as well as testimony from leading toxicologists and environmental health scientists. It also would include a more robust discussion of the ability of KCBX to comply with the regulations as drafted, ways the regulations could be improved, and different ways the Illinois

[1] http://switchboard.nrdc.org/blogs/aalexander/time_to_heed_governor_quinns_c_1.html#.Utk748RKYBo.twitter. A letter from NRDC, which is available at this Internet address, is also being submitted herewith as Exhibit 1.

EPA's goals could be achieved without threatening to put KCBX and other companies out of business.

In these circumstances, there is no basis to deprive KCBX or any other entity affected by this rulemaking of the standard rulemaking procedures. Accordingly, KCBX requests that the Board deny Illinois EPA's Motion, and instead consider the proposed rules under normal rulemaking procedures. If the Board feels that it does not have sufficient written justification to deny Illinois EPA's Motion, KCBX moves the Board to schedule a hearing to allow it and other interested parties to submit additional evidence and testimony that no emergency exists.

II. BACKGROUND

KCBX operates two bulk material transfer facilities in Chicago along the Calumet River between East 100th Street and East 107th Street. KCBX has operated its North facility for more than 20 years, and acquired its South facility in December 2012. Illinois EPA has issued air permits recently to both of these facilities,[2] and has issued a National Pollutant Discharge Elimination System ("NPDES") permit to KCBX North.[3] KCBX South currently operates under a Subtitle D non-discharge water permit,[4] and construction activities at the site are covered under the Illinois EPA's General NPDES Permit for Storm Water Discharges from Construction Site Activities.

[2] See Federally Enforceable State Operating Permit ("FESOP"), issued to KCBX North by Illinois EPA on April 5, 2012, and Revised Construction Permit issued to KCBX South on April 18, 2013.

[3] See Renewed NPDES Permit issued to KCBX North by Illinois EPA on May 29, 2013.

[4] See Mine Related Water Pollution Control Permit issued by Illinois EPA to KCBX South on July 2, 2013.

The business of these facilities is to transfer bulk products – currently coal and petroleum coke ("pet coke")[5] – from one mode of transportation such as train or barge, to another form of transportation such as lake vessel, staging the materials for a period of time to match up the incoming and outgoing modes of transportation. Accordingly, KCBX is directly affected by the Illinois EPA's proposed rule. In fact, as written, the rule threatens to shut down KCBX's business altogether.

III. LEGAL STANDARD

Board rulemaking proceedings are governed by the Illinois Administrative Procedure Act ("APA"). 5 ILCS 100/5-6, 5-35. Under the APA, agencies must adopt rules under the APA's "general rulemaking" provision, Section 5-40, which requires 45-day notice of proposed rules, hearings if requested by a sufficient number of interested parties, and other procedural safeguards including the ability to provide "data, views, arguments, or comments." 5 ILCS 100/5-6, 5-40. The agency may only deviate from this normal rulemaking procedure if one of two exceptions applies: (1) an "emergency" exists, or (2) the rulemaking is "preemptory" (*e.g.*, federal law requires the rules to be promulgated). 5 ILCS 100/5-40, 5-45, 5-50.

Here, Illinois EPA argues that the Board should not follow its normal rulemaking procedures, and petitions the Board for an emergency rulemaking. Under the APA, "emergency" means "the existence of any situation that any agency finds reasonably constitutes a threat to the public interest, safety, or welfare." 5 ILCS 100/5-45. For purposes of Board rulemakings, the Illinois Environmental Protection Act ("Act") more specifically provides:

[5] Pet coke is a valuable product intentionally produced as part of the process of refining crude oil. Pet coke has many uses, including energy generation and the production of cement, steel, aluminum, and other specialty products. Notably, pet coke has been used safely and broadly since the 1930s. See, e.g., http://www.afpm.org/policy-position-petroleum-coke/.

> On proclamation by the Governor, pursuant to Section 8 of the Illinois Emergency Services and Disaster Act of 1975, that a disaster emergency exists, or when the Board finds that a severe public health emergency exists, the Board may, in relation to any proposed regulation, order that such regulation shall take effect without delay and the Board shall proceed with the hearings and studies required by this Section while the regulation continues in effect.
>
> When the Board finds that a situation exists which reasonably constitutes a threat to the public interest, safety or welfare, the Board may adopt regulations pursuant to and in accordance with Section 5-45 of the Illinois Administrative Procedure Act.

415 ILCS 5/27(c). Accord 35 Ill. Admin. Code § 102.612.

Illinois EPA does not assert that the Governor has proclaimed a "disaster emergency" or that "a severe public health emergency exists." Rather, Illinois EPA first asserts that "[s]everal bulk terminals located in Cook County process, transport, and handle large quantities of coke and/or coal, and store such materials in large outdoor storage areas." Motion, ¶1. Illinois EPA then concludes that "[e]missions of fugitive particulate matter ('PM') from these and similar operations … reasonably constitute a threat to the public interest, safety, or welfare," and that "the discharge of runoff from large, uncovered coke and coal piles into waters of the State … reasonably constitute[s] a threat to the public interest or welfare." Id.

"In analyzing any request for emergency rulemaking, the Board must determine first whether an emergency within the meaning of the APA exists, and only second what the content of the emergency rule should be." In The Matter Of: Proposed Amendments To: Regulation Of Petroleum Leaking Underground Storage Tanks (35 Ill. Adm. Code 732 and 734), PCB R04-22, R04-23 (consolidated) at 7 (Ill.Pol.Control.Bd. June 3, 2004). While "the existence of an emergency is primarily a matter of agency discretion … courts are not conclusively bound by an agency's determination that an emergency exists." Citizens for a Better Environment v. Illinois

Pollution Control Board, 152 Ill. App. 3d 105, 504 N.E.2d 166, 105 Ill. Dec. 297 (1st Dist. 1987) (finding that the Board erred in deciding that an emergency existed and vacating as "invalid" emergency rules adopted by the Board). Finally, "[a]dministrative agencies must comply with the public notice and comment requirements of the Administrative Procedure Act," and "[u]nless a rule conforms with the public notice and comment requirements, it is not valid or effective against any person or party and may not be invoked by an administrative agency for any purpose." Cnty. of Du Page v. Illinois Labor Relations Bd., 358 Ill. App. 3d 174, 183, *op. supplemented by* 359 Ill. App. 3d 577 (Ill. App. Ct. 2005).

IV. NO EMERGENCY EXISTS

The Board should not allow this rulemaking to go forward on an emergency basis. As more fully discussed below, no "emergency" exists because coal and pet coke handling facilities pose no threat to the "public interest, safety or welfare."

A. Coal and Pet Coke Dust Pose no Threat to the Public Interest, Safety or Welfare

Summary reports from United States Environmental Protection Agency ("USEPA") and Congressional Research Service[6] ("CRS"), submitted herewith, indicate that potential emissions of airborne particulate matter from pet coke dust pose low risk to human health. These reports conclude that pet coke has not been associated with any inhalation-related mortalities or any reproductive or developmental effects. (Exhibit 2 at p. 11, Exhibit 3 at p. 9.) The US EPA and CRS reviewed studies finding that pet coke is not carcinogenic via inhalation. They also found that pet coke is not an identified mutagenic or prone to inducing chromosomal aberrations during

[6] As explained on the website for the Library of Congress, "[t]he Congressional Research Service (CRS) works exclusively for the United States Congress, providing policy and legal analysis to committees and Members of both the House and Senate, regardless of party affiliation. As a legislative branch agency within the Library of Congress, CRS has been a valued and respected resource on Capitol Hill for nearly a century."

in vivo toxicity testing. (Exhibit 2 at p. 12, Exhibit 3 at pp. 9-10.)

According to CRS, "[o]nly animal cases studies of repeated-dose and chronic inhalation have shown respiratory inflammation attributed to the non-specific effects of dust particles rather than the specific effects of petcoke."[7] With respect to "Human Health Effects," CRS concluded that "[m]ost toxicity analyses of petcoke, as referenced by EPA, find it has a low health hazard potential in humans, with no observed carcinogenic, reproductive, or developmental effects." Id. at 9.

With few exceptions (most notably, certain ports in California), pet coke is typically stored in open-air piles. That is similar to how other non-hazardous industrial and agricultural bulk materials not affected by the elements (rain, excessive heat/cold, pests, etc.) are typically stored. To date, Illinois EPA has not identified any discernible risk to health and/or the environment to warrant special regulation of piles of pet coke as distinct from any other piles. Again, according to CRS and US EPA, pet coke has "low potential to cause adverse effect[s] on aquatic or terrestrial environments." Id. at 9. CRS further noted that "[m]ost chemical analyses of petcoke, as referenced by EPA, find it to be highly stable and non-reactive at ambient environmental conditions." Id. at 8. And the CRS added that "If released to the environment, petcoke would not be expected to undergo many of the environmental fate pathways which could lead to environmental risks." Id.

Collectively, the data indicate that pet coke is not associated with a high level of hazard based on toxicological testing. Indeed, available toxicological data generally indicate a low level of hazard following inhalation and dermal exposure in animals (and animal models); petroleum

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[7] Anthony Andrews et al., Congressional Research Service, Petroleum Coke: Industry and Environmental Issues, Oct. 29, 2013, at 9.

coke was not found to cause overt mortality, developmental/reproductive toxicity, genotoxicity, mutagenicity, or carcinogenicity following repeated exposures. Adverse effects were generally limited to pulmonary inflammation and associated effects in the respiratory system (e.g., abnormal pulmonary function tests) following repeated and chronic excess exposure via inhalation. These types of respiratory effects are commonly associated with excess exposures to dusts generally, and are not particular or specific to pet coke dust. Nor is there any evidence that the excess and chronic exposures needed to induce these respiratory effects are present in the areas surrounding KCBX's facilities.

The mineral content of dust associated with coal depends on the particle size of the dust, the coal seam, and the method in which the coal was mined. ACGIH, 2001. IARC has classified coal dust as a Group 3 compound – cannot be classified as to its carcinogenicity to humans – based on inadequate evidence in both humans and experimental animals. IARC, 1997. Also, in 1982, NIOSH published a Health Hazard Evaluation evaluating exposures at a power plant station in Pennsylvania, concluding that coal handlers were no more likely to have bronchitis, wheezing or asthma, or elevated blood pressure than other employees. NIOSH, 1982. A study of opencast mining workers found that occupational exposures were not sufficient to cause important reductions in lung function or increased frequency of chronic bronchitis, nor were such exposures positively associated with asthma symptoms (though a small increased risk of pneumoconiosis among high exposure occupations, i.e., dustiest preproduction jobs, was observed). Love et al., 1997 and NIOSH, 2011. And evaluation of available British studies show little evidence of an association of chronic health effects, including respiratory illnesses and asthma severity associated with living near opencast mine sites. Temple and Sykes, 1992;

Pless-Mulloili et al, 2000; Pless-Mulloli et al., 2001. Thus, adverse effects associated with coal dust generally follow repeated and chronic excess exposure via inhalation. And again there is no evidence that the excess and chronic exposures to coal dust needed to induce these effects are present in the areas surrounding KCBX's facilities.

Thus, these reports from the U.S. EPA and the CRS, along with numerous other toxicology studies, belie Illinois EPA's claim that fugitive particulate dust from coal and pet coke handling poses a "danger, threat to health, etc."[8] An allegation that coal or pet coke dust is an "emergency" threat to human health simply is not true.

B. Operation of KCBX's Facilities Do Not Create any Emergency

KCBX has extensive safeguards in place at both of its facilities to guard against potential coal and pet coke dust emissions. As noted above, these safeguards were recently put to the test during a severe wind storm on November 17, 2013 that included tornadoes throughout the state and caused a two-hour delay of the Chicago Bears game.[9] KCBX employees who were at work did not observe dust leaving the KCBX facilities during this storm. Also, as set forth above, KCBX's facilities are operated pursuant to permits issued by Illinois EPA, which permits contain significant requirements to control and regulate fugitive particulate matter emissions. Thus, no "emergency" exists with regard to either of KCBX's facilities that would justify dispensing with the normal rulemaking process and rushing through an emergency rulemaking process.

[8] A non-exhaustive list of additional scientific references is attached as Exhibit 4.

[9] See, e.g., http://articles.chicagotribune.com/2013-11-17/news/ct-met-bears-evacuation-20131118_1_evacuation-order-bears-severe-storm.

1. **The August 30 Windstorm Occurred Before the Current Dust Suppression System Was in Place at KCBX South**

KCBX understands that some of Illinois EPA's concern regarding alleged particulate matter emissions from coal and pet coke handling facilities may stem from a wind storm that occurred in Chicago on August 30, 2013.[10] This windstorm apparently resulted in visible airborne dust over the neighborhood east of KCBX's South facility. The windstorm occurred less than a year after KCBX acquired its South facility, and when the storm occurred, KCBX was in the process of constructing improvements to the site, including the existing dust-suppression system. Since August 30, that new dust suppression system has been put into service and is the one that worked during the November 17, 2013 severe wind storm. But at the time of the August 30 windstorm, KCBX was operating the system that had been in place at the South facility at the time that KCBX acquired it. Notably, on that same date, there were no complaints about dust from KCBX North, where the North facility's dust suppression system was operating.

2. **Soil and Surface Samples from Neighborhoods Surrounding KCBX Facilities Show no Evidence of Coal or Pet Coke Contamination**

KCBX worked with Dr. David MacIntosh, ScD, CIH, Chief Science Officer with Environmental Health & Engineering, Inc., to test soil and surfaces in the neighborhoods surrounding the KCBX facilities. Dr. MacIntosh is also an adjunct professor at the Harvard School of Public Health, a technical advisor to government agencies and the World Health Organization, and a leading authority and author of numerous publications in the area of exposure assessment, risk analysis, and environmental management. Dr. MacIntosh directed a

[10] Local Chicago news reported that wind gusts were up to 70 miles per hour. The storm brought down trees and caused power outages and transportation delays throughout the city. See, e.g., http://articles.chicagotribune.com/2013-08-31/news/ct-met-severe-weather-metra-20130831_1_metra-trains-metra-website-tom-miller.

comprehensive soil and surface sampling across the area around the KCBX facilities in order to determine the levels, if any, at which signature components of pet coke and coal might be present. The results, attached as Exhibit 5, establish that no significant amount of pet coke or coal from the KCBX facilities was deposited in the areas sampled and that none of the samples of soil or surface dust show elevated levels of substances in ratios associated with pet coke or coal. This reinforces that no "emergency" exists associated with regard to its facilities.

3. KCBX Employs Extensive Safeguards and Best Management Practices to Control PM Emissions

As noted above, KCBX has extensive safeguards in place at both its North and South facilities to guard against fugitive dust emissions. As set forth in the Fugitive Particulate Operating Programs ("FPOPs") for both the North and South facilities, these safeguards include an array of dust control best management practices including water cannon sprays, water trucks, weather monitoring, pile management and grooming, application of surfactant and encrusting agents, water spray bars on conveyor transfer points, and truck wheel washes, as well as the suspension of operations. In the face of these complementary, state-of-the-art safeguards, any notion that an "emergency" is posed by KCBX's facilities simply is not credible.

- Water Cannon Sprays – At the South facility, storage of coal and pet coke are closely managed both by trained employees and by a computer-enhanced dust-suppression system. The dust suppression system consists of 42 water cannons that are capable of distributing up to 1,800 gallons per minute of targeted water in order to manage the potential for airborne particulate matter. The system is also equipped with state-of-the-art software that uses real-time weather data, including barometric pressure and wind speeds to focus the dust-suppression efforts. As noted above, this system was not yet operational when the wind storm occurred on August 30, 2013, but was fully operational for the November 17, 2013 event. Similarly, at the North facility, KCBX utilizes 19 water cannons that are capable of distributing up to 600 gallons per minute of targeted water. The water cannons at both facilities have automated controls that allow for programmed sequencing. Both the North and South facilities also use trained employees to closely monitor the piles and the dust suppression systems.

Additionally, both the North and South facilities use the following to supplement their respective dust suppression systems:

- Water Trucks – Mobile water trucks are used to supplement the cannon sprays. Water application by the trucks is targeted to areas that may need additional control and is adjusted as necessary to further mitigate potential dust emissions.
- Weather Monitoring – KCBX employees proactively monitor weather forecasts and apply water to piles in advance when high winds are predicted.
- Pile Management and Grooming – Storage piles are shaped and compacted to manage the potential for wind erosion.
- Surfactant and Crusting Agents – Commercial surfactants and encrusting agents are applied to the surface of inactive piles to decrease the potential for dust emissions. Surfactants increase the ability of water to adhere to dust particles. Crusting agents create a surface seal.

- Spray Bars on Fixed Conveyor Transfer Points – Water spray bars are mounted at fixed conveyor transfer points, applying water to suppress potential dust that might be created as product is transferred from one conveyor to another.
- Truck Wheel Washes – Truck wheel wash systems are in place at both the North and South facilities to remove loose debris from trucks/tires prior to exiting the terminal.
- Street Sweeping – KCBX routinely sweeps the facility and surrounding streets during truck loading operations.
- Operational suspension – Vessel and barge loading operations are suspended if wind speeds exceed 40 mph. Also, if employees observe dust from a specific activity, even at wind speeds below 40 mph, that activity is ceased until the dust can be effectively managed.

Beyond all of these measures, KCBX has also agreed to implement an air-monitoring program at both its North and South facilities, approved by the USEPA, which program can demonstrate the effectiveness of the current systems and procedures. This air monitoring program goes above and beyond what the USEPA initially requested, as KCBX chose to install additional supplemental air monitors in order to generate even better data. In light of these facts, it is clear that KCBX's facilities do not create any "emergency."

4. Existing Ambient Air Conditions do not Indicate the Presence of an Emergency

The USEPA has determined that the area where KCBX's facilities are located is in attainment for both PM_{10} and $PM_{2.5}$. Specifically, in 2005, USEPA designated the Lake Calumet (Southeast Chicago) area as attainment for PM_{10}. 70 Fed. Reg. 55545 (Sept. 22, 2005).

Likewise, in 2013, USEPA designated the area as attainment for the 1997 $PM_{2.5}$ standard. 78 Fed. Reg. 60704 Oct. 2, 2013). This federal action, in response to requests from Illinois EPA, demonstrates that the air in the area is meeting the NAAQS, and that no emergency exists.

C. Existing Regulations and Carve Outs from the Proposed Rule Show No Emergency Exists

Bulk material handling facilities must obtain air permits from Illinois EPA pursuant to 35 Ill. Admin. Code Part 201. To obtain such a permit, a facility must submit "proof to the Agency that" – and Illinois EPA must determine that – "[t]he emission unit or air pollution control equipment [at the facility] has been constructed or modified to operate so as not to cause a violation of the Act." 35 Ill. Admin Code § 201.160(b)(1). Such facilities also must comply with the Visible and Particulate Matter requirements of Part 212 of the Board's regulations. For example, existing rules limit the opacity of emissions, 35 Ill. Admin. Code § 212.123, and prohibit emissions of visible particulate matter that are visible by an observer looking generally toward the zenith at a point beyond the property line of the source. 35 Ill. Admin. Code § 212.301. Rules also govern fugitive particulate matter, including the management of storage piles, conveyor loading operations, and traffic areas surrounding storage piles. 35 Ill. Admin. Code §§ 212.304, 212.305, and 212.306. Many facilities must also develop a Fugitive Particulate Operating Program, which these facilities must submit to Illinois EPA for review. 35 Ill. Admin. Code § 212.309.

In its Motion, Illinois EPA acknowledges that "[t]he Board's current regulations generally address fugitive PM emissions," but argues that "the proposed emergency regulations are necessary to establish more detailed control requirements specific to emissions and discharges from coke and coal bulk terminal operations." Motion, ¶16. However, Illinois EPA does not explain what makes coal and pet coke handling facilities different from aggregate, grain, ore, scrap metal, and other bulk material handling facilities across the State that could be sources of fugitive particulate matter emissions. Thus, Illinois EPA has failed to justify that additional rules specific to coal and pet coke handling facilities are needed at all, much less on an emergency basis.

Further, Illinois EPA contradicts its own argument that an emergency exists by exempting producers and consumers of pet coke and coal from its proposed rule. See Motion, Exhibit A, proposed Section 213.115, definition of "Coke or coal bulk terminal" (excluding from regulation "the source, site, or facility that produces or consumes the coke or coal"). According to the Illinois State Geological Survey, 20 to 22 coal-fired electric power plants and industrial facilities operated in Illinois in 2013. See http://isgs.illinois.edu/sites/isgs/files/maps/statewide/2013-coal-industry.pdf. The Department of Energy collects data about how much coal these facilities have on-site at their locations at the end of each month, and reports that for the months January through October of 2013, these plants and facilities in the aggregate had between 6 million and 8.5 million tons of coal in inventory at their locations. See Exhibit 6 (data from http://www.eia.gov/electricity/data/eia923/index.html). Illinois EPA provides no explanation why these facilities and the millions of tons of coal they have on-site do not present an "emergency" but pet coke and coal handling facilities allegedly do. That is because Illinois EPA cannot make such a showing. No facilities associated with pet coke or coal – whether producers, handlers, or consumers – present an emergency that would justify the Board abandoning its normal rulemaking procedures.

D. No Water "Emergencies" Exist at Coal and Pet Coke Facilities

Illinois EPA states generally that berms and sediment ponds are inadequate to protect water and that coke/coal has been deposited into off-site sewers. Motion, ¶13. Other than making these general, conclusory statements, however, Illinois EPA does not identify any impending water "emergencies" that exist that require immediate action at all coke and pet coke facilities. If such conditions are appropriately documented at a given facility, Illinois EPA could enforce existing regulations and remedy the problems on a site-specific basis. However, Illinois EPA does not explain why current regulatory requirements and enforcement mechanisms are inadequate to protect the environment, much less constitute an emergency.

E. Board Precedent Regarding Emergency Rules Establishes that No Emergency Exists in This Case

The Board has used its authority sparingly to promulgate emergency rules in the past, with most of those emergency rules dealing with true public health emergencies. The Board's previous decisions regarding emergency rulemakings, and Illinois court precedent, also demonstrate that the Board should deny Illinois EPA's Motion for emergency rulemaking. Unlike other circumstances where the Board has adopted emergency rules, there is no disaster or emergency in this case warranting such action. For example:

In In the Matter of: Hazardous Hospital Wastes, Section 3(jj) and 21(h) of the EPA, R80-19 (Ill.Pol.Control.Bd. Dec. 18, 1980), the Board adopted emergency rules related to medical care waste. When the Board adopted these rules, it was faced with a situation where confusion existed over a recently enacted law defining "hazardous hospital waste" and a concern that landfills would immediately refuse to accept any medical care wastes. The Board found that "a severe public health emergency will exist if medical care wastes, not intended to be covered ... are stored by their non-hospital generators rather than properly disposed of." Id. at1.

In Emergency Rulemaking: Livestock Waste Regulations 35 Ill. Adm. Code 505, R97-14 (Ill.Pol.Control.Bd. Oct. 29, 1996 and Mar. 20, 1997), the Board adopted emergency livestock waste management rules where none existed, in an effort to alleviate a potential threat to public health and interest by adopting design standards for livestock management facilities at a time when such facilities had begun to proliferate in the State.

In In the Matter of: Open-Burning Rules, 35 Ill. Adm. Code 237.121, R93-15 (Ill.Pol.Control.Bd. Aug. 20, 1993), and In the Matter of: Emergency Amendments to the Landfill Rules for On-Site Burial of Dead Animals in Flood-Disaster Counties 35 Ill. Adm. Code 807.106, R93-25 (Ill.Pol.Control.Bd. Sept. 23, 1993), the Board adopted emergency rules allowing the disposal of dead animals and the open burning, without permit, of certain combustible non-hazardous waste generated in twenty counties that had been designated disaster areas as a result of massive flooding that created a "volume of waste ... unprecedented in the state's history." R93-15, at 5 (Ill.Pol.Control.Bd. Aug. 20, 1993).

In other cases, however, Illinois courts have stood ready to invalidate "emergency" rules that do not correspond with an actual emergency. See, e.g., Senn Park Nursing Ctr., a Div. of Mid-States Health Centers, Inc. v. Miller, 118 Ill. App. 3d 733, 744, 455 N.E.2d 162, 74 Ill. Dec. 132 (1st Dist. 1983) aff'd 104 Ill. 2d 169, 184-86 (1984) (invalidating emergency rule regarding reimbursable costs under Medicaid where the only emergency was due to agency's own failures and there was no real threat to the public); Champaign-Urbana Pub. Health Dist. v. Illinois Labor Relations Bd., 354 Ill. App. 3d 482, 821 N.E.2d 691, 290 Ill. Dec. 379 (4th Dist. 2004) (invalidating emergency rules when only alleged emergency was one of administrative interest and convenience). See also Citizens for a Better Environment v. Illinois Pollution Control Board, 152 Ill. App. 3d 105, 504 N.E.2d 166, 105 Ill. Dec. 297 (1st Dist. 1987) (overturning an emergency rule in part because "a public body cannot create an urgent situation and then claim an emergency"); Cnty. of Du Page v. Ill. Labor Relations Bd., 358 Ill. App. 3d at 181, 830 N.E.2d 709, 294 Ill. Dec. 297 (2d Dist. 2005) (invalidating emergency rules of the Labor Relations Board because no emergency existed). Indeed, "[t]he reason for adopting an emergency rule should be truly emergent and persuasive to a reviewing court." Champaign-Urbana Pub. Health Dist. V. Ill. Labor Relations Bd., 354 Ill. App. 3d at 491, 821 N.E.2d 691 (4th Dist. 2004).

In this case, there is no confusion of law that would lead to an inability to properly dispose of dangerous waste, no proliferation of unregulated facilities, and no natural disaster. Instead, Illinois EPA points only to unsupported conclusions and hearsay, and to facilities that do not create any "emergency." Unlike in the cases discussed above, the Board here should find that no emergency exists and should deny Illinois EPA's Motion for Emergency Rulemaking.

F. The Proposed Rules Would Impose Severe Burdens

As noted above, in reviewing Illinois EPA's Motion, "the Board must determine first whether an emergency within the meaning of the APA exists, and only second what the content of the emergency rule should be." In The Matter Of: Proposed Amendments To: Regulation Of Petroleum Leaking Underground Storage Tanks (35 Ill. Adm. Code 732 and 734), PCB R04-22, R04-23 (consolidated) at 7 (Ill.Pol.Control.Bd. June 3, 2004). In light of this and the impossibly short comment period, i.e., one and one-half business days from posting of the Illinois EPA's proposal and motion on the Board's website until the Hearing Officer deadline for responses, KCBX is not at this time submitting detailed comments on all of the text of the proposed rules. However, it is important that the Board understand that the content and the timing of some provisions of the proposed rules would impose excessive – and, indeed, impossible – burdens on KCBX and on other facilities covered by the rules and, in some cases, are likely to be determined (after an appropriate consideration by the Board) to be technically infeasible and/or economically unreasonable. For example:

- Proposed Section 213.320(b), Impermeable Barriers, would require covered facilities, within 60 days, to "locate all coke piles and coal piles … [o]n impermeable bases or pads." KCBX's North and South facilities have storage areas of approximately 40 and 60 acres, respectively, significant portions of which are not paved or otherwise impermeable. In order to create impermeable bases in these storage areas, KCBX would have to shut down its operations for several months, remove all material from its facilities, and spend millions of dollars to install impermeable bases or pads. During this time-period, KCBX would be unable to perform its contracts and would lose customers.

- Proposed Section 213.325, Wastewater and Storm Water Runoff Controls, would require facilities, within 45 days, to "[d]emonstrate that [their] site is graded in such a way as to ensure proper drainage and to prevent pooling of water." KCBX's facilities are currently graded to direct drainage to collection ponds, but are not graded so as to "prevent pooling of water." In fact, pooled water acts as a dust inhibitor and, to some extent, is beneficial and encouraged. This requirement also would cause KCBX and other similarly situated companies to have to shut down their businesses, remove material from their properties, and re-grade those properties, during which time KCBX and those other affected companies would be unable to perform their contracts and would lose customers.

- Proposed Section 213.325,(a)(2), which addresses sedimentation ponds, requires facilities, within 45 days, to have sedimentation ponds that are lined and that are large enough "to contain or appropriately treat runoff from a 100-year, 24-hour precipitation event." KCBX's facilities have sedimentation ponds, but they are not lined, so KCBX would have to reconstruct them. In addition, if the changes that the proposed rules would impose regarding paving and grading, discussed above, were enacted, those changes would promote additional runoff that will alter the required sizing of KCBX's sedimentation ponds, which would cause KCBX to have to increase the size of those ponds. All of this work would also require KCBX to devote significant resources and to almost immediately shut down its facilities for a period of time, again with the prospect of losing customers.

- Proposed Section 213.235, Pile Height, would require that, within 60 days, piles of coal or pet coke "must not exceed thirty (30) feet" in height. Currently, KCBX can construct piles up to 60 feet high, because its cannon systems are that high and thus ensure that potential particulate matter emissions from these piles are controlled. Cutting the maximum height of its piles in half, especially when combined with the 200-foot setback requirement of proposed Section 213.230, Property Boundary Setbacks, would reduce KCBX's capacity by approximately 40%. This would leave KCBX unable to perform all of its contracts with customers, which contracts it entered into based on the permitted capacity of its facilities.

- Proposed Section 213.260, Transfer Points, and the proposed definition of "moist material" in proposed Section 213.115, would force KCBX to shut down during freezing conditions through the end of this winter. With regard to proposed Section 213.260, during freezing conditions:

    - transferring only "moist material" under Section 213.260(a) is not an option, because the proposed definition of "moist"– that is "having a moisture content <u>that is in no place less than</u> 8.3% by weight for coke, and 7.6% by weight for coal" – is unachievable during freezing conditions, at least with regard to pet coke;

    - applying water on conveyors under Section 213.260(b) is not an option because the water would freeze on contact with the conveyors and on the ground, creating a hazard for employees and operational difficulties for, and potentially damaging, the equipment or making it otherwise inoperable; and,

    - KCBX does not have and could not in the prescribed timeframe build the truck loading structure, or obtain the bulk material stacking equipment that would be necessary to utilize choke-feeding under proposed Section 213.260, because such equipment is not readily available in the market, causing extensive lead times for equipment ordering and fabrication.

- Likewise, while KCBX's South facility has rumble strips as required under proposed Section 213.275(a)(2)(C) to address the potential for dustfrom trucks, KCBX could not currently comply with the requirement of that proposed Section that trucks "pass through a wheel wash station," as KCBX only has outdoor wheel wash stations, which cannot safely apply water during freezing conditions.

Again, these are not all of KCBX's concerns about the content of the proposed rules. KCBX makes these limited points to emphasize that the emergency rules would have severe effects on KCBX and on other similar facilities. Indeed, it seems clear that the practical effect of the requirements noted above – even setting aside the remaining requirements of the proposed rules – would be to make compliance impossible. Such draconian action should not be taken without the benefit of the procedures and deliberations built into the Board's normal rulemaking process.

G. The Proposed Rules Could Result in Adverse Impact Generally on Commerce

Based upon all the information provided herein, KCBX and other owners/operators of coke or coal bulk terminals would be adversely affected by implementation of the proposed rules. In addition, the proposed rules could result in adverse impact generally on commerce in the State of Illinois and throughout the region. For example, the increased costs associated with the proposed rules and/or any curtailment of operations at coke and coal bulk terminals would result in curtailment of operations at both KCBX's facilities and adverse impacts to both upstream and downstream producers, consumers and transporters. The producers of pet coke and coal, and the transporters of pet coke and coal (ship, barge, rail, truck), both from the producers to terminals, and then from the terminals to consumers, would be adversely affected by increased costs and/or curtailed operations at terminals. In turn, the consumers of the pet coke and coal would be adversely affected by the increased costs and/or curtailed operations at terminals. Such disruption could result in product shortages and price increases, as well as the loss of jobs throughout the entire stream of commerce in the State of Illinois and throughout the region.

V. ILLINOIS EPA'S MOTION IS LEGALLY DEFICIENT

Finally, the Illinois EPA's Motion, on its face, is insufficient to state a case for any rulemaking and especially for an emergency rulemaking. This is true both in general terms, and with regard to specific provisions of the Proposal.

A. Illinois EPA does not Provide the Board with the Basic Information Necessary to Promulgate Rules

As already noted in the Hearing Officer Order, issued in this matter on January 17, 2014, Illinois EPA's proposal is deficient on its face. Illinois EPA does not provide a statement of reasons, copies of materials to be incorporated by reference, or proper proof of service. Perhaps most importantly, a statement of reasons is described in Section 102.202(b) as follows:

> A statement of reasons supporting the proposal, including a statement of the facts that support the proposal, and a statement of the purpose and effect of the proposal, <u>including environmental, technical and economic justification</u>. The statement must discuss the applicable factors listed in Section 27 (a) of the Act. The statement must include, to the extent reasonably practicable, all affected sources and facilities and the economic impact of the proposed rule;

35 Ill. Admin. Code 102.202(b) (emphasis added); *see also* 415 ILCS 5/27(a).

When promulgating rules under the Act, the Board shall take into account the following information:

> the existing physical conditions, the character of the area involved, including the character of surrounding land uses, zoning classification, the nature of the existing air quality, or receiving body of water, as the case may be, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution.

415 ILCS 5/27(a).

Here, Illinois EPA provides no information on any of these topics. Illinois EPA does not identify affected facilities, explain where these affected facilities are located, or describe existing air and water quality. Illinois EPA does not provide any information on the scope of this rule, how many facilities would be covered, or why current regulations are insufficient. Illinois EPA does not provide any information on the technical feasibility or economic reasonableness of the proposed emergency rules. The Board is required to consider technical feasibility and economic reasonableness of compliance with proposed regulations. Granite City Div. of Nat'l Steel Co. v. The Ill. Pollution Control Bd., 155 Ill. 2d 149, 181, 613 N.E.2d 719, 734, 184 Ill. Dec. 402 (1993). As described above, air quality in the area has attained National Ambient Air Quality Standards, dust at these types of facilities is already highly regulated, and imposing the proposed emergency rules on facilities is unnecessary and would be economically unreasonable, and, in certain circumstances, technically infeasible.

B. "Information" Provided by Illinois EPA is Insufficient to Jutify and Emergency Rulemaking

"Any person filing with the Board a written proposal for the adoption, amendment, or repeal of regulations shall provide information supporting the requested change." 415 ILCS 5/27(a) (emphasis added). Accord In The Matter of: Revision to Antidegradation Rules, R01-13, Slip Op. December 6, 2001 at p. 10 ("The proponent of a rule must present testimony [or other evidence] in support of that rule."). Illinois EPA's Motion, however, is insufficient in its entirety because it is unsupported by evidence. For example, among others, Illinois EPA's Motion states the following unsupported conclusions:

- "[s]tormwater and wastewater associated with runoff from open storage piles of coke and coal" can, if "inadequately controlled," "lead to excessive floating debris or bottom deposits that could adversely affect aquatic life" (Motion, ¶5);

- "inadequate storage of coke and coal poses a threat to groundwater contamination due to leaching of metals and other constituents associated with these large storage piles" (Id.); and,

- "[e]missions of fugitive PM from coke or coal bulk terminals are inadequately controlled, and cannot be adequately controlled unless certain operations at the facilities, including storage, processing, handling, and transfer operations, are enclosed within a building or other structure" (Motion, ¶14).

Illinois EPA cites no evidence to support these assertions, but merely attaches two affidavits of Agency personnel which state that these conclusions and every other statement in the Motion, "are true and correct." Affidavits of David Bloomberg, Sanjay Sofat.

Illinois EPA's Motion also is insufficient because it improperly relies on nothing more than hearsay that it has not independently confirmed to be accurate. Hearsay evidence consists of "a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted." Ill. R. Evid. 801(c) (eff. Jan. 1, 2011). This type of evidence "'is generally inadmissible due to its lack of reliability'" and the inability of the opposing party to confront the declarant unless it falls within an exception to the hearsay rule. People v. Caffey, 205 Ill. 2d 52, 88, 792 N.E.2d 1163, 275 Ill. Dec. 390 (2001) (quoting People v. Olinger, 176 Ill. 2d 326, 357, 680 N.E.2d 321, 223 Ill. Dec. 588 (1997)). See also People v. Dunmore, 389 Ill. App. 3d 1095, 1106, 906 N.E.2d 1233, 329 Ill. Dec. 622 (2009).

The Board has refused to rely upon affidavits containing hearsay and stricken the same when filed in proceedings before it. Recently, in People v. Atkinson Landfill Co., PCB No. 13-28 (Ill.Pol.Control.Bd. January 9, 2014), an enforcement action, the Respondent landfill filed a motion to dismiss the State's Complaint. The motion was supported in part, by the affidavits of two of its truck drivers, which included statements purportedly made by municipal officials authorizing the disposal of leachate in a municipal sewer. Id. at 4. The Board granted the State's motion to strike the affidavits because they contained hearsay statements. The Board found that even under the more relaxed standard for admissibility set forth in its procedural rules,[11] the affidavits were hearsay, not competent evidence and therefore stricken. Id. at 6. As discussed below, the affidavits offered in support of the proposed emergency rules sought here are as deficient as those in Atkinson.

In paragraph 13 of its Motion, Illinois EPA states: "[r]egarding bulk terminals located in Cook County," the Agency "has become aware of complaints or observed that" various events have allegedly occurred, including alleged discharges to water. (Emphasis added.) Illinois EPA lists eight alleged events in this paragraph, but does not state which of these alleged events it "observed" and which it "has become aware of." Further, Illinois EPA does not even state when any of these events allegedly occurred.

Being "aware of complaints" – that is, being told by someone, or reading in the newspaper, that someone else complained about something having occurred at some unspecified time is hearsay – and cannot be considered a valid basis for an emergency rulemaking. Neither Illinois EPA, nor the Board, nor any entity that would be affected by Illinois EPA's Motion, has any ability to question the persons (or news media) that apparently made these allegations or otherwise evaluate whether they have any merit. In fact, Illinois EPA does not even state that it attempted in any way to verify that the "complaints" of which it "has become aware" were in any way well-founded. With all due respect to the affiants and the Agency, conclusions supported by

[11] The Board's procedural rules provide that the "hearing officer" may admit "evidence that is material, relevant, and would be relied upon by prudent persons in the conduct of serious affairs, unless the evidence is privileged." 35 Ill. Adm. Code 101.626(a).

no evidence, generic affidavits, and double-hearsay that is impossible to explore or question cannot constitute sufficient bases for the Board to conclude that an "emergency" exists that justifies abandoning the Board's normal rulemaking process and adopting emergency rules. Otherwise, the Agency could justify an emergency rulemaking in any situation it wanted to – by stating that it has "become aware" of alleged events, making some associated conclusions, and filing a generic affidavit – which would usurp the Board's right to determine when an emergency rulemaking should go forward. For these reasons, the Board should deny Illinois EPA's Motion for Emergency Rulemaking.

C. Specific Provisions of Illinois EPA's Proposed Rules are Further Flawed

In addition to the general issues highlighted above, specific provisions of Illinois EPA's proposed rules are further flawed in more specific ways.

1. Attempted Applicability Beyond 150 Days

First, the Motion is flawed in that it seeks to require facilities to take actions more than 150 days after the proposed emergency rules would become effective. Again, the APA requires that "[a]n emergency rule may be effective for a period of not longer than 150 days." 5 ILCS 100/5-45(c) (emphasis added). However, section 213.220 of the proposed emergency rules would require that "the owner or operator [of a facility subject to the Rules] must submit to the Agency a plan for total enclosure of all coke piles, coal piles, [and other operations at the facility] as quickly as possible, but in no event later than two years after the effective date of this Part." Proposal, Exhibit A, at 6 (emphasis added). Because this provision would require submission of a plan that is in effect beyond 150 days, this provision by definition cannot be adopted as part of an emergency rule.

2. **Proposed Waste Rules**

Second, the Motion is flawed to the extent that it proposes waste rules in addition to rules regarding air emissions and water discharges. As noted above, Illinois EPA's Motion asserts that an "emergency" exists because of "[i]nadequately controlled fugitive PM emissions, along with inadequately controlled discharges of stormwater and wastewater." Motion, ¶12. However, in addition to proposed air and water rules, the Agency's proposal contains two proposed rules regarding "Hazardous Waste Determinations" (for pet coke only, not coal) – proposed Sections 213.410 and 213.415. Motion, Exhibit A at 15. Illinois EPA does not even mention hazardous waste once in its Motion, much less provide any argument or evidence that would support a Board finding that some kind of "emergency" exists with regard to hazardous waste determinations at pet coke handling facilities. See Motion. As Illinois EPA has not provided any argument or support for these proposed waste rules, as Section 27(a) of the Act requires, the Board cannot find that any "emergency" exists that would justify the Board considering the proposed hazardous waste rules outside the Board's normal rulemaking process.

Further, even if Illinois EPA had presented evidence of some kind of "hazardous waste emergency," the Board must strike these two rules from Illinois EPA's proposal because they directly conflict with the Act. The Board, of course, only has authority to enact rules that are consistent with the Act. The Act provides that only a "discarded material" can be a waste. 415 ILCS 5/3.220. However, Illinois EPA's proposed emergency rules would require pet coke handlers to assume that pet coke being sent to their facility for later shipment to an end user is a solid waste. Motion, Exhibit A at 15, Proposed Section 213.415(b) ("When making hazardous waste determinations pursuant to this Section coke must be analyzed as if it were a solid waste.")

Then, the rules would require that handlers "must not accept coke ... unless ... [a] hazardous waste determination for the coke has been conducted" and "[s]uch determination establishes that the coke is not a hazardous waste." Motion, Exhibit A at 15, proposed Section 213.415(a) (emphasis added). Illinois EPA acknowledges in its Motion that pet coke and met coke are products, utilized "as a replacement fuel or fuel blend for coal-fired power plants and cement kilns," and "as a fuel and as a reducing agent in smelting iron ore," respectively. The Board has no authority to, by regulation, declare a product a "solid waste," without any consideration as to whether that product has been discarded. Likewise, the Board has no authority to, by regulation, declare that a product that is moved in commerce constitutes a "hazardous waste." Such declarations would directly contravene the Act's definition of "waste" and be void ab initio.

Third, the same problems exist with regard to Illinois EPA's proposal that the Board should, on an emergency basis, require "disposal of coke and coal that has been on-site for more than a year." Motion at ¶14; Motion, Exhibit A, proposed Section 213.215 (emphasis added). Illinois EPA nowhere alleges (or cites to any evidence that) coke or coal that is present at a facility for "more than a year" creates any threat, much less an emergency threat. Further, as with proposed Sections 213.410 and 213.415, which relate to coke coming to a handling facility, proposed Section 213.215 would, by regulation, declare products – both coke and coal – that are present at a facility for longer than a year to be a "waste" that must be disposed of, with no consideration as to whether such products have been discarded. Such a regulation would directly contradict the Act's definition of waste, and thus, the Board has no authority to pass such a regulation.

For these reasons, the Board must strike proposed Sections 213.215, 213.410, and 213.415 from Illinois EPA's proposal.

3. Improper Medical "Evidence"

Finally, even if it were not double-hearsay, the Board must strike paragraph 13(e) of Illinois EPA's Motion alleging that Illinois EPA "has become aware of complaints or observed that … [r]esidents have respiratory conditions that have been aggravated by coke/coal dust emissions" as unsupported medical evidence. The Board has repeatedly made clear that only "medical experts" can submit medical evidence to the Board, and that "[t]he Board will disregard [persons'] opinions on the causes of the illnesses that they describe." Glasgow, et al v. Granite City Steel, PCB No. 00-221 at 4 (Ill.Pol.Control.Bd. Mar. 7, 2002) (citing Bridgeman v. Terminal Railroad Ass'n of St. Louis, 195 Ill. App. 3d 966, 973-974, 552 N.E.2d 1146, 1150 (5th Dist. 1990), app. den. 132 Ill. 2d 543, 555 N.E.2d 374)). In fact, in Glasgow, the Board rejected lay testimony "on the link between coal dust and health," id., exactly the kind of "evidence" (though hearsay in this case) that Illinois EPA is attempting to submit here. For the reasons that the Board stated in Glasgow, the Board must reject such "evidence" in this case as well.

VI. APROVAL OF THE EMERGENCY RULES WOULD VIOLATE THE U.S. CONSTITUTION

A. The Emergency Rules Violate the Dormant Commerce Clause

State laws and regulations that impose a burden on interstate commerce that is "clearly excessive in relation to the putative local benefits" will be struck as unconstitutional under the Dormant Commerce Clause of the U.S. Constitution. Pike v. Bruce Church, Inc., 397 U.S. 137, 142 (1970). The proposed emergency rules here would impose such an impermissible burden, in at least the respects set forth below.

First, the regulation discriminates against interstate shipment (as opposed to in-state production and consumption) of the specified materials. Where a state law "directly regulates or discriminates against interstate commerce, or when its effect is to favor in-state economic interests over out-of-state interests," a court will "generally st[rike] down the statute without further inquiry" under the Dormant Commerce Clause of the U.S. Constitution. Brown-Forman Distillers Corp. v. New York State Liquor Auth., 476 U.S. 573, 579 (1986). The emergency rule advances in-state economic interests by exempting "the source, site, or facility that produces or consumers the coke or coal" from its definition of "Coke or coal bulk terminal." Section 213.115. This exemption leaves Illinois-based producers and consumers free to store and ship coal and pet coke throughout the state without having to comply with the emergency rule's onerous requirements. Out-of-state producers and consumers that wish to transport their coal and pet coke through holding facilities in Illinois, in contrast, will have to bear the costs of the regulation or reroute their cross-border commerce entirely. Such disparate treatment is forbidden by the Dormant Commerce Clause. See, e.g., Bacchus Imports, Ltd. v. Dias, 468 U.S. 263, 271 (1984) (invalidating Hawaii tax exemption that exempted certain locally produced alcohols); Hunt v. Wash. Apple Advertising Comm'n, 432 U.S. 333, 338 (1977) (invalidating North Carolina law, unique among the 50 states, that would have required Washington apple growers to abolish or significantly alter their practice of shipping apples in containers with printed labels).

Second, KCBX's Chicago-based facilities function as a way-station for pet coke produced out-of-state and ultimately destined for sale to other states as well as international destinations. The emergency regulations threaten to significantly disrupt this cross-border commerce. To the extent that they raise the costs of transporting pet coke through Illinois, the emergency rules stand not only to externalize the costs of shipment to be borne by those who do not reside in Illinois and have no say in the passage of legislation, see Midwest Title Loans, Inc. v. Mills, 593 F.3d 660, 665 (7th Cir. 2010), but to force those involved with the transport of pet coke to route around Illinois at their own expense, see, e.g. Government Supplies Consolidating Services, Inc. v. Bayh, 975 F.2d 1267 (7th Cir. 1992) (finding increased costs resulting from in-state waste legislation "would effectively bar the importation of out-of-state waste into Indiana" and that this was "clearly excessive" under Pike).

Third, the emergency regulations apply on their face to the instrumentalities of commerce. See Section 213.115 (defining "Vehicle" to mean "any car, truck, railcar, off-road mobile heavy equipment, or marine vessel"). Proposed Section 213.270, for example, prohibits the loading of material into any truck trailer "unless it is subsequently and immediately covered before leaving the source." Such requirements are analogous to those in Kassel v. Consol. Freightways Corp. of Delaware, 450 U.S. 662 (1981), where a plurality of the court determined that an Iowa law imposing regulations with illusory safety benefits on tractor trailers impermissibly burdened commerce. There, as here, compliance with the state's regulations - regulations with no analogue in neighboring states - would impose unnecessary costs on out-of-state truckers who would otherwise use the state's facilities.

B. The Emergency Rules Violate Due Process

Both the Illinois and U.S. Constitution guarantee due process that is not being afforded here. In general, a party from whom a property right is taken must be afforded adequate procedural safeguards. See Board of Regents v. Roth, 408 U.S. 564, 568-69 (1972); E. St. Louis Federation Of Teachers, Local 1220, Am. Federation Of Teachers, AFL-CIO v. E. St. Louis Sch.

Dist. No. 189 Fin. Oversight Panel, 178 Ill.2d 399, 415, 227 Ill.Dec. 568, 687 N.E.2d 1050 (1997) ("Courts considering procedural due process questions conduct a three-part analysis: the first asks the threshold question whether there exists a liberty or property interest which has been interfered with by the State; the second examines the risk of an erroneous deprivation of such an interest through the procedures already in place, while considering the value of additional safeguards; and the third addresses the effect the administrative and monetary burdens would have on the state's interest.").

Given the many deficiencies and deprivations discussed above (including lack of notice and opportunity to comment on the proposed emergency regulations, the non-existence of an emergency, the failure of Illinois EPA to offer the Board evidence to consider regarding technical feasibility or economic reasonableness, and the lack of justification for the overly intrusive rules), adoption of the proposed rules on an emergency basis would violate procedural due process. First, "[t]he purported emergency nature of the regulations [does] not justify dispensing with the requirements of notice and an opportunity to comment." Pac. Nw. Venison Producers v. Smitch, 1992 WL 613294, at *5 (W.D. Wash. Sept. 2, 1992). As in Pacific Northwest Venison Producers, the "the regulations at issue d[o] not address an urgent crisis but rather potential problems that had been under study for many months." Second, the Illinois EPA accepted comments from some, specially selected constituents, "but refused to accept input from those who would be immediately affected by its decision." Id. ("The Commission in that respect was dealing with a small and readily identifiable group of ranchers - in fact, a group that had repeatedly asked to be heard - whose businesses would be damaged or ended by the regulations."). Id. Third, "[a]lthough the emergency regulations are temporary, their practical effect will be to restrict severely and immediately, if not extinguish, the plaintiffs' businesses." Id. Moreover, because the argument offered in support of the rules relies almost entirely on unsupported hearsay, the rules lack the necessary justification. Id. (finding due process claim supported in part by indication that an opportunity to submit contradictory evidence could have shown falsity of the evidence the commission relied upon). In light of the unsupported and unnecessary restriction of KCBX's property right, and the lack of an opportunity to contest the propriety of such rules, the proposed emergency rules violate KCBX's due process rights.

VII. REQUEST FOR HEARING

KCBX submits that its presentation above should be more than sufficient for the Board to conclude that no emergency rulemaking is appropriate in this case. If the Board is not inclined to deny Illinois EPA's Motion based on this and other written responses and comments alone, however, KCBX requests that the Board schedule a hearing on the question of whether an "emergency" exists. At that hearing, KCBX would present testimony from Dr. MacIntosh, who developed Exhibit 5, and whose curriculum vitae is attached as Exhibit 7 as well as from a leading toxicologist, in addition to other evidence, as further proof that no "emergency" exists in this case that would justify the Board proceeding with an emergency rulemaking.

VIII. REQUEST FOR A STAY IN THE ALTERNATIVE

If, notwithstanding the above, the Board decides to adopt the proposed rules on an emergency basis, KCBX respectfully requests, in the alternative, that the Board stay the enforcement of the emergency rules pending further judicial review, as authorized under Illinois Supreme Court Rule 335(g). This stay is necessary and appropriate considering the irreparable harm that the emergency rules will otherwise cause KCBX and the very serious legal questions that surround the validity of the proposed rules, including the claimed "emergency" allegedly prompting them. As the foregoing discussion makes clear, the alleged harm to the environment and public welfare underlying this constructed "emergency" is illusory. Pet coke and coal handling pose no danger to the public, and, even if such activity could have a moderate impact the quality of life in surrounding neighborhoods, KCBX has established that its best practices have effectively addressed the threat of fugitive dust even in the most extreme circumstances. Neither the State nor its citizens would bear any hardship from a stay. By contrast, the harm to KCBX would be great if the emergency rules become effective immediately. Not only would immediate implementation deprive KCBX of the right to meaningfully comment on regulations that threaten to put it out of business, but it would pose corresponding harm to similarly situated parties and industries, as reflected in parallel comments. In sum, the balancing of the equities clearly favors a stay. Given the shortness of time before the regulation would go into effect, the irreparable harm KCBX faces, and the possible need to seek judicial intervention, KCBX respectfully requests that the Board rule on its request for stay contemporaneously with any ruling adopting the proposed rules on an emergency basis.

IX. CONCLUSION

For the reasons stated above, KCBX respectfully requests the Board deny Illinois EPA's Motion for Emergency Rulemaking. If the Board declines to do so based solely on this and other written submissions presented to it, the Board should schedule a hearing at the earliest possible date at which KCBX and other entities affected by the proposed rule can present additional evidence that no emergency exists to justify this rulemaking proceeding on an emergency basis.

Alternatively, if the Board grants Illinois EPA's Motion, the Board should grant an interim stay pending further proceedings.

Respectfully submitted,
KCBX TERMINALS COMPANY,

Dated: January 21, 2014

By: /s/ Katherine D. Hodge
Katherine D. Hodge

Katherine D. Hodge
Matthew C. Read
HODGE DWYER & DRIVER
3150 Roland Avenue
Post Office Box 5776
Springfield, Illinois 62705-5776
(217) 523-4900

STATE OF KANSAS)
) SS
COUNTY OF SEDGWICK)

Dave Severson on oath deposes and states:

1. That he has worked for KCBX TERMINALS COMPANY ("KCBX") for over 12 years, and will mark his 13 year anniversary with KCBX on February 12, 2014. After graduation from college, he began work for Koch Industries, Inc., the ultimate parent company of KCBX, and held various sales, supply, and management roles until his appointment to President of KCBX February 12, 2001.

2. That he is currently employed as KCBX's President based at the company's headquarters in Wichita, KS.

3. That as part of his duties as the President, he is responsible for overall business strategies and profitability.

4. That he is a 1986 graduate of Kansas State University with a Bachelor's degree in Business.

5. That he participated in the preparation and review of KCBX's Response in Opposition to the Illinois Environmental Protection Agency's ("Illinois EPA's") Proposal and Motion for Emergency Rulemaking and Request for Hearing.

Under penalties as provided by law pursuant to Section 1-109 of the Code of Civil Procedure, the undersigned certifies that the statements set forth in this instrument are true and correct, except as to matters therein stated to be on information and belief and as to such matters the undersigned certifies as aforesaid that he verily believes the same to be true.

FURTHER AFFIANT SAYETH NOT.

Dave Severson

Subscribed and sworn to before me
this 21st day of January, 2014

Vicki Messmer Hye
Notary Public

My Appointment Expires:
September 29, 2014

VICKI MESSMER HYE
Notary Public - State of Kansas

STATE OF ILLINOIS)
) SS
COUNTY OF COOK)

Michael Estadt on oath deposes and states:

1. That he has worked for KCBX TERMINALS COMPANY ("KCBX") for over 4 years and will mark his 5 year anniversary with KCBX on April 27, 2014.

2. That he is currently employed as KCBX Chicago Terminals Operations Manager.

3. That as part of his duties as the Operations Manager, he is responsible for day to day activities at KCBX.

4. That he is a Class of 2000 graduate of Rowan University with a Bachelors of Science degree in Chemical Engineering.

5. That he participated in the preparation and review of KCBX's Response in Opposition to the Illinois Environmental Protection Agency's ("Illinois EPA's") Proposal and Motion for Emergency Rulemaking and Request for Hearing.

Under penalties as provided by law pursuant to Section 1-109 of the Code of Civil Procedure, the undersigned certifies that the statements set forth in this instrument are true and correct, except as to matters therein stated to be on information and belief and as to such matters the undersigned certifies as aforesaid that he verily believes the same to be true.

FURTHER AFFIANT SAYETH NOT.

Michael Estadt

Subscribed and sworn to before me
this 21st day of JANUARY 2014.

Carol R. Stolovo

Notary Public

NOTARY PUBLIC
SEAL
INDIANA

Exhibit 1

NRDC
THE EARTH'S BEST DEFENSE

NATURAL RESOURCES DEFENSE COUNCIL

Via electronic mail (john.j.kim@illinois.gov)

John J. Kim
Chief Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Comments concerning emergency Part 213 rules governing fugitive dust

Dear John:

Thank you for taking the time to talk with us this morning regarding our concerns with the emergency rule. We very much appreciate that the Governor is focused on this issue and wants to take strong action to curb the very real public health threat that petcoke and eoal piles represent.

We have made clear our position that the most sensible use of emergency power is a moratorium: suspension of permits for new facilities or expansion of existing facilities, in order to ensure that an expanded presence of the piles in the state does not become entrenched via a regulatory approach. That said, however, we have a set of specific technical concerns with the rules that are relevant regardless of whether you adopt the moratorium approach, as they apply to existing facilities.

The following is a list of issues we have identified thus far in our very limited review. As we indicated on the call, we have not had time to do the type of thorough review that would be necessary to identify all relevant issues, but we hope that this limited listing of some key concerns is helpful to you.

Our comments are listed in the order they are found in the draft, not necessarily in order of priority. That said, our key priorities include (i) shortening the timeframes for enclosure of major dust sources; (ii) adding further clarity to the provision governing operation during wind events, which we consider to be critically important; (iii) enhancing the setback requirements, which are also critical, and (iv) adding testing and monitoring provisions for most notably visible emissions and opacity.

These comments incorporate by reference the draft comments submitted separately by ELPC (ELPC Comments) during the call this morning, unless otherwise noted.

Section 213.115 Definitions

"Accumulation." The basis for using three ounces per square foot as the threshold for accumulation is not clear and should be explained. Moreover, three ounces per square foot is a significant amount of material; in comparison, silt, the parameter for measuring deposits on surfaces, is typically calculated in grams per square meter. Thus, IEPA should adopt a lower threshold for accumulation, employing the grams per square meter unit.

"Coke or Coal Bulk Terminal." The ELPC Comments observe that this definition is overly narrow in excluding locations where petcoke is produced and consumed, because Illinois has numerous other facilities that produce petcoke (*e.g.*, the ExxonMobil refinery in Joliet, the Citgo refinery in Lemont, the Wood River refinery in Roxana, Illinois, and numerous coal mines where coal is stored), such that bulk storage at production locations is a real possibility. We would add that many of these facilities, while governed by major source air permits, have dated and insufficient provisions governing fugitive emissions from petcoke piles. The BP Whiting permit, issued more recently, at least requires enclosure of coke handling and storage facilities, but these requirements were obtained through litigation and it is our understanding the permits for the referenced Illinois refinery facilities do not contain similar provisions.

"Water spray system." The 1500 psi limitation on the the upper limit in the range of pressures is not justified. Systems are available that operate at pressures up to 2000 psi.[1]

Section 213.215 Storage Limitation

One year storage limit (subsection a)). While we support the prohibition on long-term storage reflected in subsection a), we believe the limit should be 6 months rather than one year, which is more consistent with RCRA requirements.

Section 213.*220 Plan for Total Enclosure*

Two-year time frame. As discussed in the ELPC comments, two years is an excessive amount of time to allow for full enclosure. As ELPC notes, the technical aspects of the enclosure process for piles should take no more than about 9 months. Even if one were to assume, however, that two years is an appropriate amount of time to allow for enclosure of the *piles*, there is no reason why that amount of time should be necessary to enclose the other aspects of operation identified in this section – *i.e.*, conveyors, transfer points, loading and unloading areas, screening areas, crushing areas, and sizing areas. Instead of lumping all of these disparate components together, the State should follow the City's lead and identify separate time frames

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[1] *See, e.g.*, MEFCOR, Fully Automatic Dust Suppression Water Control Valve, Model DSV400, available at http://173.254.28.129/~copyitb1/mefcor/dsv400.htm; *see also* Tecpro Australia, Tecpro Australia – Specialists in Spray Nozzles and Dust Suppression Solutions for Mining Industry, available at http://www.mining-technology.com/contractors/emission_control/tecpro-australia/. Spray systems used in the mining industry should be translatable to the facility covered by the Proposed Rules.

for enclosure of each. *See* subsection 6.0 of the City's draft ordinance – although we do not endorse the specific time frames the City has proposed.[2]

Section 213.235 Coke and Coal Fugitive Dust Plan

Need for review period and criteria. It is essential that this section incorporate a requirement that the Agency review the Dust Plans required to be submitted to it; and criteria for reviewing the adequacy of such plans. As currently drafted, the rule merely requires physical submission of the plan, without provision for scrutiny of it. The section should expressly provide for an agency review period concluding in a determination, and establish discretionary criteria for such determination that are grounded in protection of public health, not merely compliance with minimum control requirements required by the letter of the regulations. That is, the section should provide that the Agency will reject any plan that (i) is found not to be sufficiently protective of public health and the environment, *and* (ii) does not *at minimum* demonstrate compliance with the requirements of this Subpart and contain all of the information specified in 35 Ill. Adm. Code 212.310.

In addition, to the extent the Dust Plans are to be in effect beyond the time frame of the emergency rule, there must be provision for public comment. The fact that the rule is being promulgated on an emergency basis should not be used deny citizens the right to have input on measures they will need to live with for the long term.

Section 213.230 Property Boundary Setbacks

Setback distance. We very much appreciate the inclusion in the rule of a setback for unenclosed piles inside the property line, as it is critical that there be a wide separation between the piles and neighboring properties. However, 200 feet is extremely minimal when dealing with fugitive dust that can travel much further, especially given the high wind speeds seen in the Chicago area, and we would therefore strongly encourage you to expand the setback distance, going beyond the facility boundary if necessary to ensure that dust does not burden health and welfare. (*See also* our comments concerning the Section 213.320 Water and Well Setbacks).

Section 213.235 Pile Height

Pile height is not justified. There is no justification for allowing 30 foot piles, which correspond to the height of a 3 story building; and it is quite clear that piles at this height will be subject to significant wind disturbance given the wind gusts that can occur at these heights. In just 2013 alone, the highest wind gust speed recorded in Chicago at that height[3] was 67 miles per hour and highest sustained wind speed was 41 mph at Midway Airport.[4] Spray systems are known to be of limited effectiveness at high winds, as spray can be redirected away from piles by the wind.

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[2] As will be set forth in more detail in our comments on the City's proposal, the timelines are both too long (e.g., a year is not needed for enclosing conveyors or loading/unloading areas), while some timelines do not make sense in context (one cannot comply with obligations triggered by a factor that itself does not apply until later on).

[3] Typically, wind speeds are measured at the standard anemometric height of 10 meters.

[4] *See* http://weatherspark.com/history/30851/2013/Chicago-Illinois-United-States. Such wind speed data is typically recorded at a height of 30 meters, approximately equal to the maximum pile height allowed by the Proposed Rules.

Section 213.240 Wind Events

Need for further definition. This is an absolutely key provision, since the disturbance activity referenced in it is an enormous generator of dust during a wind event, and we appreciate that the Agency has included it. However, more definition is needed to make this provision effective. First, "wind speeds" must be defined, as wind speed may be measured in a number of different ways (*e.g.*, average wind speed, wind speed sustained over a period of time, wind gusts, *etc.*) The rules should use 15 mph average wind speed over a reasonable averaging time, and also include a threshold for wind gusts of a limited duration, above which operations must similarly cease. Second, the definition should specify at what elevation the wind speed is to be measured. While typically wind speed is measured at a height of 10 meters, in this case it may be more appropriate to base the wind speed measurement at an elevation specific to the expected heights of sources such as piles or loading activities. Third, the section should establish a protocol for weather station design and operation, to ensure that wind speed measurements are accurate. USEPA protocols and guidance should be the metric for weather stations. Finally, facilities must follow protocols for siting weather stations, such that they are located in an unsheltered position, centrally placed in relation to the sources.

Section 213.245 Paving

Paving requirement. This section provides only that roadways "within the source" must be paved. This is insufficiently protective, as dust disturbance on unpaved roads outside the facility creates a significant public health risk. Residents of the Calumet area report significant dust from truck traffic on unpaved sections of road surrounding the KCBX south facility. Conversely, USEPA has found that paving unpaved roads can significantly reduce PM10. We note also that Rule 1158 from the South Coast Air Quality Management District, on which this provision was based, does not exempt any facilities from the requirement to have truck traffic only travel on paved roads within a quarter mile radius of the facility. Instead, it requires paved roads around all facilities served by trucks, and sweeping on those roads.

The limited paving requirement is additionally insufficient in view of Section 213.250 (a), which requires sweeping and cleaning of all roads outside the source, within a quarter mile of the source perimeter. That requirement cannot be complied with if those roads are not paved, as typically unpaved roads are not swept as paved roads are. Accordingly, the paving requirement should also apply to roads within a quarter mile of the source.

Section 312.250 Roadways

Application to rail facilities. This section should establish cleaning requirements not just for roads but also for railway facilities, which are a significant source of dust. Specifically, this section should require the facility operator or owner to maintain spill-free and material-free railroad tracks by daily vacuuming or otherwise removing any materials that may be deposited on the tracks or adjacent to the tracks that can entrain fugitive dust. It should also prohibit the use of bottom-dump rail road cars, which can leak dust-forming materials onto the tracks.

Section 213.270 Vehicle Tarping

Title. The title of the section should be changed to "Vehicle Covering," as tarps are only one of the allowed controls.

Solid covers. The section should make clear that solid covers are available and should be used for barges. We observed such a solid barge cover on a barge docked at the Beemsterboer facility during a boat trip in mid-October of 2013.

Section 213.275 Truck Transport

Speed limit. The basis for the 8 mph speed limit is not state or clear. The ability of trucks to pulverize, create and entrain fugitive dust depends on many factors including truck weight, number of tires, speed, etc. Thus, simply noting a speed limit, without basis, does not ensure effectiveness in dust control so as to achieve compliance with the visual emission limit and opacity limits applicable to roadways under the existing code (see also comment about a 5% opacity limit). The Agency should confirm whether this speed limit will achieve compliance with these limits, and if not, modify the speed limit accordingly.

Leaks. This section should prohibit leaks of both liquid and solid material (solids can "leak" from vehicles[5]

Railcars and barges. Measures equivalent to those for trucks should be added for railcars and barges. All outgoing railcars should be cleaned, and there should be a prohibition on holes in railcars and barges such that material leaks (in solid or liquid form) from the cars.

New Section, Visual Emissions and Opacity Testing

While the current Illinois regulations include numeric limits on opacity as well as visible emissions, they completely lack any testing protocols for these parameters. The emergency rules should adopt such testing protocols.

These protocols should include, at minimum, the following:

- Periodic testing using approved methods and protocols for determining visible emissions and opacity, such as USEPA's Method 9 or 9d, as appropriate, by a trained and certified professional[6];
- A schedule for such testing, with testing occurring at least quarterly;
- A full range of weather and atmospheric conditions under which such testing must occur, such that representative conditions at the facility are covered;

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[5] *See* Guardian Carleton, Fugitive Dust Program, October 2013 ("Guardian Carleton") (requested by the Michigan Department of Environmental Quality), available at http://www.deq.state.mi.us/aps/downloads/ROP/pub_ntce/B1877/October%202013%20Fugitive%20Dust.pdf (describing leakage of solid materials onto tracks and obligations to keep the tracks free of raw materials).

[6] See, e.g., USEPA, Test Methods for Paved and Unpaved Parking Lots, available at http://www.epa.gov/region9/air/phoenixpm/fip/method.html.

- A prohibition on nighttime operations, as measurement of opacity at night is infeasible

Additionally, we recommend that the Agency establish a cumulative daily limit on excess opacity levels, such as not to exceed three three-minute periods in a consecutive 24-hour period, as 24 episodes of three minute exceedances can equal a significant amount of fugitive dust in a single day.

Finally, the Agency should limit opacity from all covered sources within a facility to 5% instead of 10%. This is the limit that applies to a number of parallel fugitive dust sources, including barge loading, in Granite City, Illinois, under the state's fugitive dust regulations (Michigan similarly imposes a 5% limit on a number of sources). The Calumet area, unlike Granite City, has a number of fugitive dust sources located in close proximity to neighborhoods; thus, it is appropriate to require sources in more densely populated areas to comply with at least as rigorous an opacity standard.

Section 213.285, Recordkeeping and Reporting

General. The rules should require that a person trained and certified in dust management be responsible for and certify all records and reports under this section.

"Type" (213.285 a) 1)). The term "type" of coke and coal is vague. The section should specifically require reporting of composition of the material, derived through testing.

Monthly reporting (213.285 c)). The operator should not be allowed to submit only the raw data, which may be difficult and time consuming for the Agency and the public to review. Rather, it should be required to submit quarterly summary reports concerning the referenced records, along with the monthly data. As noted above, this report should be certified by a trained and licensed dust control professional.

Section 213.320 Water and Well Setbacks; Impermeable Barriers

Additional definition concerning "minimum." As noted previously, we consider the setback provisions to be a linchpin of the regulation, essential to protecting the public. Again, however, further definition is needed to ensure the effectiveness of this key provision. Subsection a) requires a "minimum" setback of 200 feet, indicating – correctly – that in some instances a larger setback will be required. However, the section does not define what those instances are, or provide the Agency with discretion to establish them pursuant to some standard. Similarly to what we have recommended for the Dust Plans, the setback provision should state (i) that setbacks must protect public health and the environment, *and* (ii) that such setbacks must be 200 feet at minimum. This provision would need to specify standards for ensuring protection of affected waterbodies and water sources.

Sufficiency of setback. We do not believe that 200' is a sufficient minimum distance. Fugitive dust can travel much further than 200 feet at the wind speeds seen in the Chicago area.

Section 213.325 Wastewater and Stormwater Runoff Plan

100-year storm (section 213.325 a) 2)). Designing the sedimentation ponds to treat the runoff from the 100-year storm event is insufficient. Likely due to climate change, the frequency and severity of storm events has significantly increased in recent years, such that the 500-year event would be a more appropriate benchmark. Our concern has significant real-world implications, as one facility's sedimentation pond is located directly adjacent to the Calumet River.

Thank you for considering these comments. If you have any questions or concerns, please contact Ann Alexander [redacted], aalexander@nrdc.org). [redacted]

Very truly yours,

NATURAL RESOUCES DEFENSE COUNCIL

Ann Alexander

____

Ann Alexander
Meleah Geertsma

Exhibit 2

SCREENING-LEVEL HAZARD CHARACTERIZATION

Petroleum Coke Category

SPONSORED CHEMICALS
Petroleum coke, green CASRN 64741-79-3
Petroleum coke, calcined CASRN 64743-05-1

The High Production Volume (HPV) Challenge Program[1] was conceived as a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsored chemicals; sponsorship entailed the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data did not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to "SIDS" (Screening Information Data Set[1,2]) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency's Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored chemicals by developing hazard characterizations (HCs). These HCs consist of an evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. They are not intended to be definitive statements regarding the possibility of unreasonable risk of injury to health or the environment.

The evaluation is performed according to established EPA guidance[2,3] and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor's responses to comments and revisions made to the submission. In order to determine whether any new hazard information was developed since the time of the HPV submission, a search of the following databases was made from one year prior to the date of the HPV Challenge submission to the present: (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, IRIS, NTP, ATSDR, IARC, EXTOXNET, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. OPPT's focus on these specific sources is based on their being of high quality, highly relevant to hazard characterization, and publicly available.

OPPT does not develop HCs for those HPV chemicals which have already been assessed internationally through the HPV program of the Organization for Economic Cooperation and Development (OECD) and for which Screening Initial Data Set (SIDS) Initial Assessment Reports (SIAR) and SIDS Initial Assessment Profiles (SIAP) are available. These documents are presented in an international forum that involves review and endorsement by governmental

[1] U.S. EPA. High Production Volume (HPV) Challenge Program; http://www.epa.gov/chemrtk/index.htm.
[2] U.S. EPA. HPV Challenge Program – Information Sources; http://www.epa.gov/chemrtk/pubs/general/guidocs.htm.
[3] U.S. EPA. Risk Assessment Guidelines; http://cfpub.epa.gov/ncea/raf/rafguid.cfm.

authorities around the world. OPPT is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments.

These hazard characterizations are technical documents intended to inform subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public.

Chemical Abstract Service Registry Number (CASRN)	**Sponsored Chemicals** **64741-79-3** **64743-05-1**
Chemical Abstract Index Name	**Sponsored Chemicals** **Coke (petroleum)** **Coke (petroleum), calcined**
Structural Formula	**See Appendix**

Summary

CASRN 64741-79-3 is a grayish-black, carbonaceous solid that is obtained from the heaviest portions of crude oil. CASRN 64743-05-1 is a product derived from CASRN 64741-79-3 under reducing conditions in kilns or hearths heated to over 1,200°C. These substances possess negligible vapor pressure and negligible water solubility. Volatilization is negligible. The rate of hydrolysis is negligible. The rate of atmospheric photooxidation is negligible. CASRN 64741-79-3 and CASRN 64743-05-1 both possess high persistence (P3) and low bioaccumulation potential (B1).

A guideline study is not available for acute inhalation toxicity; however, no mortality occurred following five days of repeated inhalation exposure to CASRN 64741-79-3 (0.058 mg/L) or CASRN 64743-05-1 (0.045 mg/L) in rats. No other data are available for CASRN 64743-05-1. Repeated exposure to CASRN 64741-79-3 dust during a 2-year inhalation toxicity study produced irreversible respiratory effects (chronic pulmonary inflammation and significantly increased absolute/relative lung weights) in rats and primates (both sexes) at all concentrations tested. Histological examination revealed macrophage accumulation (with test article deposits), focal fibrosis, bronchiolization, sclerosis and squamous alveolar metaplasia in rats at concentrations $\geq$ 0.01 mg/L; the NOAEC for systemic toxicity is not established. A combined reproductive/developmental toxicity screening test with CASRN 64741-79-3 dust showed no reproductive or developmental effects following inhalation exposure in rats; however, pulmonary inflammation (macrophage accumulation, lymphocyte hyperplasia and squamous metaplasia of respiratory epithelium) was observed in all exposed parental animals. The NOAEC for maternal toxicity is not established. The NOAEC for reproductive/developmental toxicity is 0.30 mg/L (highest concentration tested). CASRN 64741-79-3 was not mutagenic in bacteria or mammalian cells when tested *in vitro* and did not induce chromosomal aberrations in mice following inhalation exposure *in vivo*. Repeated dermal exposure to CASRN 64741-79-3

(as a 25% suspension in mineral oil) during a 2-year cancer bioassay produced acanthosis and hyperkeratosis in mice; however, no neoplastic changes were observed.

Based on the category member CASRN 64741-79-3, the 96-h LC_{50} for fish and the 48-h EC_{50} for aquatic invertebrates are no effects at saturation. Based on the category member CASRN 64741-79-3, the 96-h EL_{50} for aquatic plants is greater than 1000 mg/L (WAF nominal loading rate). Based on the category member CASRN 64741-79-3, the 21-d terrestrial plants (corn, radish and soybean) NOEC and the 14-d earthworms NOEC are no effects at saturation.

No data gaps for were identified under the HPV Challenge Program.

The sponsor, the American Petroleum Institute (API) Petroleum HPV Testing Group, submitted a Test Plan and Robust Summaries to EPA for petroleum coke on March 31, 2000. EPA posted the submission on the ChemRTK HPV Challenge website on April 21, 2000 (http://www.epa.gov/chemrtk/pubs/summaries/ptrlcoke/c12563tc.htm). EPA comments on the original submission were posted to the website on August 14, 2000. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on December 28, 2007, which were posted to the ChemRTK website on June 30, 2008. The petroleum coke category consists of the following substances:

Coke (petroleum), "green coke"	CASRN 64741-79-3
Coke (petroleum), calcined	CASRN 64743-05-1

Category Justification

This category contains both green and calcined petroleum coke. The sponsor's rationale for this grouping is based on similarities in manufacture and processing. Their reasoning suggests that as byproducts of oil refining processes (at high temperature and pressure), these substances share similar physical-chemical characteristics that are expected to produce comparable toxicity. The sponsor proposed use of test data for green petroleum coke in a read across approach to estimate potential toxicities that may be associated with exposure to calcined petroleum coke. EPA agrees that it is appropriate for green and calcined petroleum coke to be grouped in one category and accepts the proposed read across approach for this hazard characterization.

1. Chemical Identity

1.1 Identification and Purity

Petroleum coke (both green and calcined) is a black solid produced by the high pressure thermal decomposition of heavy (high boiling) petroleum process streams and residues. The specific chemical composition of any given batch of petroleum coke is determined by the quality of feedstocks used in the coking process. Green coke is the initial product formed during the cracking and carbonization of feedstocks used to produce a substance with a high carbon-to-hydrogen ratio. Green coke may undergo additional thermal processing at very high temperatures to produce calcined coke. The additional processing required to form calcined coke removes most of the remaining volatile matter (< 0.5%), thereby increasing the percentage of elemental carbon and the relative abundance of metals. Compositional information on green coke is shown in Table 6 of the Appendix.

1.2 Physical-Chemical Properties

The physical-chemical properties of coke (petroleum) "green coke" and coke (petroleum), calcined are summarized in Table 1, while the environmental fate properties are provided in Table 2. In general, most physical-chemical and environmental fate properties are not applicable for these substances as they cannot be measured or estimated accurately.

Coke (petroleum) "green coke" and coke (petroleum), calcined are both grayish-black, solid (carbonaceous) materials that are produced during the thermal conversion process with crude oil. These substances possess negligible vapor pressure and negligible water solubility.

Table 1. Physical-Chemical Properties of Petroleum Coke[1,2]

Property	Coke (petroleum)	Coke (petroleum), calcined
CASRN	64741-79-3	64743-05-1
Molecular Weight	Complex mixture	Complex mixture
Physical State	Black-colored solid	Black-colored solid
Melting Point	Not applicable	Not applicable
Boiling Point	Not applicable	Not applicable
Vapor Pressure	<.000001 mm Hg (Negligible)	Negligible
Dissociation Constant (pK_a)	Not applicable	Not applicable
Henry's Law Constant	Negligible	Negligible
Water Solubility	< 0.0000001 g/L (Negligible)	Negligible
Log K_{ow}	Not applicable	Not applicable

[1] American Petroleum Institute Petroleum HPV Testing Group. 2007. Revised Robust Summary and Test Plan for Petroleum Coke. Available online at http://www.epa.gov/chemrtk/pubs/summaries/ptrlcoke/c12563tc.htm as of January 21, 2011.
[2] Predel, H. 2005. Petroleum Coke. Ullmann's Encyclopedia of Chemical Technology. Wiley Online Library.

2. General Information on Exposure

2.1 Production Volume and Use Pattern

The Petroleum Coke category chemicals had an aggregated production and/or import volume in the United States greater than two billion pounds in calendar year 2005.

- CASRN 64741-79-3: 1 billion pounds and greater;
- CASRN 64743-05-1: 1 billion pounds and greater;

CASRN 64743-05-1:
No industrial processing and uses or commercial and consumer uses were reported for this chemical.

CASRN 64741-79-3:
Non-confidential information in the IUR indicated that the industrial processing and uses for this chemical include petroleum refineries as fuels. Non-confidential commercial and consumer uses of this chemical include "other."

2.2 Environmental Exposure and Fate

If released to soils, coke (petroleum) and coke (petroleum), calcined will become incorporated into the soil, as they have no mobility. They are essentially inert; therefore, biodegradation, atmospheric photooxidation, and hydrolysis will be negligible. Volatilization is negligible. These substances are not bioaccumulative. Coke (petroleum) and coke (petroleum), calcined both possess high persistence (P3) and low bioaccumulation potential (B1).

Table 2. Environmental Fate Properties of Petroleum Coke[1,2]

Property	Coke (petroleum)	Coke (petroleum), calcined
CASRN	64741-79-3	64743-05-1
Photodegradation Half-life	Stable	Stable
Hydrolysis Half-life	Stable	Stable
Biodegradation	Stable	Stable
Bioaccumulation Factor	Not applicable	Not applicable
Log K_{oc}	Not applicable	Not applicable
Fugacity (Level III Model) Air (%) Water (%) Soil (%) Sediment (%)	Not applicable	Not applicable
Persistence	P3 (High)	P3 (High)
Bioaccumulation	B1 (Low)	B1 (Low)

[1] American Petroleum Institute Petroleum HPV Testing Group. 2007. Revised Robust Summary and Test Plan for Petroleum Coke. Available online at http://www.epa.gov/chemrtk/pubs/summaries/ptrlcoke/c12563tc.htm as of January 21, 2011.
[2] Traditional environmental fate properties cannot be measured or accurately estimated for these substances; however, it is assumed that these substances will be stable in the environment and non-bioaccumulative due to their high molecular weight.

Conclusion: Coke (petroleum) "green coke" is a grayish-black carbonaceous solid that is obtained from the heaviest portions of crude oil. Petroleum (coke), calcined is a product derived from coke (petroleum) under reducing conditions in kilns or hearths heated to over 1,200°C. These substances possess negligible vapor pressure and negligible water solubility. Volatilization is negligible. The rate of hydrolysis is negligible. The rate of atmospheric photooxidation is negligible. Coke (petroleum) and coke (petroleum), calcined possess high persistence (P3) and low bioaccumulation potential (B1).

3. Human Health Hazard

A summary of health effects data submitted for SIDS endpoints is provided in Table 3. The table also indicates where data for the supporting chemical are read-across (RA) to the sponsored chemical.

Acute Inhalation Toxicity
A guideline acute inhalation toxicity study (OECD 403) is not available for green petroleum coke; however, no mortalities occurred in the 5-day or 2-year repeated-dose inhalation studies described below.

Green petroleum coke (CASRN 64741-79-3)
Calcined petroleum coke (CASRN 64743-05-1)
(1) Male Fischer 344 rats (40/group) were administered green petroleum coke dust (100% purity) at 58.2 mg/m^3 or calcined petroleum coke dust (99.5% purity) at 45.0 mg/m^3 (~ 0.058 or 0.045 mg/L, respectively) via (nose-only) inhalation 6 hours/day for 5 consecutive days. Positive and negative controls received silicon dioxide and titanium dioxide, respectively. The mass median aerodynamic diameters for green and calcined petroleum coke particles were 2.71 and 2.69 µm, respectively. Ten animals from each group were sacrificed at 7, 28 and 63 days post-exposure. No mortalities occurred. An increased incidence of chromodacryorrhea (red tears) was apparent in all treatment groups except titanium dioxide. At terminal sacrifice, biochemical and cytological examinations were made of bronchoalveolar lavage fluid. Histological examination of lung tissue was confined to animals sacrificed at 63 days post-exposure. Examination of bronchoalveolar lavage fluid obtained at 7 and 28 days post-exposure revealed no indication of pulmonary toxicity in exposed or control rats; however, evidence of pulmonary inflammation (increased n-acetylglucosamidase, neutrophils, lymphocytes, total protein and total cell count) was evident in both silicon dioxide and petroleum coke exposed rats at 63 days post-exposure. Macroscopic examination showed red discoloration of the lungs and parabronchial lymph nodes in petroleum coke-exposed animals. The rank order of increasing severity was: titanium dioxide < calcined petroleum coke < green petroleum coke < silicon dioxide. No signs of pulmonary fibrosis were observed in this study.
LC_{50} (Green petroleum coke) > ~ 0.058 mg/L
LC_{50} (Calcined petroleum coke) > ~ 0.045 mg/L

Repeated-Dose Toxicity

Green petroleum coke (CASRN 64741-79-3)
(1) Sprague-Dawley rats (150/sex/group) were administered (Delayed process) green petroleum coke dust (average mass median aerodynamic diameter = 3.1 ± 1.9 µm) via whole-body inhalation of the aerosol at 0, 10.2 or 30.7 mg/m^3 (~ 0.010 or 0.031 mg/L, respectively) for 6 hours/day, 5 days/week for 2 years (Klonne et al., 1987). Clinical chemistry (alanine aminotransferase, alkaline phosphatase, aspartate aminotransferase, blood urea nitrogen, calcium, phosphorus, total bilirubin, total protein, and glucose) and hematologic evaluations (mean corpuscular volume, hematocrit, hemoglobin, erythrocyte, reticulocyte, leukocyte and platelet counts) were conducted after 3, 6, 12, 18 and 24 months of exposure using ten randomly selected rats per group. Interim sacrifices were made at 5 and 30 days (10/sex/group), at 3, 6 and 12 months (20/sex/group) and at 18 months (10/sex/group) post-exposure. All surviving animals were sacrificed at 24 months. All animals sacrificed in extremis or found dead were also evaluated. Fasting body and organ weights (heart, lung plus trachea, liver, gonads, adrenals, thyroid/parathyroids, kidneys, spleen and brain) were recorded at each scheduled necropsy. Thirty-one designated tissues (not specified) from control and high exposure groups (10 rats/sex) were examined microscopically after 3,6,12 and 18 months; all remaining animals from control and high exposure groups were similarly evaluated after 24 months of exposure. Only the lung plus trachea (at 12, 18 and 24 months) and nasal turbinates (at 24 months) were examined microscopically in the lowest exposure group.

There were no treatment-related effects on body/organ weights, serum biochemistry, cytogenetic evaluations, ophthalmologic examinations or mortality; however, macroscopic examination revealed pigment accumulation (presumably test material) and gray/black discoloration of the lungs and thoracic lymph nodes in exposed animals. Significant, dose-related increases in absolute and relative lung (plus trachea) weights and chronic pulmonary inflammation (significant elevations in the number of segmented neutrophils and leukocytes and a decreased number of lymphocytes) was also observed following exposure at 0.010 and 0.03 mg/L. Histological changes observed in treated rats include macrophage accumulation, bronchiolization (adenomatous hyperplasia), focal fibrosis, sclerosis and squamous alveolar metaplasia (keratin cysts). Observed lung effects were non-reversible and increased in severity with increasing concentration and duration of exposure.
LOAEC ~ 0.010 mg/L (based on pulmonary inflammation and histopathology)
NOAEC = Not established

Green petroleum coke (CASRN 64741-79-3)
(2) Mature Cynomolgus (Macaca fascicularis) monkeys (4/sex/group) were administered (Delayed process) green petroleum coke dust (average mass median aerodynamic diameter = 3.1 ± 1.9 μm) via whole body inhalation of the aerosol at 0, 10.2 or 30.7 mg/m^3 (~ 0.010 or 0.031 mg/L, respectively) 6 hours/day, 5 days/week for 2 years (Klonne et al., 1987). No mortalities occurred. Ophthalmologic, clinical chemistry (alanine aminotransferase, alkaline phosphatase, aspartate aminotransferase, blood urea nitrogen, calcium, phosphorus, total bilirubin, total protein, and glucose) and hematologic evaluations (mean corpuscular volume, hematocrit, hemoglobin, erythrocyte, reticulocyte, leukocyte and platelet counts) were conducted at 1, 3, 6, 12, 18 and 24 months. At scheduled sacrifice (24 months), fasting body and organ weights (heart, lung plus trachea, liver, gonads, adrenals, thyroid/parathyroids, kidneys, spleen and brain) were recorded and thirty-one tissues (unspecified) from control and high exposure groups were examined microscopically. Only the lung (plus trachea) and nasal turbinates were examined in the lowest exposure group. There were no treatment-related effects on body/organ weights, serum chemistry, hematology, cytogenetic evaluations, ophthalmologic examinations or mortality; however, significant, dose-related increases in absolute and relative lung (plus trachea) weights were observed in both sexes at 0.010 and 0.03 mg/L. Histological examination showed macrophage accumulation (with test material deposits) and discoloration within the alveoli, thoracic lymph nodes and in paratracheal lymphoid tissue of all exposed animals. Observed lung effects were non-reversible and increased in severity with increasing concentration and duration of exposure. These findings are consistent with the development of pulmonary inflammation; however, no other evidence of inflammatory or metaplastic changes was reported.
LOAEC ~ 0.010 mg/L (based on pulmonary effects)
NOAEC = Not established

Reproductive/Developmental Toxicity

Green petroleum coke (CASRN 64741-79-3)
In a combined reproductive/developmental toxicity screening test, Sprague-Dawley rats (12/sex/group) were exposed via nose-only inhalation to micronized green petroleum coke (average mass median aerodynamic diameter = 2.29 μm) at 0, 30, 100 or 300 mg/m^3 (~ 0.030, 0.10 or 0.30 mg/L, respectively) for up to 52 days (Klonne et al., 1987). A two week range finding study was conducted initially to select exposure levels for the definitive study. In the

main study, rats were exposed for 6 hours/day for two weeks prior to mating. Males were then exposed for 28 days during the mating and post-mating period. Females continued to be exposed until evidence of mating, or for 14 consecutive days. Pregnant females were treated throughout gestation until scheduled sacrifice on postnatal day 4. Viability, clinical observations, body weights, feed consumption, survival, organ weights and macroscopic and microscopic findings were evaluated in parental rats. Standard reproductive (mating indices, pregnancy rates, male fertility indices, gestation length, number of implantation sites and corpora lutea, pre- and post-implantation loss, pups per litter, live born and stillborn pups and incidence of dams with no viable pups) and developmental indices (pup viability, weight, sex ratio and survival) were evaluated. Exposure-related parental effects included pigment deposition and associated discoloration of the lungs, mediastinal lymph nodes and nasal olfactory epithelium of male and female rats. Pigment deposits were also observed in the nasal turbinates and pharynx of male rats. Hyperplasia of paracortical T lymphocytes (in the mediastinal lymph nodes) and squamous metaplasia of respiratory epithelium (in the larynx) were also observed. All exposed animals showed evidence of pulmonary inflammation and discoloration. Significant dose-related increases in lung weights were observed in males (37%) and females (58%). No effects on reproductive or developmental parameters were reported in this study.
NOAEC (reproductive toxicity) > ~ 0.30 mg/L (highest concentration tested)
LOAEC (maternal toxicity) ~ 0.030 mg/L (based on pulmonary effects and histopathology)
NOAEC (developmental toxicity) > ~ 0.30 mg/L (highest concentration tested)
Genetic Toxicity – Gene Mutation

In vitro
Green petroleum coke (CASRN 64741-79-3)
(1) *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538 were exposed to micronized green petroleum coke (Delayed process) dissolved in dimethylsulfoxide (DMSO) at 123.5, 370.4, 111.1, 333.3 and 10,000 μg/plate in the presence and absence of metabolic activation. No evidence of cytotoxicity was observed; however, precipitation occurred at the highest concentration tested (10,000 μg/plate). Results for positive and negative (solvent) controls were not reported in the robust summary.
Green petroleum coke was not mutagenic in this assay.

(2) *S. typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538 were exposed to micronized green petroleum coke (Fluid process) dissolved in dimethylsulfoxide (DMSO) at 123.5, 370.4, 111.1, 333.3 and 10,000 μg/plate in the presence and absence of metabolic activation. No evidence of cytotoxicity was observed; however, precipitation occurred at the three highest concentrations tested. Heavy bacterial contamination also occurred at the highest concentration (~10,000 μg/plate). Results for positive and negative (solvent) controls were not reported in the robust summary.
Green petroleum coke was not mutagenic in this assay.

(3) L5417Y mouse lymphoma cells were exposed to (Delayed process) green petroleum coke dissolved in DMSO at concentrations up to 2000 μg/plate in the presence and absence of metabolic activation. Positive and negative controls were tested concurrently and responded appropriately. No precipitation or cytotoxicity was observed. Green petroleum coke did not induce forward mutations at the thymidine kinase locus in L5417Y mouse lymphoma cells.
Green petroleum coke was not mutagenic in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vivo

Green petroleum coke (CASRN 64741-79-3)

(1) In the chronic inhalation study described above, cytogenetic evaluations were performed on bone marrow from Sprague-Dawley rats (10/sex/group) after five days, 1, 3 and 6 months, 1 year and 22 months of inhalation exposure to (Delayed process) green petroleum coke dust at 0, 10.2 or 30.7 mg/m^3. Due to high mortality in control and treated groups, only five to eight rats per group were evaluated after 22 months on test. No significant differences in chromosome aberrations were observed in treated rats when compared to controls.
Green petroleum coke did not induce chromosomal aberrations in this assay.

(2) In a 28-day inhalation repeated-dose toxicity study, cytogenetic evaluations were performed on bone marrow from Sprague-Dawley rats (8 males/group) that were exposed to (Delayed process) green petroleum coke (powder) at 0, 10 or 40 µg/L (nominal concentrations) 6 hours/day for 5 (high-dose group) or 20 consecutive days (low-dose group). A mitosis inhibitor (colchicine) was administered 24 hours post-exposure and bone marrow smears were made from the femur. No significant differences in chromosome aberrations were observed in treated versus control animals [TSCATS (OTS00001654)].
Green petroleum coke did not induce chromosomal aberrations in this assay.

Additional Information

Carcinogenicity

Green petroleum coke (CASRN 64741-79-3)

C3H mice (25/sex/group) were exposed to 100 µL green petroleum coke (as a 25% suspension in mineral oil) via topical application to shaved dorsal skin 3 times per week throughout their lifespan (two years). The positive control group was similarly exposed to benzo-a-pyrene via topical application twice per week. The negative control group was shaved, but remained untreated. Histological assessments were conducted on all mice. A wide range of tissues and organs (not specified) were examined. The incidence of acanthosis and hyperkeratosis increased with dermal exposure to green petroleum coke; however, no neoplastic changes were observed at the application site in petroleum coke-exposed animals. Positive controls developed squamous epithelial cell neoplasms at treated sites.
Green petroleum coke was not carcinogenic to mice in this study.

Conclusion: A guideline study is not available for acute inhalation toxicity; however, no mortality occurred following five days of repeated inhalation exposure to CASRN 64741-79-3 (0.058 mg/L) or CASRN 64743-05-1 (0.045 mg/L) in rats. No other data are available for CASRN 64743-05-1. Repeated exposure to CASRN 64741-79-3 dust during a 2-year inhalation toxicity study produced irreversible respiratory effects (chronic pulmonary inflammation and significantly increased absolute/relative lung weights) in rats and primates (both sexes) at all concentrations tested. Histological examination revealed macrophage accumulation (with test article deposits), focal fibrosis, bronchiolization, sclerosis and squamous alveolar metaplasia in rats at concentrations $\geq$ 0.01 mg/L; the NOAEC for systemic toxicity is not established. A combined reproductive/developmental toxicity screening test with CASRN 64741-79-3 dust showed no reproductive or developmental effects following inhalation exposure in rats; however, pulmonary inflammation (macrophage accumulation, lymphocyte hyperplasia and squamous metaplasia of respiratory epithelium) was observed in all exposed parental animals. The NOAEC for maternal toxicity is not established. The NOAEC for reproductive/developmental toxicity is 0.30 mg/L (highest concentration tested). CASRN 64741-79-3 was not mutagenic in bacteria or mammalian cells when tested *in vitro* and did not induce chromosomal aberrations in mice following inhalation exposure *in vivo*. Repeated dermal exposure to CASRN 64741-79-3 (as a 25% suspension in mineral oil) during a 2-year cancer bioassay produced acanthosis and hyperkeratosis in mice; however, no neoplastic changes were observed.

Table 3. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Human Health Data

Endpoints	**Green Petroleum Coke (CASRN 64741-79-3)**	**Calcined Petroleum Coke (CASRN 64743-05-1)**
Acute Inhalation Toxicity **LC_{50} (mg/L)**	**> ~ 0.058**	**> ~ 0. 045**
Repeated-Dose Toxicity **NOAEC/LOAEC** **Inhalation (mg/L/day)**	**NOAEC = Not established** **LOAEC ~ 0.010** (based on chronic pulmonary inflammation and associated histopathology observed in a 2-year inhalation study)	No Data NOAEC = Not established LOAEC ~ 0.010 (RA)
Reproductive/Developmental Toxicity **NOAEC/LOAEC** **Inhalation (mg/L/day)**	**NOAEL = Not established**	No Data
Maternal Toxicity	**LOAEC ~ 0.030**	LOAEC ~ 0.030 (RA)
Reproductive Toxicity	**NOAEC > ~ 0.30**	NOAEC > ~ 0.30 (RA)
Developmental Toxicity	**NOAEC > ~ 0.30**	NOAEC > ~ 0.30 (RA)
Genetic Toxicity – Gene Mutation ***In vitro***	**Negative**	No Data Negative (RA)
Genetic Toxicity – Chromosomal Aberrations ***In vivo***	**Negative**	No Data Negative (RA)
Additional Information **Carcinogenicity**	**Negative**	No Data Negative (RA)

Measured data in bold text; (RA) = Read Across

4. Hazard to the Environment

A summary of aquatic toxicity data submitted for SIDS endpoints is provided in Table 4. The table also indicates where data for tested category members are read-across (RA) to untested members of the category.

EPA suggested that the sponsor conduct a chronic toxicity test in aquatic invertebrates with CASRN 64741-79-3 instead of acute toxicity for fish, aquatic invertebrates and aquatic plants because of a concern that leaching of hydrocarbons and metals from test substances into water may be too slow to result in effects during the acute toxicity period. The sponsor conducted acute toxicity tests using a water accommodated fraction (WAF) of the coke sample, which EPA believes that this approach can resolve the original EPA's concern.

Petroleum coke is sometimes used in a manner that can result in exposure to selected terrestrial species; therefore, the sponsor submitted the terrestrial plants test and earthworm test in addition to the acute toxicity tests for aquatic organisms.

Acute Toxicity to Fish

Green petroleum coke (CASRN 64741-79-3)
Fathead minnows *(Pimephales promelas)* were exposed to CASRN 64741-79-3 as water accommodated fractions (WAFs) under semi-static conditions for 96 hours in the closed system. The loading rates were 0 and 1000 mg/L (limit test). Milled and sieved CASRN 64741 to approximately 2 mm grain was used to prepare the WAF solutions. No mortality occurred and no clinical signs of toxicity were noted. Attempts to measure the constituents of the test substance (i.e. unalkylated polycyclic aromatic hydrocarbons (unalkylated PAHs), metals and sulfur) in aged and fresh WAFs showed that concentrations were below detection limits.
96-h LC_{50} = No effects at saturation.

Acute Toxicity to Aquatic Invertebrates

Green petroleum coke (CASRN 64741-79-3)
Daphnia (*Daphnia magna)* were exposed to CASRN 67471-79-3 as WAFs under semi-static conditions for 48 hours in the closed system. The loading rates were 0 and 1000 mg/L (limit test). Milled and sieved CASRN 64741to approximately 2 mm grain was used to prepare the WAF solutions. No immobility occurred and no clinical signs of toxicity were noted. Attempts to measure the constituents of the test substance (i.e. unalkylated PAHs, metals and sulfur) in aged and fresh WAFs showed that concentrations were below detection limits.
48-h EC_{50} = No effects at saturation.

Toxicity to Aquatic Plants

Green petroleum coke (CASRN 64741-79-3)
Freshwater algae *(Selenastrum capricornutum)* were exposed to CASRN 64741-79-3 as WAFs under static conditions for 96 hours in the closed system. The loading rates were 0 and 1000 mg/L (limit test). Milled and sieved CASRN 64741to approximately 2 mm grain was used to prepare the WAF solutions. Some statistically significant ($p < 0.05$) inhibition of growth (the

area under the growth curve; biomass) and growth rate were observed in the 1000 mg/L WAF at 72 hours (26 and 12%, respectively) and at 96 hours (28 and 7.1%, respectively), although no such effect was observed in prior range finding test. Attempts to measure the constituents of the test substance (i.e. unalkylated PAHs, metals and sulfur) in aged and fresh WAFs showed that concentrations were below detection limits.

96-h EL_{50} (biomass) > 1000 mg/L (WAF nominal loading rate)
96-h EL_{50} (growth rate) > 1000 mg/L (WAF nominal loading rate)

Toxicity to Terrestrial Plants

Green petroleum coke (CASRN 64741-79-3)
Corn (*Zea mays*), radish (*Raphanaus sativus*) and soybean (*Glycine max*) were exposed to soil-incorporated CASRN 64741-79-3 at 0 and 1000 mg/kg (limit test) for 21 days. CASRN 64741-79-3 milled to mean particle size of 3.3 μm was used to prepare soil-incorporated CASRN 64741-79-3. No statistically significant differences in all three species were found for seedling emergence, seedling survival, seedling height, and shoot dry weight between the dosed and control groups. Attempts to measure the constituents of the test substance (i.e. unalkylated PAHs, metals) in soil showed unalkylated PAHs were below detection limits and metals were not greater than soil background levels.

21-d LC_{50} = No effects at saturation.
21-d NOEC = No effects at saturation.

Toxicity to Soil Dwelling Organisms

Green petroleum coke (CASRN 64741-79-3)
Earthworms (*E. fetida*) were exposed to soil-incorporated CASRN 64741-79-3 at 0 and 1000 mg/kg for 14 days. CASRN 64741-79-3 milled to mean particle size of 3.3 μm was used to prepare soil-incorporated CASRN 64741-79-3. No mortality, aversion to the soil or soil burrowing behavior was observed. There were no statistical differences in earthworm body weight or change in body weight when measured at the end of the test. Attempts to measure the constituents of the test substance (i.e. unalkylated PAHs, metals) in soil showed unalkylated PAHs were below detection limits and metals were not greater than soil background levels.

14-d LC_{50} = No effects at saturation.
14-d NOEC = No effects at saturation.

Conclusion: Based on the category member CASRN 64741-79-3, the 96-h LC_{50} for fish and the 48-h EC_{50} for aquatic invertebrates are no effects at saturation. Based on the category member CASRN 64741-79-3, the 96-h EL_{50} for aquatic plants is greater than 1000 mg/L (WAF nominal loading rate). Based on the category member CASRN 64741-79-3, the 21-d terrestrial plants (corn, radish and soybean) NOEC and the 14-d earthworms NOEC are no effects at saturation.

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program - Aquatic Toxicity Data

Endpoints	Green Petroleum Coke (64741-79-3)	Calcined Petroleum Coke (64743-05-1)
Fish **96-h LC_{50} (mg/L)**	**NES**	No Data NES (RA)
Aquatic Invertebrates **48-h EC_{50} (mg/L)**	**NES**	No Data NES (RA)
Aquatic Plants **96-h EL_{50} (mg/L;** **WAF nominal loading rate)** **(growth rate)** **(biomass)**	 **> 1000** **> 1000**	No Data > 1000 > 1000 (RA)

Bold=experimental data (i.e. derived from testing); NES = No effects at saturation (water solubility limit); (RA) = Read Across

5. References

Klonne, D. R., Burns, J.M., Halder C.A., Holdsworth C.E., Ulrich C.E. Two-Year Inhalation Toxicity Study of Petroleum Coke in Rats and Monkeys. *Am. J. Indust. Med.* 11:375-389 (1987).

APPENDIX

The following pages show:

- Table 5 with a list of representative structures
- Table 6 with compositional information on green coke

Table 5. Structural Information on the Petroleum Coke Category		
Sponsored Chemicals		
Chemical Name	**CASRN**	**Structure[1]**
Coke (petroleum)	64741-79-3	A solid material resulting from high temperature treatment of petroleum fractions. It consists of carbonaceous material and contains some hydrocarbons having a high carbon-to-hydrogen ratio.
Coke (petroleum), calcined	64743-05-1	A complex combination of carbonaceous material including extremely high molecular weight hydrocarbons obtained as a solid material from the calcining of petroleum coke at temperatures in excess of 1,000°C (1,832°F). The hydrocarbons present in calcined coke have a very high carbon-to-hydrogen ratio.

[1]Meaningful molecular structures cannot be drawn for these highly carbonaceous, high molecular weight materials.

Table 6. Compositional Data for Green Coke (taken from the Petroleum Coke Category Analysis and Hazard Characterization document: http://www.epa.gov/chemrtk/pubs/summaries/ptrlcoke/c12563rr2.pdf)

	Delayed Process Green Coke - 2003 Sample [1]				API Sample # 4-1-140 [2]	Micronized Delayed Process Green Coke – 1981 sample [3]	
Sample	pellet (initial)[4]	pellet (final)[5]	micro-nized (initial)	micro-nized (final)	Delayed Process Coke	1981 Analysis	1984 Analysis
Bi (bismuth)	<19.3		<29.6				
Ca (calcium)	178	81.7	121.6	158.7			
Cd (cadmium)	<9.6		<14.8				
Co (cobalt)	<9.6	1.9	<14.8	1.7			
Cr (chromium)	<9.6	3.9	<14.8	4.6			
Cu (copper)	<11.6	1.8	<17.8	2.3			
Fe (iron)	310	215.9	247	276.1			
Hg (mercury)					<1	<1	<0.01
K (potassium)	<28.9	10.9	<44.4	20.5			
Li (lithium)	<9.6	<1.2	<14.8	<1.16			
Mg (magnesium)	77.4	50.3	60.9	65.5			
Mn (manganese)	<19.3	5.3	<29.6	7.3			
Mo (molybdenum)	<19.3	16.7	<29.6	16.0			
Na (sodium)	133	87.8	114.6	99.0			
Ni (nickel)	367.1	319.6	351.7	304.6	95	78	85
P (phosphorus)	<19.3	19.8	30.3	25.0			
Pb (lead)	<19.3	4.88	<29.61	7.4			
Pd (palladium)		<6.9		<6.9			
Pt (platinum)		3.8		4.5			
S (sulfur)	73920		58060				
Sb (antimony)	<48.2		<74.0				
Se (selenium)	<19.3		<29.6		4.5	<0.2	<0.5
Si (silicon)	743.2	86.75		204			
Sn (tin)	<28.9	<2.3		<2.3			

Sample	Delayed Process Green Coke - 2003 Sample [1]				API Sample # 4-1-140 [2]	Micronized Delayed Process Green Coke – 1981 sample [3]	
	pellet (initial)[4]	pellet (final)[5]	micro-nized (initial)	micro-nized (final)	Delayed Process Coke	1981 Analysis	1984 Analysis
Average Mass Median Aerodynamic Particle Size, µm	2000*	2000*	2.3/3.3*		≤ 5**	3.1	3.1
Elemental Analysis, % wt							
Carbon					89.93	89.97	89.58
Hydrogen					3.71	5.04	3.89
Oxygen					1.3	1.62	2.14
Sulphur	7.4		5.8		3.36	3.27	3.42
Nitrogen					1.1	1.1	1.2
Other Analysis, % wt							
SiO2					0.04	<0.04	<0.02
Ash					0.21	0.19	0.28
Trace Metals, ppm							
Al (aluminum)	321	205.1	300.2	250.7			
As (arsenic)	<19.3	<2.3	<29.6	<2.3	<0.001	0.3	0.7
B (boron)	<19.3		<29.6				
Ba (barium)	<19.3	7.74	<29.6	6.9			
Be (beryllium)	<9.6		<14.8				

Sample	Delayed Process Green Coke - 2003 Sample [1]				API Sample # 4-1-140 [2]	Micronized Delayed Process Green Coke – 1981 sample [3]	
	pellet (initial)[4]	pellet (final)[6]	micro-nized (initial)	micro-nized (final)	Delayed Process Coke	1981 Analysis	1984 Analysis
Ti (titanium)	12.9	11.7	<14.8	14.4			
V (vanadium)	1938	1559	1805	1580	145	140	130
Zn (zinc)	12.0	8.9	<14.8	11.2			
Benzene Extract, % wt					1.79	2.08	2.64
PAHs, ppm							
Naphthalene	3.6	3.6	11	11			
1-methyl naphthalene	2.7	3.1	10	12			
2-methyl naphthalene	11	12	26	26			
Acenaphthene	ND	0.18	ND	0.51			
Acenaphthylene	ND	0.12	ND	0.5			
Fluorene	0.34	0.37	1.5	1.5	11	ND	ND
Phenanthrene	0.69	0.64	7.8	8.2	ND	ND	ND
Anthracene	ND	0.29	3.3	3.6			
Pyrene	1.3	1.2	8.6	10	ND	165	158
Fluroanthene	ND	0.1	1.4	1.6			
Benzofluorenes					ND	ND	ND
Benzo(a)anthracene	0.58	0.59	7.1	8	544		
Benzp(a,b)anthrcene						280	287
Chrysene	0.88	1.1	9.4	10	126	210	255
Benzo(a)pyrene	1.8	1.7	11	13	440	175	190
Benzo(e)pyrene					110	85	134
Beno(b)fluoranthene	0.52	0.62	3.8	3.9	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	1.5			

Sample	Delayed Process Green Coke - 2003 Sample [1]				API Sample # 4-1-140 [2]	Micronized Delayed Process Green Coke – 1981 sample [3]	
	pellet (initial)[4]	pellet (final)[5]	micro-nized (initial)	micro-nized (final)	Delayed Process Coke	1981 Analysis	1984 Analysis
Perylene					ND		
Methyl benzo(a)pyrene					ND	ND	
Benzo(g,h,i)perylene	1.1	1.4	8.7	12	439	120	167
Dibenzo(a,h)anthracene	0.49	0.51	4.1	4.3	ND	NQ	ND
Benzo(g,h,i)fluoranthene					ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.34	0.45	3.5	3.3			
Dimethylbenz(a)anthracene							ND
Methylbenzo(g,h,i)perylene							377
Coronene					ND	ND	ND

Toxicology study(s) in which samples were used:

[1] OECD 203 Fish acute toxicity test; OECD 202 Invertebrate acute toxicity test; OECD 201 Algal growth inhibition test; OECD 208 Seedling emergence and growth of terrestrial plants; OECD 207 Earthworm acute toxicity test; OECD 421 Reproduction/developmental toxicity screening test

[2] Mouse dermal carcinogenicity study; *Salmonella* assay; mouse lymphoma cell assay

[3] Rat chronic inhalation study; Monkey chronic inhalation study; *Salmonella* assay; Rat *in vivo* cytogenicity assay

[4] initial refers to analyses conducted prior to initiation of the toxicology studies

[5] final refers to analyses conducted following completion of the toxicology studies

ND = not detected

NQ = detected, but not quantifiable

Blank cells = analysis not performed

* values are average mean particle size

** size not measured; value estimated from scanning electron micrographs

References: Aveka, Inc., 2003; CONCAWE, 1993; Chevron Products Company, 2003, 2005; Lancaster Laboratories, Inc., 2003, 2005.

Exhibit 3

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Petroleum Coke: Industry and Environmental Issues

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CRS REPORT
Prepared for Members and
Committees of Congress

Summary

In early 2013, media outlets around Detroit, Michigan began publishing stories about large piles of petroleum coke stored along the Detroit Riverfront. Petroleum coke (petcoke) is a black-colored solid composed primarily of carbon, and may contain limited amounts of elemental forms of sulfur, metals and non-volatile inorganic compounds. Petcoke is essentially chemically inert. Petcoke exposure is considered to pose few human health or environmental risks, but may present significant nuisance concerns. The material in Detroit was the byproduct of the nearby Marathon Refinery's processing of heavy crude oils derived, in part, from Canadian oil sands deposits. The situation gained national attention with the publication of an article in the *New York Times* ("A Black Mound of Canadian Oil Waste Is Rising over Detroit," *New York Times*, May 17, 2013). The piles of petcoke sparked local concerns over the potential impacts of the material on human health and the environment, and whether these concerns were adequately addressed by local, state, and federal regulations. As petroleum refining is a nationwide commercial industry, these concerns may arise in other regions.

Petcoke is a co-product of several distillation processes used in refining heavy crude oil. Nearly half of U.S. petroleum refineries (56 or more) use a coking process to convert heavy crude oils into refined petroleum products, and more refineries may follow suit to take advantage of the supply of heavy crude oils from Canada's oil sands projects. Although it is a refining co-product, petcoke has economic value as both a heating fuel and raw material in manufacturing. In 2012, the U.S. Energy Information Administration reported that U.S. refineries produced in excess of 56 million metric tons of petcoke, of which 80% was exported.

The U.S. Environmental Protection Agency has surveyed the potential human health and environmental impacts of petcoke through its High Production Volume (HPV) Challenge Program and found the material to be highly stable and non-reactive at ambient environmental conditions. Most toxicity analyses of petcoke find it has a low potential to cause adverse effects on aquatic or terrestrial environments as well as a low health hazard potential in humans, with no observed carcinogenic, reproductive, or developmental effects. Cases of repeated-dose and chronic inhalation of fugitive dust (as generated during petcoke handling and storage) in animal studies do appear associated with respiratory inflammation. Emissions from the combustion of petcoke, however, can have impacts on human health and the environment, including the release of common pollutants, hazardous substances, and high levels of the greenhouse gas, carbon dioxide.

While some federal statutes address certain environmental impacts of petcoke's life-cycle, most regulatory action and oversight has been undertaken at the state and local levels, generally through facility-specific permitting requirements. Federally, petcoke is exempted from classification as either a solid or hazardous waste under the Resource Conservation and Recovery Act (RCRA) and is not considered a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Petcoke facilities may be regulated under certain provisions of the National Pollutant Discharge Elimination System (NPDES) permit program, as authorized by the Clean Water Act (CWA), if it is determined that runoff from sites where it is stored has the potential to transport the substance to nearby surface waters. The handling of petcoke may also create instances of reduced air quality due to releases of fugitive dust into the atmosphere. Most of the impacts of fugitive dust are localized; and thus, much of the regulatory oversight is implemented at the local and state level. Whether such oversight is providing adequate protection is among the issues that have been raised.

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Background

Some Members of Congress have expressed concern about storage and management of petroleum coke (petcoke) in their districts. Despite a lack of data on observed health impacts, local concerns have included potential human health and environmental impacts of fugitive dusts and runoff into waterways. Broader concerns have also been raised about the carbon dioxide (greenhouse gas) emissions from petcoke combustion.

Petcoke is the co-product of several processes used in petroleum refining to upgrade "residuum" into gasoline and middle distillate-range fuels. Residuum (or resid) remains after refineries initially distill heavy crude oils. Petcoke is a black-colored solid composed primarily of carbon, and may contain limited amounts of elemental forms of sulfur, metals, and non-volatile inorganic compounds.

The petroleum industry and federal regulators characterize petcoke as a "co-product" because it may have some commercial value as a boiler fuel and as a raw material in manufacturing. Nearly half of U.S. petroleum refineries employ "coking" processes. Refineries also produce petcoke as a by-product of catalysis, which refineries later consume as a fuel.

In addition to the existing suite of coking refineries, other refineries may add coking processes to take advantage of increased supplies of heavy crude oils from Canada's oil sand projects. Meanwhile, newly available light crude oil from U.S. unconventional shale projects and the Texas Permian Basin is leading some coking refineries to cut back on coking. At present, it is uncertain whether petcoke production will increase, remain steady or even decline, given the changing slate of U.S. crude oil supplies. Nevertheless, the export and demand for U.S. petcoke has been rising recently.

Community stakeholders have grown concerned over the potential effects on public health and the environment related to the production, storage, transportation, and use of petcoke. Some of these impacts include concerns over air quality due to fugitive dust, water quality due to run-off, and the potential for toxic and other emissions (including greenhouse gas emissions) from its combustion as a fuel source. In light of these concerns, industry, regulators, and compliance officers may be interested in best practices related to the storing, containing, and managing of petcoke.

Petcoke Uses

Petcoke may be combusted as fuel in industrial and power generating plants. Cement plants and power plants are currently the two greatest consumers of petcoke. There is some limited use as space heating and in commercial brick kilns in Europe, and a small but emerging market as a metallurgical coal blending component for the steel industry. In the United States, the high sulfur content may limit the petcoke in a coal/petcoke blend in a plant designed for coal. However, more recently designed Circulating Fluidized Bed (CFB) boilers can accommodate 100% high sulfur coke.[1]

[1] Pet Coke Consulting LLC, http://www.petcokeconsulting.com/primer/index.html.

Fuel grade petcoke can substitute for "steam coal" in power plant boilers, having the advantage of a higher heating value (discussed below). Conventional coal-fired boilers can blend petcoke with steam coal, and newer boiler designs have replaced steam coal with petcoke entirely.[2] Cement plants consume fuel-grade petcoke in rotary kilns.

Anode grade calcined petcoke is the principal raw material used in manufacturing carbon anodes for use in aluminum smelting. The anodes act as conductors of electricity and as a source of carbon in the electrolytic cell that reduces alumina into aluminum metal. Carbon anode manufacturers, predominantly captive operations of aluminum smelting companies, purchase anode grade calcined petcoke, mix it with pitch binders, press the mixture into blocks, and then bake the mixture to form a finished, hardened carbon anode.

Petcoke Composition

Petcoke is composed primarily of carbon. The specific chemical composition of petcoke depends on the composition of the petroleum feedstock used in refining. Petcoke impurities (i.e., the non-elemental carbonaceous substances) include some residual hydrocarbons left over from processing (referred to as volatiles), as well as elemental forms of nitrogen, sulfur, nickel, vanadium, and other heavy metals. These impurities exist as a hardened residuum captured within coke's carbon matrix. **Table 1** provides an observed range of petcoke properties for green and calcined petcoke.

Table 1. Petcoke Elemental Composition

By Weight Percent

Composition	Green	Calcined
Carbon	89.58–91.80	98.40
Hydrogen	3.71–5.04	0.14
Oxygen	1.30–2.14	0.02
Nitrogen	0.95–1.20	0.22
Sulfur	1.29–3.42	1.20
Ash (including heavy metals such as nickel and vanadium)	0.19–0.35	0.35
Carbon-Hydrogen Ratio	18:1–24:1	910:1

Source: U.S. Environmental Protection Agency, Screening-Level Hazard Characterization, Petroleum Coke Category, June 2011; and H.W. Nelson, *Petroleum Coke Handling Problems*, 1970.

Notes: The process of "calcining" converts green coke to almost pure carbon, with a defined structure to produce carbon anodes for the aluminum industry.

[2] Thermal coal is sometimes called "steam coal" because it is used to fire boiler plants that produce steam for electricity generation and industrial uses.

Petcoke Compared to Metallurgical Coke and Coal

Petcoke has a significantly high heating value compared to metallurgical coke (metcoke) and bituminous coals (see **Table 2**). The higher heating value comes at the cost of higher sulfur and nitrogen content, however. Ash content is relatively low, compared to coal, but much of it is in the form of heavy metals. Due to the severe thermal environment in which petcoke forms, there is very little combustible volatile material. The low volatile content, in comparison to coal and other fossil fuels, makes petcoke more difficult to ignite and sustain combustion.[3]

Bituminous coal includes two subtypes: thermal and metallurgical.[4] Metallurgical coke is made from low ash, low sulfur bituminous coal, with special coking properties. To produce metcoke, special coke ovens heat metallurgical grade coal at temperatures of 1,000°F to 2,000°F to fuse fixed carbon and inherent ash, and drive off most of the volatile matter.[5] Approximately 1.5 tons of metallurgical coal will produce one ton of metcoke. The final product is a nearly pure carbon source with sizes ranging from basketballs (foundry coke) to a fine powder (coke breeze).

Table 2. Petcoke vs. Metcoke and Coal

Heating Value and Price

Fuel	Coal Rank	Btu / lb.	$/Short Ton
Petcoke	n.a.	14,200	See Note
Metcoke	Metallurgic	12,600	171.51
Steam Coal			
Pittsburgh #8	Bituminous	13,000	68.25
Illinois #6	Bituminous	11,000	45.40
Powder River Basin	Sub-bituminous	8,800	10.30

Source: MIT, The Future of Coal Appendices, P5, http://web.mit.edu/coal/The_Future_of_Coal_Appendices.pdf, and EIA, Coal News and markets, http://www.eia.gov/coal/news_markets/.

Notes: Steam Coal Prices as of July 19, 2013. Petcoke prices track steam coal prices, but at a discount that may range from 15% to 85%. Recent prices have been closer to 67% of steam coal prices.

Petcoke Grades

The coking processes described above produce "green coke," which then requires additional thermal processing to remove any residual hydrocarbons (volatile matter) to increase the percentage of elemental carbon. Thermal processing lowers the potential toxicity of the coke. Depending on the coking operation temperatures, length of coking-time, and quality of the crude oil feedstock, one of several grades of petcoke can be produced:

[3] Anthony Pavone, "Converting Petroleum Coke to Electricity," Proceedings from the 14th National Industrial Energy Technology Conference, Houston, TX, April 22-23, 1992, http://repository.tamu.edu/bitstream/handle/1969.1/92212/ESL-IE-92-04-47.pdf.

[4] Bituminous coals are mined throughout the eastern United States range but generally have higher sulfur and nitrogen contents than western coals.

[5] Oxbow, *Metallurgical Coke*, http://www.oxbow.com/Products_Industrial_Materials_Metallurgical_Coke.html. Also see Grande Cache Coal, *Met Coke 101*, http://www.gccoal.com/about-us/met-coal-101.html.

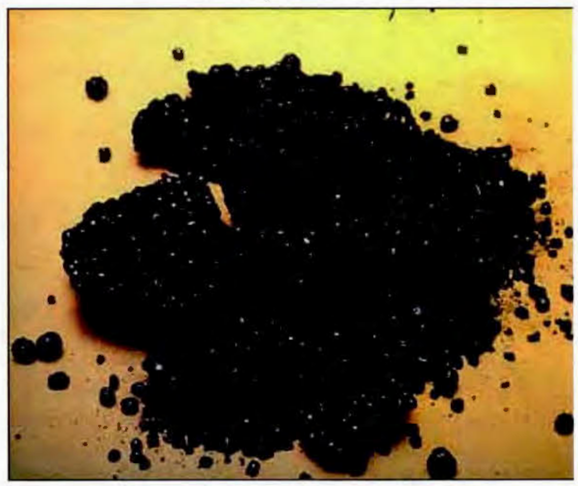
- *sponge coke*, the most common type of regular-grade petcoke, used as a solid fuel (see **Figure 1**);
- *needle coke,* a premium-grade coke made from special petroleum feedstock, used in the manufacture of high-quality graphite electrodes for the steel industry;
- *shot coke,* produced from heavy petroleum feedstock, used as fuel, but less desirable than sponge coke (see **Figure 2**);
- *purge coke*, produced by flexi-coking, used as a fuel in coke-burning boilers; or
- *catalyst coke,* carbon deposited on catalysts, used in various refining processes and burned off and used as a fuel in the refining process; not recoverable in a concentrated form.

Figure 1. Sponge Coke

Source: John D. Elliott, Shot Coke: Design & Operations, http://www.fwc.com/publications/tech_papers/oil_gas/shotcoke.pdf.

Figure 2. Shot Coke

Partially Crushed



Source: John D. Elliott, Shot Coke: Design & Operations, http://www.fwc.com/publications/tech_papers/oil_gas/shotcoke.pdf.

Coking Refineries and Outputs

The fleet of petroleum refineries operating throughout the United States has steadily declined in the past several decades as refining capacity has become concentrated in larger refineries. At present, some 115 refineries (and refinery complexes) produce over 17 million barrels per day of motor fuels and other petroleum products. Nearly half (56) have the coking capacity to convert heavy crude oils[6] (see the **Appendix** to this report).

[6] For further background on the refining industry, see CRS Report R41478, *The U.S. Oil Refining Industry: Background in Changing Markets and Fuel Policies*, by Anthony Andrews et al.

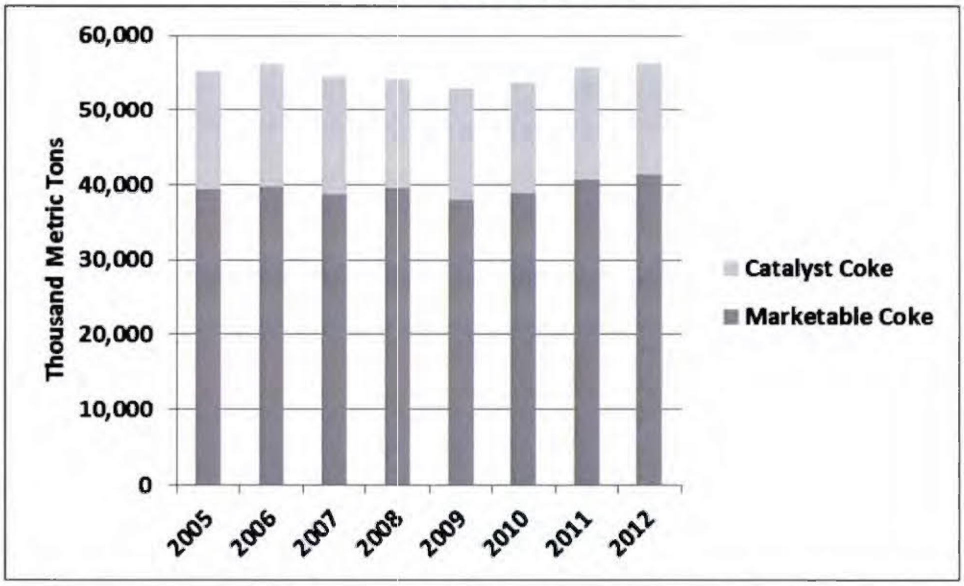
Coking capacity has been concentrated in refineries operating along the Gulf Coast, the historic refining center of the United States and primary destination for crude oil imports. However, to take advantage of the increasing supply of heavier crude oils from Canada's oil sands projects, several Midwest refineries have added coking conversion capacity.

U.S. refineries have the capacity to process 2.5 million barrels per day of petroleum resid. The Gulf Coast not only represents the greatest refining capacity (9.3 million barrels per day), it also represents also the greatest coking capacity (1.5 million barrels per day).

U.S. petcoke production has remained constant over the last decade for the reason that refining capacity has remained constant (see **Figure 3**). In 2012, the U.S. Energy Information Administration (EIA) reported that U.S. refineries produced 42 million metric tons of marketable petcoke and another 15 million metric tons of catalyst coke.[7] For the purpose of comparison, the United States produced 9.3 million tons of coke from metallurgical grade coal[8] and more than 1.2 billion tons of coal in 2012.[9]

Figure 3. U.S. Refinery Net Petcoke Production

Thousand Metric Tons per Year



Source: U.S. Energy Information Administration, U.S. Refinery Net Production, http://www.eia.gov/dnav/pet/pet_pnp_refp2_dc_nus_mbbl_a.htm.

Notes: Catalysts used in various refining processes (e.g., catalytic cracking) become deactivated from the buildup of carbon deposits, In order to reactivate the catalysts; the carbon is burned off and used as a fuel by the refinery. The carbon coke is not recoverable in a concentrated form.

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[7] The U.S. Energy Information Administration reported that U.S. refinery net production of petroleum coke in 2012 was 310,481 thousand barrels (U.S. Refinery Net Production, http://www.eia.gov/dnav/pet/pet_pnp_refp2_dc_nus_mbbl_a.htm). 1 metric ton is the equivalent of 5.51 barrels.

[8] American Iron and Steel Institute, *Annual Statistical Report*, 2012, p.80. Production and Consumption of Coke.

[9] U.S. Energy Information Administration, *Monthly Energy Review*, Coal, June 2013, http://www.eia.gov/totalenergy/data/monthly/index.cfm#coal.

Overall, petcoke production reflects refinery capacity utilization rate, which represents the use of the refinery atmospheric crude oil distillation units. The rate is calculated by dividing the gross input to these units by the operable refining capacity of the units. The utilization rate has averaged from 82% to 88%.[10] U.S. refineries have been producing approximately 40 million metric tons of marketable petcoke annually over the period of 2007 through 2012. Refineries, however, need enough light-heavy price spread (LHS) between coker feedstock (heavy resid) and light products (gasoline, jet, and diesel) to run their coking units profitably. With the rising availability of U.S. produced light-sweet crude oil, however, some refineries may choose to cut back on coking, and thus produce less coke. These and other variables lend uncertainty to whether petcoke production will increase, remain steady or decline in the coming years.

Petcoke Storage Terminals

Refineries temporarily stockpile petcoke on their facilities, but because they generally lack sufficient storage space must transport it regularly to avoid production slowdowns. Typically, coker drums are mounted over railroad tracks so that coke can be discharged directly into open hopper or gondola cars. The rail cars then transport the petcoke to calcining plants or to temporary storage terminals.

A complete accounting of independent terminals that store petcoke exceeds the scope of this report. However, a CRS survey identified at least four companies with petroleum coke as a primary business line: SSM Petroleum Coke LLC, TCP Petroleum coke Corp, DTE Petroleum Coke, LLC, and Kinder Morgan Petroleum Coke Gp LC.[11] SSM Petroleum Coke is an affiliate of Oxbow Carbon LLC (Koch Industries, Inc.). Koch Carbon, LLC specialize in the global sourcing, supply, handling, and transportation of bulk commodities including, but not limited to, petcoke. TCP Petroleum Coke Corporation is a joint venture between CITGO Petroleum Corporation (CITGO) and RWE Power AG, offering a diversified marketing network to over 30 countries. DTE Petroleum Coke is a subsidiary of DTE Energy, a diversified energy company that includes electric/gas utilities. DTE Energy has reportedly removed the petcoke it stored at its Detroit Bulk Storage site along the Detroit River.[12] Kinder Morgan Petroleum Coke L.P. advertises that it is responsible for handling over 10 million tons of petcoke through several terminals located on the Texas Gulf Coast.

Petcoke Market and Exports

Petcoke competes with both coal and metcoke in the international market. Its comparatively higher heating values makes it an economic substitute for steam coal. However, its granular physical properties may add to the cost of material handling, which is reflected in a discounted price compared with coal in the United States. Petcoke prices track coal prices but at discounts in the range of 15% to 85%.[13] Recently U.S. petcoke price have ranged from 67% to 68% of coal prices.

[10] U.S. Energy Information Administration, Refinery Utilization and Capacity, http://www.eia.gov/dnav/pet/pet_pnp_unc_dcu_nus_a.htm.

[11] A search through http://www.Manta.com produced six U.S. companies matching "petroleum coke."

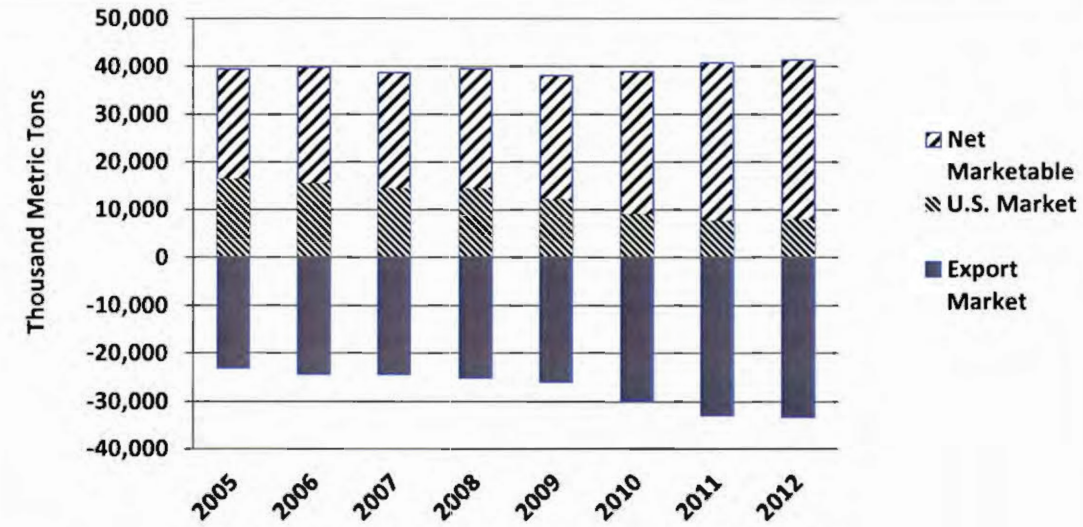
[12] "Pet Coke Piles Along Detroit River Clear Away," *CBS Detroit*, August 27, 2013, http://detroit.cbslocal.com/2013/08/27/pet-coke-piles-along-detriot-river-cleared-away/.

[13] Personal communication with Mike Stewart, Jacobs Consultancy/Petroleum Coke Quarterly.

U.S. petcoke exports have steadily increased over the last decade, as the U.S. market has given way to increased demand overseas (see **Figure 4**). In 2012, 80% of marketable (i.e., non-catalyst) petcoke was exported. The largest recipients of U.S. petcoke exports in 2012 were China (14%), followed by Japan (11%), Mexico (9%), and Turkey (7%). China's demand has steadily increased during the last decade.

Figure 4. Net Petcoke Production vs. Exports

Thousand Metric Tons per Year



	2005	2006	2007	2008	2009	2010	2011	2012
Net Marketable	39,474	39,818	38,694	39,529	38,105	38,895	40,749	41,376
U.S. Market	16,458	15,577	14,450	14,461	12,185	9,155	7,677	7,952
Export Market	-23,016	-24,241	-24,244	-25,068	-25,920	-29,740	-33,071	-33,424

Source: U.S. Energy Information Administration, U.S. Refinery Net Production, http://www.eia.gov/dnav/pet/pet_pnp_refp2_dc_nus_mbbl_a.htm, and Petroleum Coke Exports by Destination, http://www.eia.gov/dnav/pet/pet_move_expc_a_eppc_eex_mbbl_a.htm.

Potential Health and Environmental Impacts

The recent increase in coking capacity in the United States has raised concerns over the potential impacts of petcoke on both human health and the environment. Local concerns include air quality hazards, water quality hazards, and potential exposure to toxic substances. These impacts may arise during various stages of petcoke's life-cycle, including its production, handling, storage, transportation, combustion, and use. Broader concerns have been raised about the greenhouse gas (i.e., carbon dioxide) emissions from petcoke combustion. The focus of this report, however, is on the impacts of handling and storage, not on end-use combustion.

EPA's Hazard and Toxicity Characterizations

In recent years, the U.S. Environmental Protection Agency (EPA) has surveyed the potential human health and environmental impacts of petcoke through its High Production Volume (HPV) Challenge Program. The HPV Challenge Program, initiated jointly by EPA, Environmental Defense Fund (EDF), American Petroleum Institute (API), and American Chemistry Council (ACC), was instituted for several purposes, including

1. to collect health and environmental effects data on industrial chemicals produced in the United States in high volumes,
2. to provide the public with basic hazard information that would allow for active participation in environmental decision-making at all levels—local, state, and federal, and
3. to provide EPA with valuable hazard and toxicity information to support its mission of protecting human health and welfare.

Companies have sponsored research into more than 2,200 HPV chemicals, with approximately 1,400 administered directly through the HPV Challenge Program and the remainder administered indirectly through international efforts.[14] API sponsored a testing group for the petcoke category,[15] which produced an analysis in December 2007.[16] This analysis was supplemented by EPA, after stakeholder comments, and published in June 2011.[17]

The findings from EPA's hazard characterization of petcoke are summarized in the following sections.

Environmental Fate

Most chemical analyses of petcoke, as referenced by EPA, find it to be highly stable and non-reactive at ambient environmental conditions.

Due to the extreme conditions under which petcoke is produced, qualities such as melting point, boiling point, vapor pressure, and water solubility exist well outside the range of ambient conditions. If released to the environment, petcoke would not be expected to undergo many of the environmental fate pathways which could lead to environmental risks. Depending on the particle size and density of the material, terrestrial releases of petcoke become incorporated into the soil or transported via wind or surface water flow. If released to the aquatic environment, petcoke incorporates into sediment or floats on the surface, depending on the particle size and density in relation to water. Chemically, petcoke is essentially inert. That is, petcoke does not vaporize into the atmosphere, does not react chemically in the presence of water, and does not react chemically

[14] U.S. Environmental Protection Agency's High Production Volume (HPV) Challenge Program, http://www.epa.gov/chemrtk/index.htm.

[15] U.S. Environmental Protection Agency, *Robust Summaries & Test Plans: Petroleum Coke*, http://www.epa.gov/chemrtk/pubs/summaries/ptrlcoke/c12563tc.htm.

[16] The American Petroleum Institute Petroleum HPV Testing Group, Petroleum Coke Category Analysis and Hazard Characterization, submitted to EPA December 28, 2007, http://www.epa.gov/hpv/pubs/summaries/ptrlcoke/c12563rr2.pdf.

[17] U.S. Environmental Protection Agency, Screening-Level Hazard Characterization, Petroleum Coke Category, June 2011, http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Petroleum%20Coke_June_2011.pdf.

in the presence of light. Furthermore, it is not biodegradable, nor does it bio-accumulate substances—such as toxic chemicals—into its structure.[18]

Environmental Toxicity

Most eco-toxicity analyses of petcoke, as referenced by EPA, find it has a low potential to cause adverse effect on aquatic or terrestrial environments.

The environmental effects of petcoke have been tested along various pathways for exposure in the environment, including both aquatic and terrestrial endpoints in plants and animals. Aquatic and terrestrial toxicity tests have been performed to assess the hazard of petcoke releases to representative aquatic organisms and terrestrial soil-dwelling invertebrates and plants. In these studies, petcoke was found to be non-toxic to terrestrial plants and animals, non-toxic to aquatic animals (both vertebrates and invertebrates), and showed only slight effects on aquatic plants at the exposure levels tested (i.e., studies found slight growth inhibition in freshwater algae).[19] (The exposure levels and durations were conducted in accordance with EPA and Organization for Economic Co-operation and Development (OECD) recommendations, although, presumably, these tests could be re-administered at higher dosages or intervals to assess the effects of greater concentrations.)

Human Health Effects

Most toxicity analyses of petcoke, as referenced by EPA, find it has a low health hazard potential in humans, with no observed carcinogenic, reproductive, or developmental effects. Only animal cases studies of repeated-dose and chronic inhalation have shown respiratory inflammation attributed to the non-specific effects of dust particles rather than the specific effects of petcoke.

Inhalation of and skin contact with petcoke were assessed to be the most likely exposure routes to humans. Most repeated-dose inhalation exposure studies (on rats and primates) found cases of irreversible respiratory effects and significantly increased lung weights. These effects were considered to be non-specific responses of the respiratory tract to high concentrations of dust particles rather than compound specific-induced effects. Petcoke was not found to be carcinogenic via inhalation. No excess skin or visceral cancers were observed in a lifetime skin painting study. Petcoke was not found to produce genetic mutations in bacteria and mammalian cells in standard in vitro toxicity tests or to produce chromosome aberrations of bone marrow in

[18] Petcoke's volatilization is negligible, its rate of hydrolysis is negligible, and its rate of atmospheric photo-oxidation is negligible. Neither biodegradation nor bioaccumulation is applicable.

[19] Environmental toxicity studies referenced by the EPA analysis include Wildlife International, Ltd., *Petroleum Coke: A 96-Hour Static-Renewal Acute Toxicity Test with the Fathead Minnow (Pimephales promelas), Final Report,* Project No. 472A-1134, 2006; Wildlife International, Ltd., *Petroleum Coke: A 48-Hour Static-Renewal Acute Immobilisation Test with the Cladocern (Daphnia magna), Final Report,* Project No. 472A-112, 2006; Wildlife International, Ltd., *Petroleum Coke: A 96-Hour Toxicity Test with the Freshwater Alga (Selenastrum capricornutum), Final Report,* Project No. 472A-114, 2006; Wildlife International, Ltd., *Petroleum Coke: A 21-Day Toxicity Test to Determine the Effects of the Test Substance on Seedling Emergence and Growth of Terrestrial Plants, Final Report,* Project No. 472-102, 2006; Wildlife International, Ltd., *Petroleum Coke: A 14-Day Acute Toxicity Test with the Earthworm (Eisenia fetida), Final Report,* Project No. 472-101, 2006.

standard in vivo toxicity tests. Petcoke was not found to produce any reproductive or developmental effects following repeated inhalation or exposure to the skin.[20]

Reactivity

Petcoke is generally stable under normal conditions; however, the substance has the potential to become flammable or explosive. Emissions from the combustion—either accidentally or purposefully—of petcoke can have impacts on human health and the environment, including the release of common pollutants, hazardous substances, and greenhouse gases.

When petcoke is combusted, common pollutants and hazardous decomposition products may be produced such as carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides, particulate matter, and heavy metals, depending upon the chemical composition of the feedstock (see **Table 1** for the chemical composition of petcoke). These releases may take place unintentionally, through the natural or unintended combustion of surface or air-borne dust particles, or intentionally, through the combustion of petcoke for electrical power generation or other like purposes.

Petcoke's use as a fuel is criticized because it commonly has higher greenhouse gas emissions relative to the amount of heat it generates when burned. **Table 3** presents potential carbon dioxide (CO_2) emissions for petcoke in comparison to metallurgical coke and several grades of steam coal. When petcoke or coal combust, CO_2 forms from one carbon atom (C) uniting with two oxygen atoms (O).[21] Assuming complete combustion, 1 pound of carbon combines with 2.667 pounds of oxygen to produce 3.667 pounds of carbon dioxide. Petcoke with a carbon content of 90% and a heating value of 14,200 Btu per pound emits about 232 pounds of carbon dioxide per million Btu when completely burned.[22] Comparatively, Powder River Basin coal with a carbon content of 48% and a heating value of 8,800 Btu per pound emits about 202 pounds of carbon dioxide per million Btu when completely burned, or 15% less than petcoke. Because coal has high hydrogen-to-carbon ratio compared to petcoke, part of its energy content comes from the combustion of hydrogen that is emitted as water vapor instead of carbon dioxide.

[20] Toxicity studies referenced by the EPA analysis include Huntingdon Life Sciences, Study No. 03-4246, "Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures," 2006; Klonne, D. R., Burns, J. M., Halder, C. A., Holdsworth, C. E. and Ulrich, C. E., "Two Year Inhalation Study of Petroleum Coke in Rats and Monkeys." *American Journal of Industrial Medicine*, 11:375-389, 1987; and IRDC (International Research & Development Corporation), "Chronic Inhalation Toxicity Study of Petroleum Coke (Delayed Process) in Rats and Monkeys," API Publication number 32-30234, 1985.

[21] B. D. Hong and E. R. Slatick, *Carbon Dioxide Emission Factors for Coal*, U.S. Energy Information Administration, http://www.eia.gov/coal/production/quarterly/co2_article/co2.html.

[22] Potential carbon dioxide emissions can be calculated by use of the following formula: percent carbon ÷ Btu per pound x 36,670 = pounds (lbs.) of carbon dioxide per million Btu.

Table 3. Petcoke vs. Coal: Combustion Emissions

Fuel	Coal Rank	Sulfur %wt.	Btu / lb.	Carbon %wt.	CO_2 lbs./ Million Btu
Petcoke	n.a.	1.5–6.0	14,200	89–92	232
Metcoke	Metallurgic	0.4–0.7	12,600	91–92	266
Steam Coal					
Pittsburgh #8	Bituminous	3.0	13,000	73–74	207
Illinois #6	Bituminous	3.9	11,000	60–61	201
Powder River Basin	Sub-bituminous	0.5	8,800	48–49	202

Source: MIT, The Future of Coal Appendices, p. P5.

Notes: Potential carbon dioxide emissions calculated by percent carbon ÷ Btu per pound x 36,670 = pounds (lbs.) of carbon dioxide per million Btu.

Federal Regulatory Requirements

Various aspects of the production, handling, storage, transportation, combustion, and use of petcoke have been addressed at local, state, and federal levels to protect human health and the environment. While some federal statutes address certain environmental impacts of petcoke's life-cycle, most regulatory action and oversight has been undertaken at the state and local levels, generally through facility-specific permitting requirements. With few exceptions, petcoke is not specifically regulated by local, state, or federal codes.[23] Rather, it is petcoke's potential contribution to more general hazards (e.g., air and water quality impacts such as haze, fugitive dust, and stormwater runoff) that is monitored and controlled through various permitting and reporting requirements at the state and local levels. This report focuses on the federal response to petcoke and on the rules that may be implemented during the handling, storage, and transportation phases of petcoke's life-cycle. States may also have their own laws or regulations related to the handling, storage, and transportation of petcoke, specifically, or high-production-volume industrial substances like petcoke, more generally; a full review of state and local code is beyond the scope of this report.

Regulatory agencies at all levels of government commonly aim to manage the human health and environmental impacts of industrial materials (e.g., petcoke) based upon thorough assessments of their hazardous exposure pathways. Because of its relative inertness, exposure to petcoke is considered to pose few human health and environmental risks. Thus, federal law generally exempts petcoke from classification as either a solid or hazardous waste. Despite these exemptions, petcoke may nevertheless present significant nuisance concerns. A "nuisance" is the unreasonable, unwarranted and/or unlawful use of property, which causes inconvenience or damage to others, either to individuals or to the general public.[24] A nuisance may not violate any

[23] In a survey of state statutes, conducted by the U.S. Library of Congress's Law Library for this report on August 9, 2013, California was found to be the only state which has passed laws to directly manage the environmental impacts from the handling, storage, and transportation of petcoke. California State Code on petcoke included California Code–HSC Section 40459 (requirements for enclosing piles of petcoke when storing the substance prior to shipment), http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=40001-41000&file=40440-40459, and California Code–VEH Section 23114 (requirements for the transportation of petcoke by vehicle), http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=23001-24000&file=23100-23135.

[24] A nuisance may be either a private nuisance or a public nuisance. An activity constitutes a *private* nuisance if it is a (continued...)

regulatory standard or cause demonstrable environmental or health impacts; however, if a nuisance interferes with a person's use of his or her property, it may be the basis for a lawsuit for damages or an injunction. For example, fugitive dust from petcoke storage piles can be deposited on and in nearby waterways, outdoor areas, or residents' homes, leaving a black- or grey-colored residue. This deposition may result in undesirable and unsightly conditions, interfering with residents' comfort and use of their property. Similarly, dust from coke piles can challenge the operations of commercial or industrial facilities, such as pharmaceutical research and production plants, electronics assembly, or fuel cell membrane manufacturing. Dust from nearby coke piles can increase filtration costs or threaten the integrity of strict quality control standards required for such high technology operations.

In light of these issues, the monitoring and management of petcoke at the federal level is summarized in the following sections.

Waste Classifications

Federal law generally exempts petcoke from classification as either a solid or hazardous waste.

The exemption for petcoke from classification as either a solid or hazardous waste stems from the scope of the statutory term "solid waste" as decided in *American Mining Congress v. U.S. EPA.*[25] In that decision, the court held that materials recycled and reused in an ongoing manufacturing or industrial process were not considered to be "discarded," and hence, not considered to be "solid wastes." Furthermore, in 1998, EPA identified a list of petroleum refining wastes that would be subject to federal regulations applicable to the management of hazardous waste established under the Resource Conservation and Recovery Act (RCRA).[26] In this rulemaking, EPA stated that petcoke is not a refining waste, but rather a "co-product" of the refining process.[27] In separate rulemaking, EPA included petcoke among other fuels in its definition of "traditional fuels" (at 40

(...continued)

substantial and unreasonable invasion of another's interest in the private use and enjoyment of land, without involving trespass. Private nuisance actions are brought by the aggrieved landowner. An activity is a *public* nuisance if it creates an "unreasonable" interference with a right common to the general public. Unreasonableness may rest on the activity significantly interfering with, among other things, public health and safety. Public nuisance cases are usually brought by the government rather than private entities, but may be brought by the latter if they suffer special injury.

[25] *American Mining Congress v. U.S. EPA*, 824 F.2nd 1177 (D.C. Cir. 1987). The court held that the EPA exceeded its authority by amending its definition of "solid waste" under the Resource Conservation and Recovery Act (RCRA) to include secondary materials destined for reuse within an industry's ongoing production process. The court held that EPA's interpretation is contrary to RCRA's plain language (§ 1004(5) defines solid waste to include "discarded material"), and that EPA's inclusion of materials retained for immediate use as discarded material strains the everyday usage of that term.

[26] 42 U.S.C. 6901 et seq. For further discussion of the authorities of RCRA, see CRS Report RL30798, *Environmental Laws: Summaries of Major Statutes Administered by the Environmental Protection Agency*, coordinated by David M. Bearden.

[27] See U.S. Environmental Protection Agency, Final Rule, "Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Petroleum Refining Process Wastes; Land Disposal Restrictions for Newly Identified Wastes; and CERCLA Hazardous Substance Designation and Reportable Quantities," August 6, 1998, 63 *Federal Register* 42110. "The coke product itself may best be characterized as a co-product of the coking operation, while the principal products are the light ends that are returned to the refining process. Thus, the Agency is affirming that the conventional coking operation is a production process, resids are normal feedstocks to this process and petroleum coke is a legitimate fuel product." Id, at page 42121.

C.F.R. 241.2). As a result of these determinations, unless or until it is discarded, petcoke would not be subject to federal waste management requirements established under RCRA.

Petcoke would not be subject to the federal cleanup authorities of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, often referred to as Superfund)[28] because of the exclusion of petroleum from the statute. The response authorities of CERCLA specifically apply to the release of hazardous substances, pollutants, or contaminants into the environment. Hazardous substances under CERCLA are broader than hazardous wastes under RCRA and include hundreds of toxic chemicals. However, CERCLA defines a hazardous substance, pollutant, or contaminant to exclude "petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance."[29] EPA's interpretation has been that hazardous substances present in petroleum that are naturally occurring or are normally added during the refining process are fractions of the petroleum that would fall within the scope of the exclusion from CERCLA. EPA's position has been that CERCLA may be applied to the cleanup of wastes containing petroleum, if the wastes contain hazardous substances that are not part of the petroleum product itself.[30] Hazardous substances that may leach from a petroleum product into the environment, and therefore no longer be part of the petroleum product, may raise other issues.

Industrial Stormwater Runoff

The handling and storage of petcoke may be regulated under certain provisions of the National Pollutant Discharge Elimination System (NPDES) permit program,[31] as authorized by the Clean Water Act (CWA),[32] if it is determined that runoff from storage sites due to rain or snowmelt has the potential to transport the substance to nearby surface waters.

Activities that take place at industrial facilities, such as material handling and storage, are often exposed to the weather. As runoff from rain or snowmelt comes into contact with these activities, it can pick up pollutants and transport them to a nearby storm sewer system or directly to a river, lake, or coastal water. Recognition of the water quality problems of stormwater runoff led Congress in 1987—when it last comprehensively amended the CWA—to direct EPA to implement a specific permit program for stormwater discharges from industrial sources and municipalities (P.L. 100-4). These stormwater requirements were incorporated into the National

[28] 42 U.S.C. 9601 et seq. For further discussion of the authorities of CERCLA, see CRS Report R41039, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, by David M. Bearden.

[29] The definition of the term "hazardous substance" in Section 101 (14) of CERCLA is codified at 42 U.S.C. 9601(14). The definition of the terms "pollutant" and "contaminant" in Section 101(33) of CERCLA is codified at 42 U.S.C. 9601(33).

[30] U.S. Environmental Protection Agency, Office of General Counsel, *Scope of the CERCLA Petroleum Exclusion Under Sections 101(14) and 104(a)(2)*, July 31, 1987. Section 104(a)(2) of CERCLA, as originally enacted in 1980, defined the term "pollutant or contaminant." Section 101(f) of the Superfund Amendments and Reauthorization Act of 1986 re-designated the definition of this term in Section 101(33) of CERCLA, cited above. The full text of the 1987 guidance is available at http://www.epa.gov/compliance/resources/policies/cleanup/superfund/petro-exclu-mem.pdf.

[31] For further discussion on the NPDES Permit Program, see CRS Report 97-290, *Stormwater Permits: Status of EPA's Regulatory Program*, by Claudia Copeland, as well as U.S. Environmental Protection Agency, "National Pollutant Discharge Elimination System," http://cfpub.epa.gov/npdes/.

[32] 33 U.S.C. §§1251-1387. For further discussion of the authorities of CWA, see CRS Report RL30030, *Clean Water Act: A Summary of the Law*, by Claudia Copeland.

Pollutant Discharge Elimination System (NPDES), a comprehensive permit program authorized in Section 402 of the CWA. Under the act, it is illegal to discharge pollutants from point sources (e.g., industrial plant pipes, sewage treatment plants, or storm sewers) into the nation's waters without a permit. NPDES permits are the fundamental compliance and enforcement mechanism of the law. EPA manages the NPDES stormwater program in four states (Idaho, Massachusetts, New Hampshire, and New Mexico), plus the District of Columbia and most U.S. territories, and has delegated that authority to the remaining 46 states and the Virgin Islands. Therefore, the vast majority of industrial and other facilities obtain NPDES permit coverage for stormwater discharge through their state. Petroleum refining facilities are one of several categories of facilities that are specifically covered under the CWA stormwater regulatory program.

Common requirements for coverage under an industrial stormwater permit include development of a written stormwater pollution prevention plan (SWPPP), implementation of control measures, and submittal of a request for permit coverage, usually referred to as the Notice of Intent (NOI). The SWPPP is a written assessment of potential sources of pollutants in stormwater runoff and control measures that will be implemented at the facility to minimize the discharge of these pollutants in runoff from the site. These control measures include site-specific best management practices, maintenance plans, inspections, employee training, and reporting. The procedures detailed in the SWPPP must be implemented by the facility and updated as necessary, with a copy of the SWPPP kept on-site. The industrial stormwater permit also requires collection of visual, analytical, and compliance monitoring data to determine the effectiveness of implemented best management practices. Stormwater permits are valid for up to five years and must be renewed.

Best management practices for the prevention of industrial stormwater runoff include ensuring adequate storage facilities and equipment, spill detection and repair, and employee training. Many environmental agencies, including EPA, provide extensive summaries of best management practices.[33]

Fugitive Dust

The handling, storage, and transportation of petcoke may create instances of reduced air quality due to weather or activity related releases of fugitive dust into the atmosphere. Most of the impacts of fugitive dust are localized; and thus, much of the regulatory oversight is implemented at the local and state level and generally takes the form of a fugitive dust control program.

Facilities may be required by state or local agencies to develop a fugitive dust control program for many reasons. State and local agencies, based on their own air emission measurements, their own code of regulations, environmental consent orders, or complaints of nuisance, may require a fugitive dust program from any facility if it processes, uses, stores, transports, or conveys bulk materials from a highly emitting dust source. Further, these programs are often a necessary component to any air permitting requirements at the state and local level, including permits to install, operate, or decommission a facility. At the federal level, Clean Air Act (CAA)[34] National

[33] An extensive list of best management practices for stormwater runoff, included under the general categories of "good housekeeping practices," "minimize exposure," "erosion and sediment control," and "management of runoff," can be found in U.S. Environmental Protection Agency, *Industrial Stormwater, Fact Sheet Series, Sector C: Chemical and Allied Products Manufacturing and Refining*, U.S. EPA Office of Water, EPA-833-F-06-018, December 2006, http://www.epa.gov/npdes/pubs/sector_c_chemical.pdf.

[34] 33 U.S.C. §§1251-1387. For further discussion of the authorities of CWA, see CRS Report RL30030, *Clean Water Act: A Summary of the Law*, by Claudia Copeland.

Ambient Air Quality Standards (NAAQS) have been set nationwide by EPA for particulate matter (PM).[35] NAAQS are standards for outdoor (ambient) air that are intended to protect public health and welfare from harmful concentrations of pollution. If fugitive dust generation is determined to be an issue at a facility that produces, handles, stores, transports, or uses petcoke, and if the facility is situated in an area that is identified by the EPA as "nonattainment" for PM NAAQS, then it may be possible for state authorities to ask the facility to report on and manage its fugitive dust emissions—if it is not doing so already—within the context of their State Implementation Plans (SIPs).

Whether petcoke storage is considered a significant source of PM depends a number of factors, including how the coke is handled (e.g., number of drops), individual petcoke particle sizes and the size of the overall petcoke piles, as well as the storage method. In some cases, petcoke may have been processed through pulverization that generates dust which could be monitored and controlled at $PM_{2.5}$ (less than 2.5 microns). $PM_{2.5}$ can produce greater health impacts because it is more respirable than "coarse" PM which is larger than 2.5 microns. PM that is greater than about 10 microns is generally considered less of a health risk because it is less respirable. As illustrated in **Figure 1**, most forms of petcoke are comprised of granules orders of magnitude larger than $PM_{2.5}$, and are not likely respirable, but may pose a nuisance concern. Also, in some cases, petcoke storage may be ephemeral because markets support frequent elimination of stored inventories.

The management of fugitive dust commonly involves the submission of a fugitive dust plan to state or local agencies. These plans would include an analysis of the quantity and opacity of fugitive dust from the facility; a determination of the type of fugitive dust control methods that would be the most effective, taking into account the quantity, moisture content, specific gravity, and particle size distribution of the bulk materials on-site; an assessment of the type of control technologies, methods, and equipment to be implemented or installed, and the schedule for implementation or installation; and a report on the level of recordkeeping and maintenance requirements for activities that are implemented under the dust program. Fugitive dust plans commonly set out an operating program designed to significantly reduce emissions to the lowest level that a particular source is capable of achieving by the application of control technology that is both reasonably available and based on technological and economic feasibility. The requirement for fugitive dust plans for a given facility and the plan's enforcement remain at the discretion of the state and local agencies.

Best management practices for the prevention of fugitive dust include ensuring adequate storage facilities and equipment, emission detection and repair, and employee training. Many environmental agencies, including the U.S. EPA, provide extensive summaries of best management practices.[36]

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[35] For further discussion of particulate matter, see CRS Report RL34762, *The National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM): EPA's 2006 Revisions and Associated Issues*, by Robert Esworthy.

[36] An extensive list of emission control techniques for fugitive dust can be found in U.S. Environmental Protection Agency, *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures*, U.S. EPA Office of Air and Radiation, EPA-450/2-92-004, September 1992, http://www.epa.gov/oaqps001/lead/pdfs/1992_09_fugitive_dust.pdf.

Regulatory Standards for Petcoke Combustion in Power Generation

The combustion of petcoke, and the resulting emissions from this combustion, may be regulated under several different provisions in the CAA and the CWA.

When petcoke is used for industrial or power generating purposes, emissions from its combustion are regulated under the standards set on the respective facilities. For example, some of the federal regulations which may be implemented by the combustion of petcoke at industrial or power generating facilities include EPA's New Source Performance Standards for Electricity Generating Units, Clean Air Interstate Rule (CAIR) for NO_x and SO_2, CAA Title V Permitting Requirements, GHG Reporting Program, Steam Electric Effluent Guidelines, recently finalized Mercury and Air Toxics Standards/Utility MACT, and proposed Coal Combustion Waste Rules, as well as the various state rules under State Implementation Plans.

A full description of these requirements is beyond the scope of this report.

Conclusion

Petcoke production depends on the crude oil demand of operating refineries that in tum depend on the availability of heavy and light crude oils and their comparative cost advantages. The domestic production of petcoke may increase as U.S. refineries continue to add coking capacity to take advantage of competitively priced petroleum produced from Canada's oil sands and other heavy crude oil sources. Conversely, as U.S. light crude oil production increases, U.S. coking refineries may find an economic advantage in switching to lighter crude oils and idle their coking units. If that occurs, the production and export of U.S. petcoke may reverse.

Community stakeholder and regulator concerns about fugitive dust emission into the air and stormwater runoff into waterways are likely to continue in situations where there is not sufficient mitigation and abatement. In some states, permit conditions have been imposed to mitigate the emissions from petcoke storage and handling. The specific permit conditions (e.g., enclosed conveyors and storage silos) are generally based on best management practices as determined by state regulators. At the federal level, Clean Air Act (CAA) National Ambient Air Quality Standards (NAAQS) for outdoor (ambient) air continue to protect public health and welfare from harmful concentrations of particulate matter pollution. If states determine that fugitive dust generation is an issue at a facility that produces, handles, stores, transports, or uses petcoke, and if the facility is situated in an area that is identified by the EPA as "nonattainment" for PM NAAQS, then state authorities may ask the facility to report on and manage its fugitive dust emissions—if it is not doing so already—within the context of their State Implementation Plans (SIPs). States and localities may also have their own regulatory standards for fugitive dust, independent of whether the area is in nonattainment of federal PM NAAQS.

In light of these concerns, industry, regulators, and compliance officers have shown a continued interest in impact assessment and best practices related to the storing, containing, and managing of petcoke. Two bills have been introduced in the 113th Congress regarding petcoke: H.R. 2298, the Petroleum Coke Transparency and Public Health Study Act (introduced 6/6/2013), and S. 1388, Petroleum Coke Transparency and Public Health Study Act (introduced 7/30/2013). Each would require the Secretary of Health and Human Services, in consultation with the Administrator of the Environmental Protection Agency, to conduct a study on the public health and environmental impacts of the production, transportation, storage, and use of petcoke.

Appendix. Petroleum Refining and Petcoke Production

Petroleum refineries use several key processes to convert crude oil systematically into refined products; these include atmospheric distillation, hydrocracking, hydrotreating, reforming, and ultimately coking. The refinery's atmospheric distillation column initially separates crude oil into lighter streams of hydrocarbons based on their boiling temperatures. The gasoline-range of petroleum distillates condense at the top of the column. Middle distillate fuels (kerosene, jet, and diesel fuels) condense in the middle of the column. The heavier-still range of gas oils condense lower in the column. Residuum, a heavy tar-like material figuratively referred to as the "bottom of the barrel," has such a high boiling temperature that it remains at the bottom of the column.

In order to produce more gasoline, refineries "crack" the heavier distillation products into the gasoline range with heat, pressure, hydrogen, and catalysts. Hydrotreating removes elemental sulfur from gasoline and middle-distillate fuels through a reaction with hydrogen gas.

Coking dates back to the late 1920s, but became an important process for U.S. refineries during the 1980s and 1990s. During this time, refineries faced a dwindling supply of light sweet crude oils favored for making gasoline and distillate fuels. They began switching to increasingly more available, heavy-sour crude oils. The resid that remained after refining heavier crudes initially found use as "ship's bunker fuel" and as boiler fuel in electric power plants. With the implementation of Clean Air Act regulations, power plants switched from boiler fuel to cleaner burning natural gas. During the same era, the demand for gasoline increased, and refineries began adding coking to convert the "resid" into motor fuels.

Coking initially converts petroleum residuum into lighter range hydrocarbons; low-Btu gas that can serve as a fuel in refinery operations; and "green coke."

Refineries commonly employ one of three types of coking processes:

- *delayed coking*—a thermal cracking process that converts residuum into gasified products streams and concentrated carbon coke. It is called "delayed coking" because cracking takes place in a coke drum rather than in a furnace or reactor. The residuum is heated in a furnace first, and then fed into the bottom of the coke drum. The "cracked" light products are drawn off at the top of the drum and sent to a fractionator which separates out gasoline, naphtha, gas oil, and lighter products. The drums are "de-coked" by hydraulic or mechanical cutting processes. In delayed coking, one coking drum is filled while a second is de-coked (emptied). First commercialized in 1928, delayed coking predominates among U.S. refineries that process heavy crude oil. See **Figure A-1**.
- *flexi-coking*—a continuous fluidized-bed thermal cracking process integrated with coke gasification. It converts most of the carbon coke to carbon monoxide (CO), which is then mixed with carbon (C2) and lighter hydrocarbons to produce a low quality fuel gas. The process was commercialized in 1976. See **Figure A-2**.
- *fluid coking*—a variation on flexi-coking that uses a cyclone to separate the coke. The process was commercialized in 1954.

Figure A-1. Shell Delayed Coking Unit

Puget Sound Refinery

Source: Shell.

Figure A-2. ExxonMobil Flexi-Coking Unit

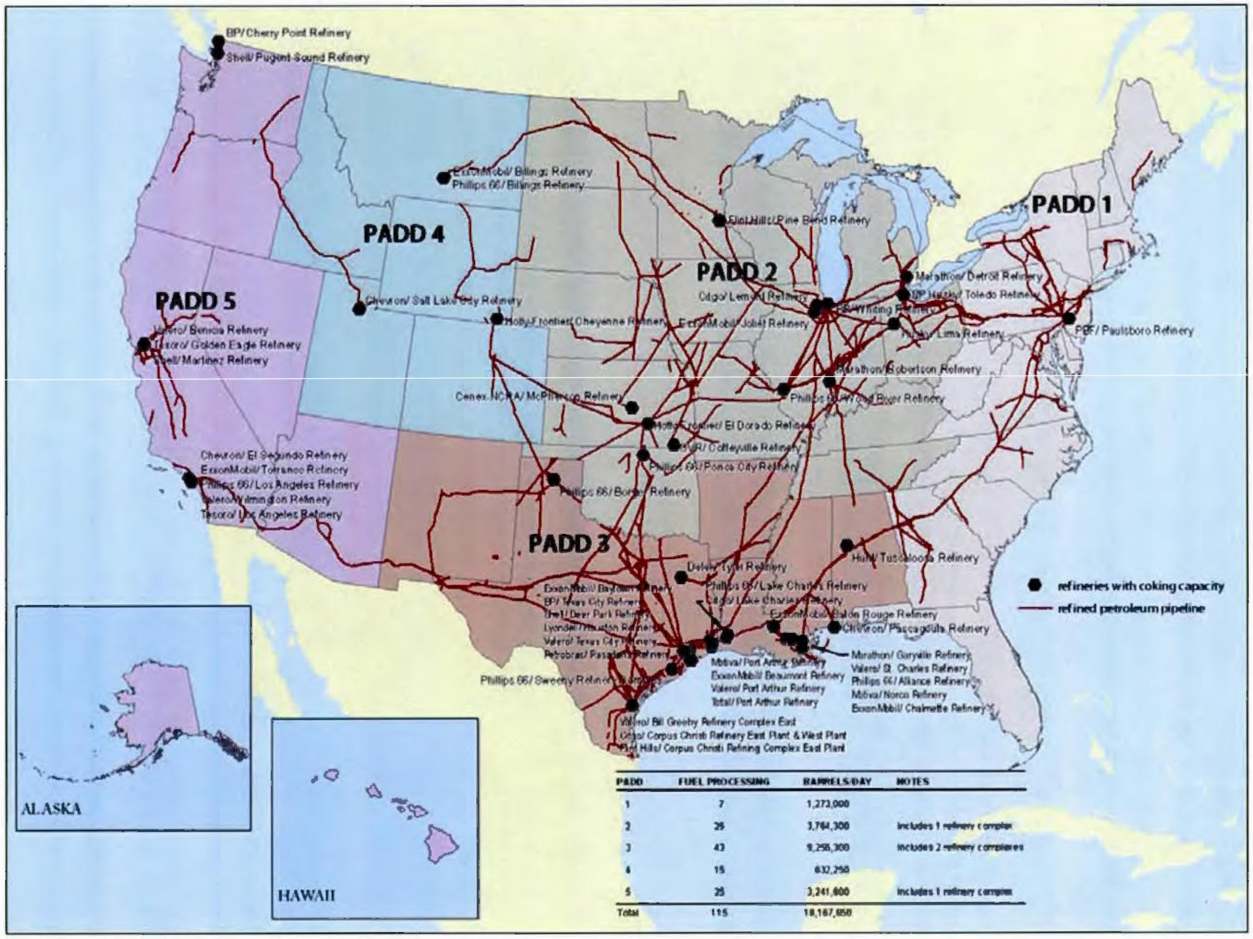
Rotterdam, The Netherlands

Source: ExxonMobil Research & Engineering Company, Upgrading of Heavy Oils with Flexicoking.

Independent processors convert the green coke into to either fuel grade or anode grade coke depending upon the crude oil refined and the coking process used.

Figure A-3. U.S. Refineries with Coking Capacity

by Petroleum Adminstration for Defense Districts (PADD)

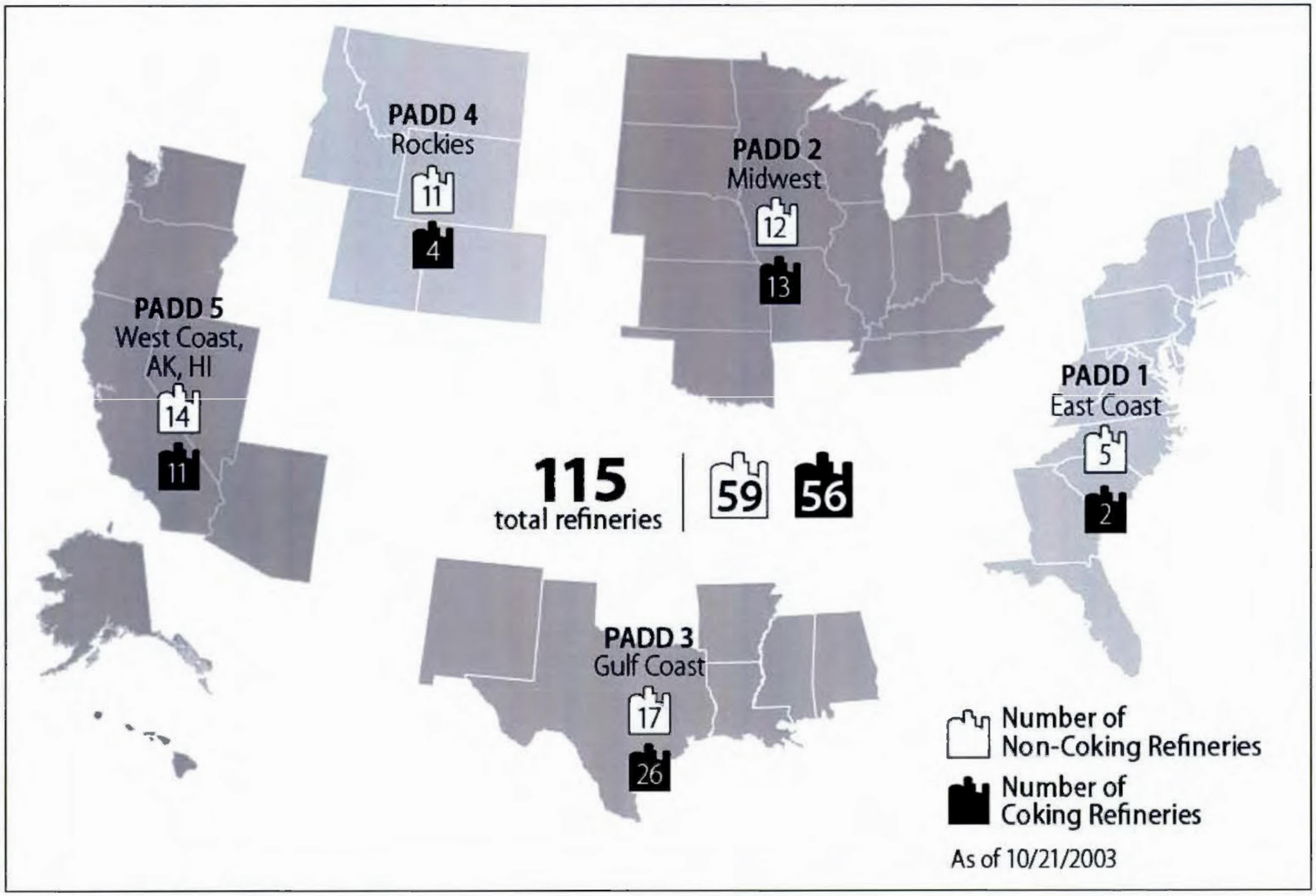


PADD	FUEL PROCESSING	BARRELS/DAY	NOTES
1	7	1,273,000	
2	25	3,764,300	includes 1 refinery complex
3	43	9,256,300	includes 2 refinery complexes
4	15	632,250	
5	25	3,241,600	includes 1 refinery complex
Total	115	18,167,850	

Source: Prepared for CRS by the Library of Congress.

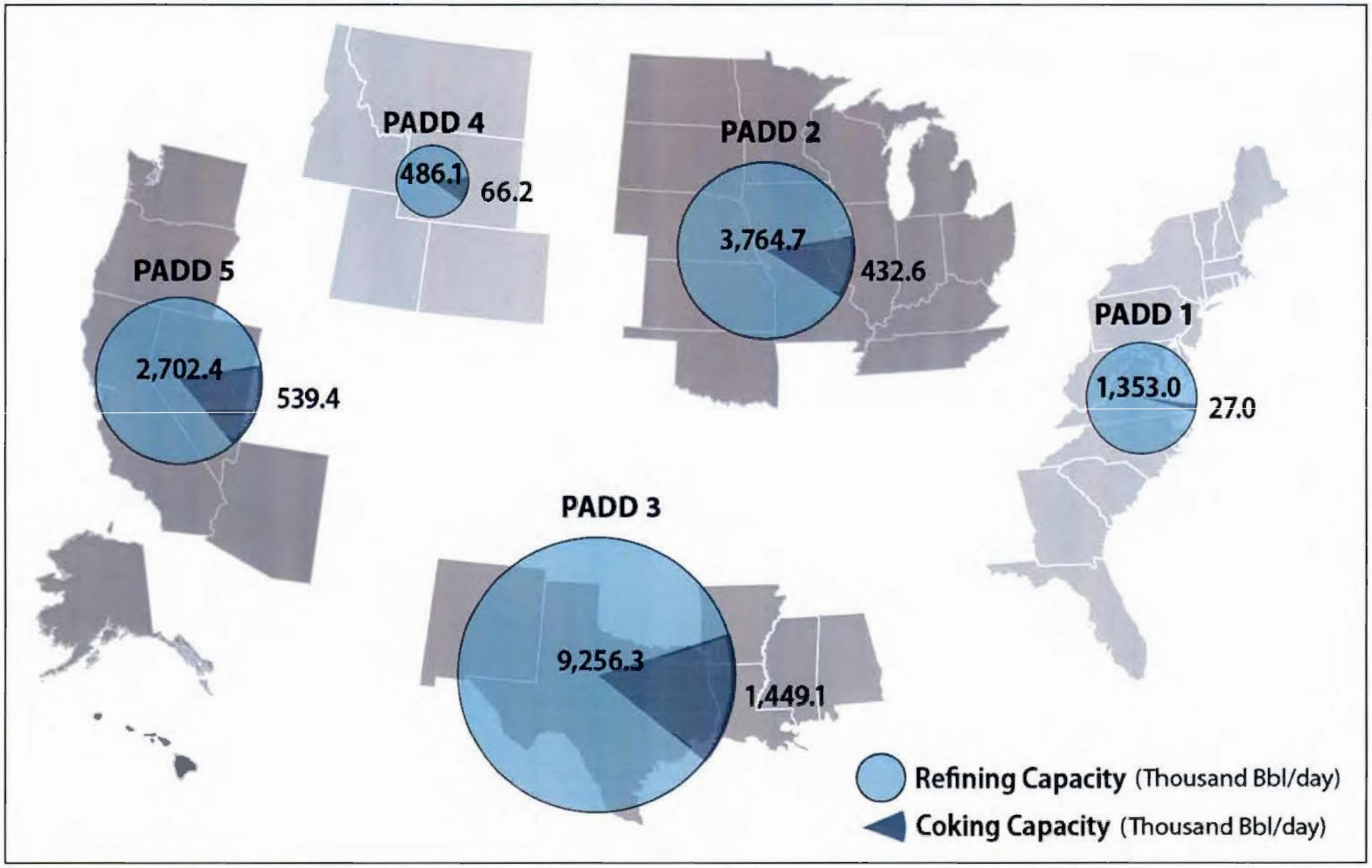
Notes: See **Table A-1** for a list of refineries.

Figure A-4. Coking Refineries by PADD



Source: Compiled by CRS from various sources.

Figure A-5. Refining and Coking Capacity by PADD



Source: Compiled by CRS from various sources.

Notes: Coking capacity denotes the throughput capacity to process petroleum resid.

Table A-1. U.S. Refineries with Coking Capacity

Advertised Refinery Capacity in Barrels per Day (Bbl/D)

PADD	St	City	Zip	Facility	Bbl/D	Congressional District
1	NJ	Paulsboro	08066	PBF/ Paulsboro Refinery	180,000	1st New Jersey
1	DE	Delaware	19706	PBF/Delaware City	190,000	At large Delaware
2	IL	Roxana	62084	Phillips 66/ Wood River Refinery	306,000	12th Illinois
2	IL	Drummond	60410	ExxonMobil/ Joliet Refinery	250,000	16th Illinois
2	IL	Robinson	62454	Marathon/ Robinson Refinery	206,000	15th Illinois
2	IL	Lemont	60439	Citgo/ Lemont Refinery	167,000	3rd Illinois
2	IN	Whiting	46394	BP/ Whiting Refinery	413,000	1st Indiana
2	KS	El Dorado	67042	Holly-Frontier/ El Dorado Refinery	135,000	4th Kansas
2	KS	Coffeyville	67337	CVR Coffeyville Refinery	115,000	2nd Kansas
2	KS	McPherson	67460	Cenex-NCRA/ McPherson Refinery	85,000	1st Kansas
2	MI	Detroit	48217	Marathon/ Detroit Refinery	106,000	13th Michigan
2	MN	Rosemont	55068	Flint Hills/ Pine Bend Refinery	320,000	2nd Minnesota
2	OH	Oregon	43616	BP-Husky/ Toledo Refinery	160,000	9th Ohio
2	OH	Lima	45804	Husky/ Lima Refinery	155,000	4th Ohio
2	OK	Ponca City	74601	Phillips 66/ Ponca City Refinery	187,000	3rd Oklahoma
3	AL	Tuscaloosa	35401	Hunt/ Tuscaloosa Refinery	72,000	7th Alabama
3	LA	Baton Rouge	70805	ExxonMobil/ Baton Rouge Refinery	503,500	2nd Louisiana
3	LA	Garyville	70051	Marathon/ Garyville Refinery	490,000	2nd Louisiana
3	LA	Lake Charles	70601	Citgo/ Lake Charles Refinery	425,000	3rd Louisiana
3	LA	Norco	70079	Valero/ St. Charles Refinery	270,000	6th Louisiana
3	LA	Belle Chasse	70037	Phillips 66/ Alliance Refinery	247,000	1st Louisiana

PADD	St	City	Zip	Facility	Bbl/D	Congressional District
3	LA	Westlake	70669	Phillips 66/ Lake Charles Refinery	239,000	3rd Louisiana
3	LA	St. Charles Parrish	70079	Motiva/ Norco Refinery	234,700	6th Louisiana
3	LA	Chalmette	70043	ExxonMobil/ Chalmette Refinery	192,500	1st Louisiana
3	MS	Pascagoula	39581	Chevron/ Pascagoula Refinery	330,000	4th Mississippi
3	TX	Port Arthur	77641	Motiva/ Port Arthur Refinery	600,000	14th Texas
3	TX	Baytown	77520	ExxonMobil/ Baytown Refinery	573,000	36th Texas
3	TX	Texas City	77590	Marathon/ Texas City Refinery	475,000	14th Texas
3	TX	Beaumont	77703	ExxonMobil/ Beaumont Refinery	365,000	14th Texas
3	TX	Deer Park	77536	Shell/ Deer Park Refinery	340,000	36th Texas
3	TX	Corpus Christi	78407	Valero/ Bill Greehy Refinery Complex East	325,000	27th Texas
3	TX	Port Arthur	77641	Valero/ Port Arthur Refinery	310,000	14th Texas
3	TX	Houston	77017	Lyondell/ Houston Refinery	268,000	29th Texas
3	TX	Sweeny	77463	Phillips 66/ Sweeny Refinery Complex	247,000	14th Texas
3	TX	Texas City	77590	Valero/ Texas City Refinery	245,000	14th Texas
3	TX	Port Arthur	77642	Total/ Port Arthur Refinery	174,000	14th Texas
3	TX	Corpus Christi	78047	Citgo/ Corpus Christi Refinery East & West Plant	165,000	27th Texas
3	TX	Corpus Christi	78408	Flint Hills/ Corpus Christi Refining Complex East Plant	150,000	27th Texas
3	TX	Borger	79007	Phillips 66/ Borger Refinery	146,000	13th Texas
3	TX	Pasadena	77506	Petrobras/ Pasadena Refinery	100,000	29th Texas
3	TX	Tyler	75702	Delek/ Tyler Refinery	60,000	1st Texas
4	MT	Billings	59101	ExxonMobil/ Billings Refinery	60,000	At Large Montana
4	MT	Billings	59101	Phillips 66/ Billings Refinery	58,000	At Large Montana
4	UT	Salt Lake City	84116	Chevron/ Salt Lake City Refinery	45,000	2nd Utah

PADD	St	City	Zip	Facility	Bbl/D	Congressional District
4	WY	Cheyenne	82007	Holly-Frontier/ Cheyenne Refinery	52,000	At Large Montana
5	CA	Paramount	90723	Alon/ California Refineries	70,000	40th California
5	CA	El Segundo	90245	Chevron/ El Segundo Refinery	290,000	33rd California
5	CA	Benicia	94510	Valero/ Benicia Refinery	170,000	5th California
5	CA	Martinez	94553	Tesoro/ Golden Eagle Refinery	166,000	5th California
5	CA	Martinez	94553	Shell/ Martinez Refinery	165,000	5th California
5	CA	Torrance	90509	ExxonMobil/ Torrance Refinery	150,000	43rd California
5	CA	Carson	90745	Phillips 66/ Los Angeles Refinery	139,000	44th California
5	CA	Wilmington	90744	Valero/ Wilmington Refinery	135,000	44th California
5	CA	Wilmington	90744	Tesoro Los/ Angeles Refinery	97,000	44th California
5	WA	Blaine	98230	BP/ Cherry Point Refinery	230,000	1st Washington
5	WA	Anacortes	98221	Shell/ Puget Sound Refinery	145,000	2nd Washington

Source: Various

Notes: Alon operates three units in Bakersfield, Paramount, and Long Beach, CA, as one refinery, but the delayed coker is reported as inactive.

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Acknowledgments

Amber Hope Wilhelm, Graphics Specialist, Congressional Research Service

Jacqueline V. Nolan, Cartographer, Library of Congress

Cassandra Foley, Law Librarian, Congressional Research Service

James Werner, Environmental Policy Section Research Manager, Congressional Research Service

Exhibit 4

Scientific References

KCBX is providing the following list of scientific literature cited in the Response. Due to the amount of time that was provided to the regulated community to respond to the Illinois EPA Motion, KCBX did not have the time needed to seek permissions from authors and study owners to provide the Board with full copies of all of the following. In situations where documents were available in the public domain and not subject to copyright restrictions, website links are provided. Should the Board request copies and/or provide additional time for comments, KCBX will seek permission to share additional full copies of reports once permissions have been appropriately granted from copyright owners.

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IARC. 1997. Coal Dust. *IARC Monographs* 68:337-406. Monograph available at: For Coal Dust, http://monographs.iarc.fr/ENG/Monographs/vol68/mono68-12.pdf, and entire Volume 68 (1997): http://monographs.iarc.fr/ENG/Monographs/vol68/

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Pless-Mulloli T, D. Howel, A. King, I. Stone, J. Merefield, J. Bessell, R. Darnell. 2000. Living near opencast coal mining sites and children's respiratory health. *Occup Environ Med* 57:145-151.

Pless-Mulloli T, D. Howel, H. Prince. 2001. Prevalence of asthma and other respiratory symptoms in children living near and away from opencast coal mining sites. *International Journal of Epidemiology* 30(556-563).

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Exhibit 5

Petcoke-Coal Test Results

David L. MacIntosh, Sc.D., C.I.H.,
Chief Science Officer

January 13, 2014

ENVIRONMENTAL HEALTH
& ENGINEERING, INC.

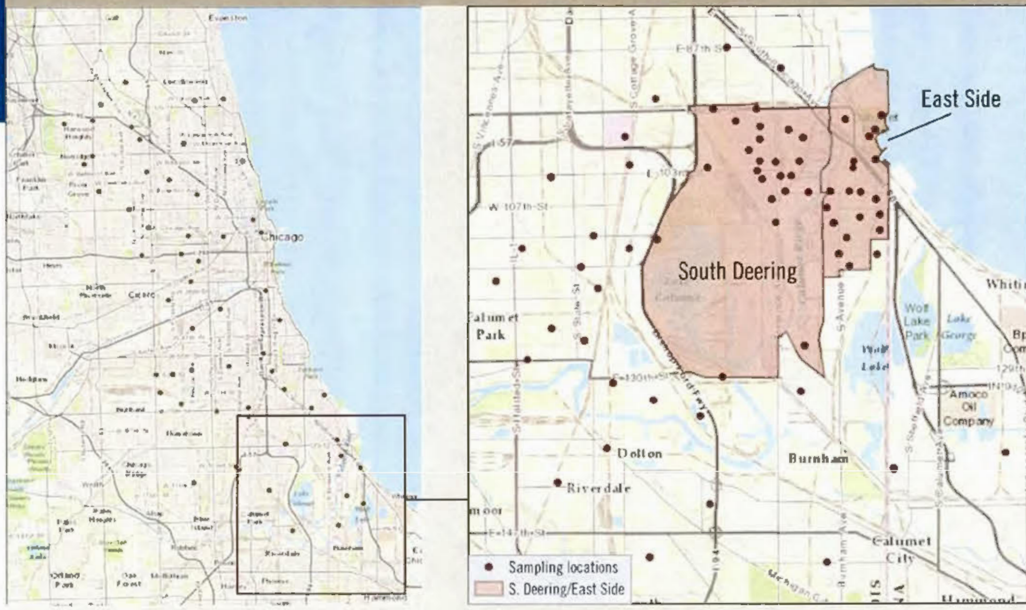
Findings

- No evidence of petcoke or coal on surfaces or in soil of East Side and South Deering neighborhoods based on indicators identified by testing petcoke and coal*

- Supporting Information
  - Composition of soil in East Side and South Deering neighborhoods similar to control neighborhoods, and was not different in any statistically significant way from levels in soil in the City of Chicago as reported by the U.S. Geological Survey or from background levels reported by the State of Illinois Environmental Protection Agency Tiered Approach for Corrective Action (TACO) program
  - Signature heavy metals and PAHs for petcoke and coal not found on surfaces sampled

* This presentation focuses on two key indicators of petcoke and coal: the vanadium to nickel ratio, and polynuclear aromatic hydrocarbon (PAH) ratios. Other indicators include vanadium, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, 1-chloronaphthalene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene; proximity to petcoke/coal terminals; and markers of transportation-related impacts (*e.g.*, lead, proximity to roads, railroads, and asphalt)

Polynuclear Aromatic Hydrocarbon Profiles



WHAT ARE POLYNUCLEAR AROMATIC HYDROCARBONS?

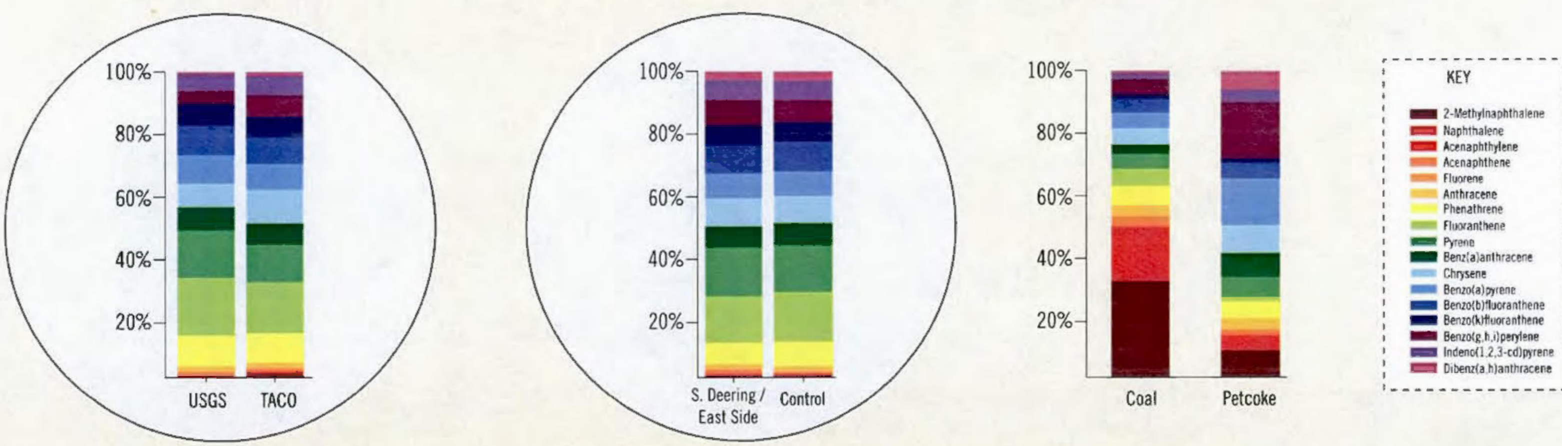
Polynuclear aromatic hydrocarbons are a group of chemicals that occur naturally in coal and crude oil. Forest fires and volcanoes produce PAHs naturally as well.

PAHs also are present in products made from fossil fuels, such as home heating oil, kerosene, gasoline, diesel fuel, and asphalt. PAHs are released into air and made whenever fossil fuels, petroleum products, wood, garbage, and other organic substances are burned. PAHs are widespread in soil, air, and water throughout the United States and the world.

Source: adapted from the Illinois Department of Public Health

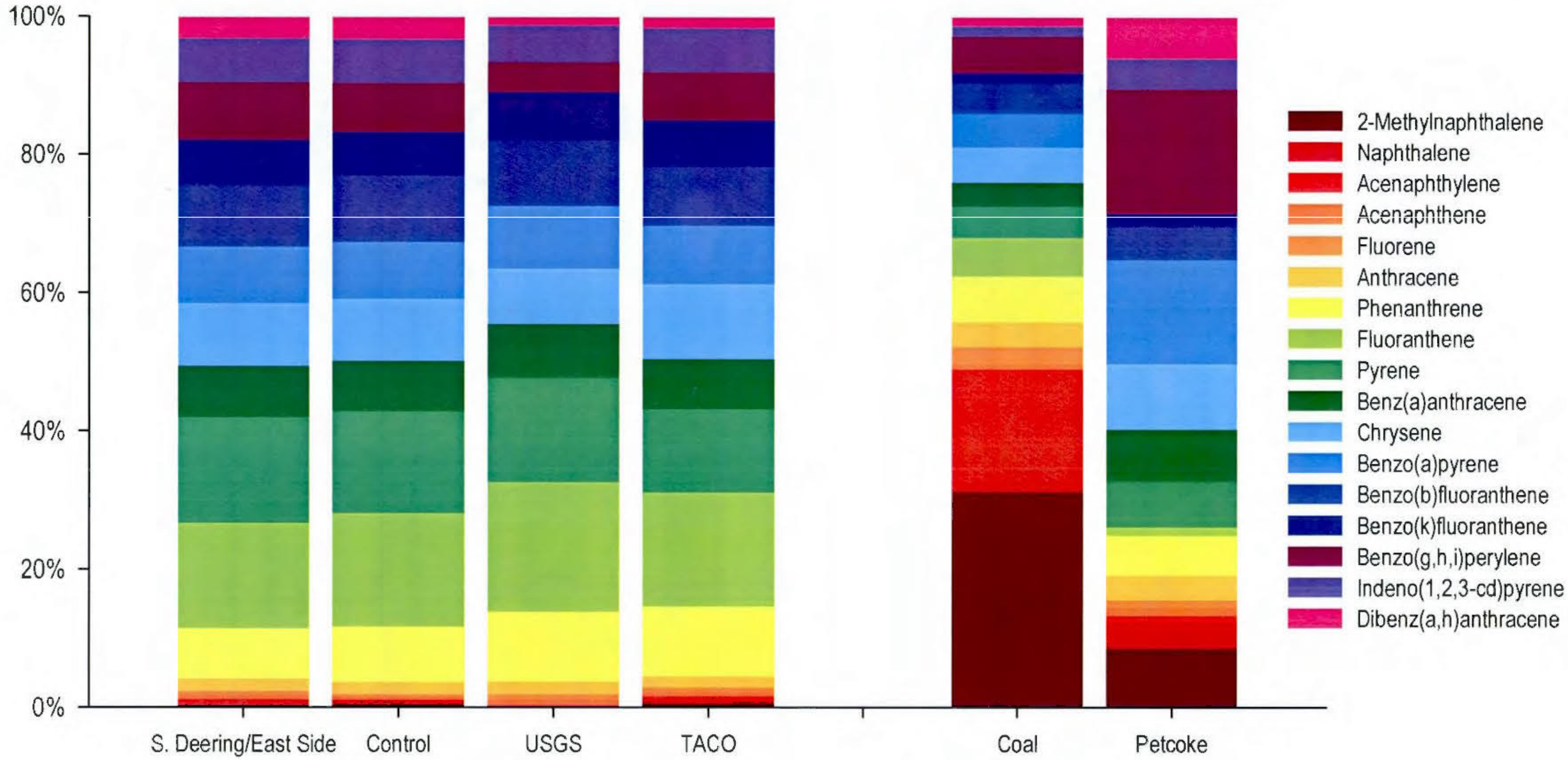
GREATER CHICAGO AREA

SAMPLED NEIGHBORHOODS - ABUTTING COAL SITES AND CONTROLS



Soil of South Deering and East Side neighborhoods is similar to the rest of Chicago, and different from coal and petcoke.

PAH Profiles

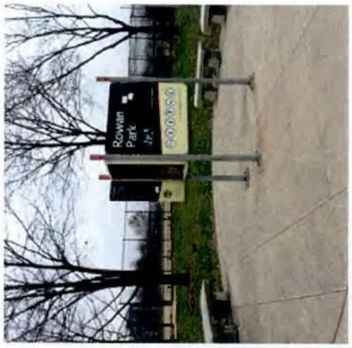


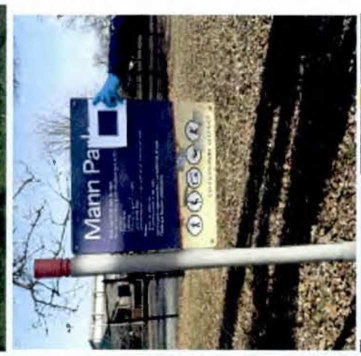
Study Outline

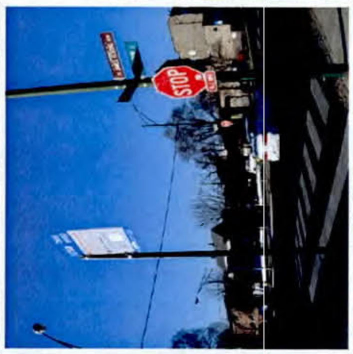
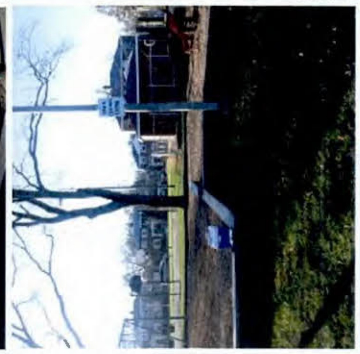
- Conducted an investigation with the objective of examining surfaces and soil in the East Side and South Deering neighborhoods for the presence of petcoke and coal.
- Examined the soil and surfaces for chemical indicators (signatures) of petcoke and coal, including certain metal (vanadium to nickel) and polynuclear aromatic hydrocarbon (PAHs) ratios.
- Samples were collected and tested in accordance with ASTM and EPA methods by independent environmental professionals and laboratories.
- Collected 69 samples of soil and surface dust in late November-early December 2013 from the East Side and South Deering neighborhoods and control areas.
  - Publicly accessible locations: parks and rights of way
  - Many locations near the petcoke/coal terminals
  - Benches, bleachers, bus stop shelters, sides of storage buildings, and green space
  - Selected to be representative of homes, buildings and yards on private property

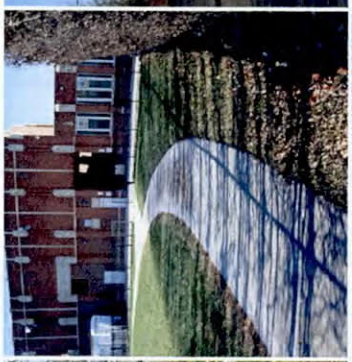
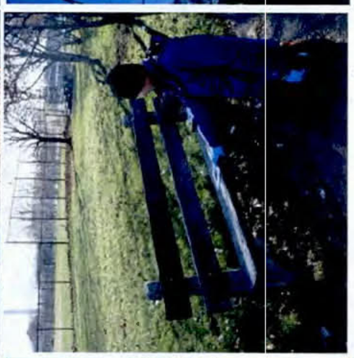
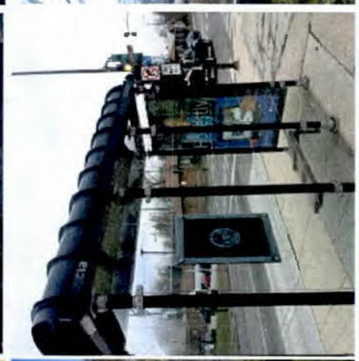
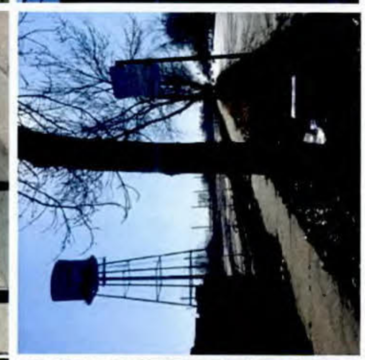
Snapshot of Sampling Locations

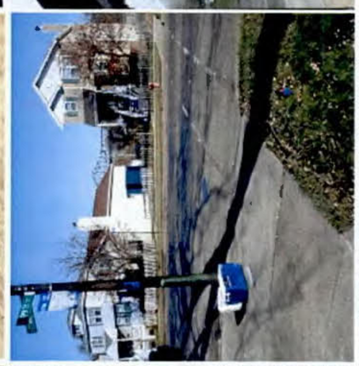
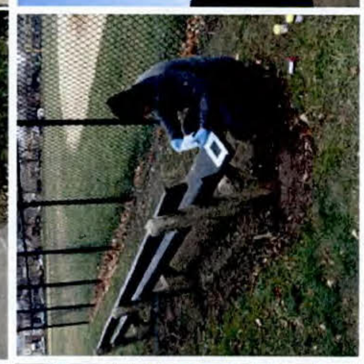
	A	B	C	D	E	F
1	ID	Location Type	Location Description	Surface Type	Description	Area
2	110	Bus Stop	Michigan & 115th Street	Metal	Bus sign pole	Control
3	60	Intersection	107th Street & S. Hoxie Street	Metal	Stop sign	S. Deering / East Side
4	20	Park	Camulet Park	Metal	Vertical bar	S. Deering / East Side
5	85	Park	Rowan Park	Painted wood	Bench	S. Deering / East Side
6	107	Park	Langston Hughes Elementary	Metal	Bench	Control
7	55	Bus Stop	3033 E 106th Street	Metal	Bent bus sign	S. Deering / East Side
8	98	Bus Stop	Ewing & 102nd Street	Metal	Bus sign	S. Deering / East Side
9	76	Bus Stop	Avenue C & 109th Street	Metal	Bus stop	S. Deering / East Side
10	102	Park	Burnside Park	Painted wood	Bench	Control
11	37	Park	Trumbell Park	Painted wood	Bench	S. Deering / East Side
12	109	Park	Morgan Field Park	Painted wood	Fountain	Control
13	86	Park	Off of E 126th St	Painted wood	Bench	S. Deering / East Side
14	95	Park	Lion Field	Painted Concrete	Building	Control
15	82	Bus Stop	Avenue O & 114th Street	Glass	Bus shelter	S. Deering / East Side
16	88	Bus Stop	103rd Street CTA Terminal	Plastic	Glass wall panel	S. Deering / East Side
17	43	Bus Stop	Ewing & 103rd St	Metal	Bus sign	S. Deering / East Side
18	87	Park	Harborside International Golf Center	Metal	Guardrail	S. Deering / East Side
19	53	Bus Stop	2801 E 106th Street	Metal	Bus stop sign	S. Deering / East Side
20	57	Park	Krause Park	Concrete	Barrier	S. Deering / East Side
21	29	Bus Stop	Yates & 102nd Street	Metal	Bus sign	S. Deering / East Side
22	32	Bus Stop	Commercial & 102nd St	Metal	Bus sign	S. Deering / East Side
23	6	Park	Veteran's Memorial Park	Painted wood	Bench	S. Deering / East Side
24	12	Bus Stop	Yates & 99th St	Metal	Bus sign	S. Deering / East Side
25	84	Park	Eggers Woods	Wood	Table	S. Deering / East Side
26	21	Park	Luella Park	Painted wood	Bench	S. Deering / East Side
27	100	Bus Stop	Commercial & 104th Street	Metal	Bus sign	S. Deering / East Side
28	46	Bus Stop	2700 E 104th Street	Metal	Bus sign	S. Deering / East Side

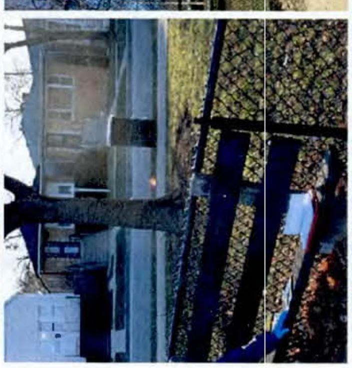
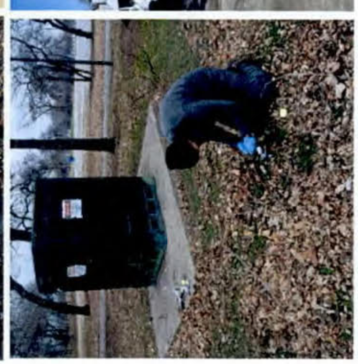
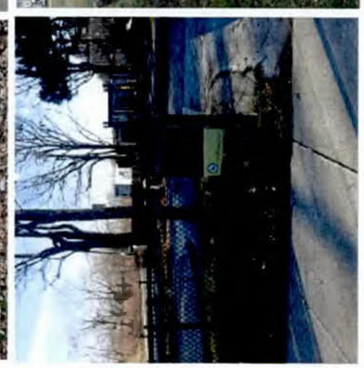

Rowan
Park


Mann Pa



STOP


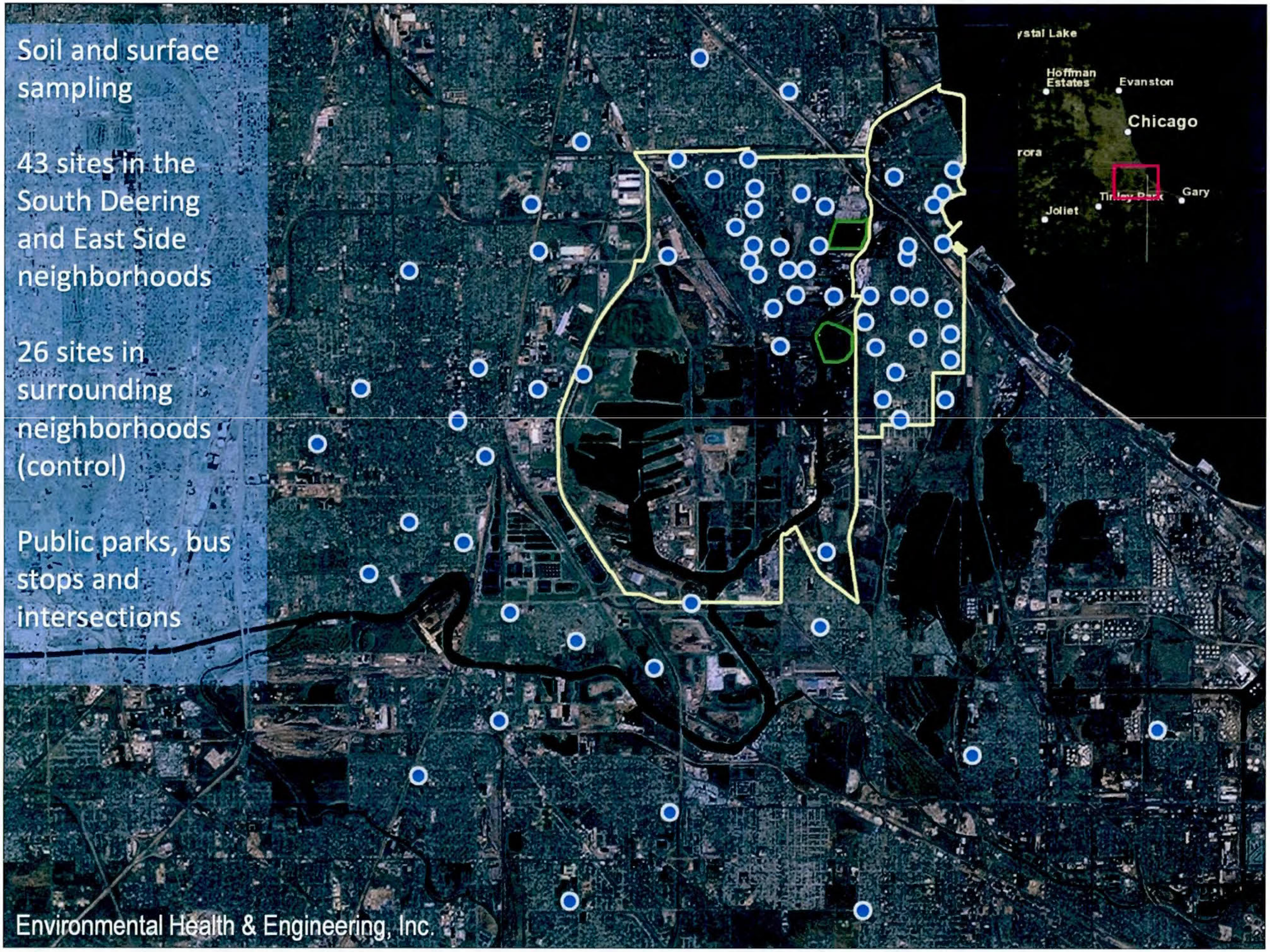




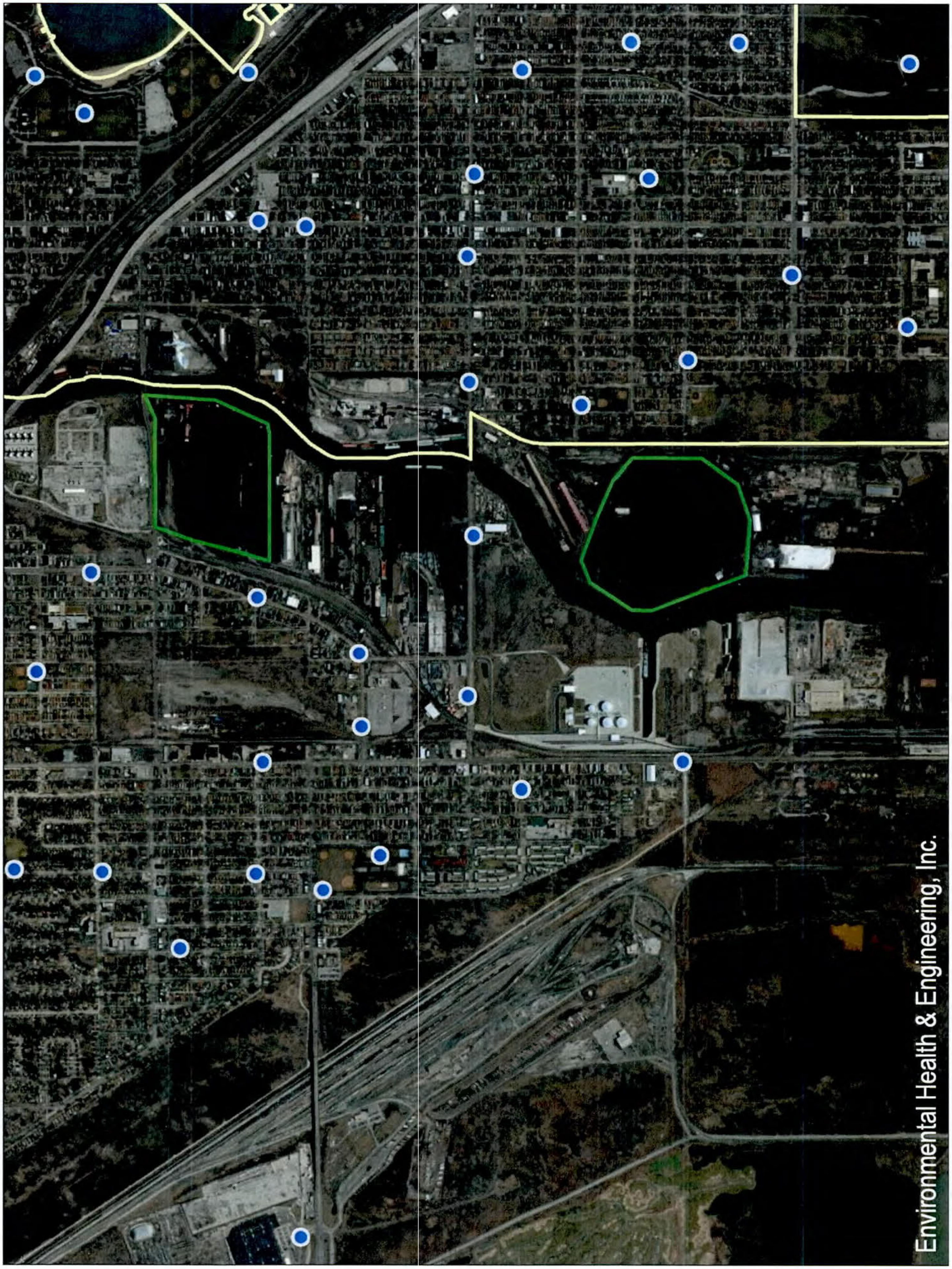




Technical Review

- All sampling and testing designed by David L. MacIntosh, Sc.D, C.I.H, Chief Science Officer with Environmental Health & Engineering, Inc.
  - Adjunct Associate Professor at the Harvard School of Public Health
  - Technical advisor to government agencies and the World Health Organization
  - 20 years experience as an active member of the environmental health profession
  - Author of numerous publications in the area of exposure assessment, risk analysis, and environmental management

- Test results interpreted and analyzed by Dr. MacIntosh


Soil and surface sampling
43 sites in the South Deering and East Side neighborhoods
26 sites in surrounding neighborhoods (control)
Public parks, bus stops and intersections
Environmental Health & Engineering, Inc.
Chicago
Evanston
Hoffman Estates
Joliet
Gary


Environmental Health & Engineering, Inc.

Sampling Locations

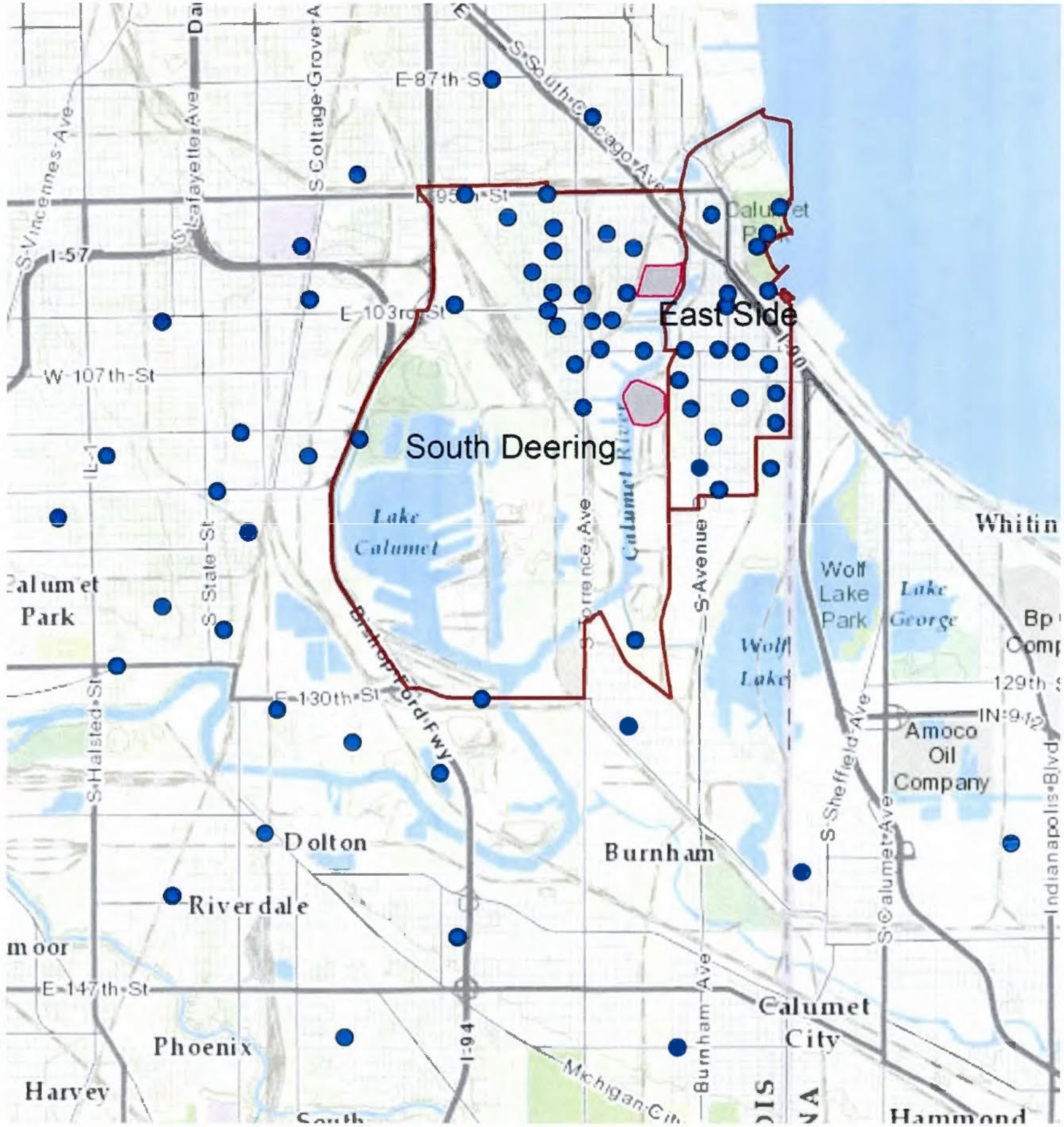
- Sampling Locations
- Site Locations
- Neighborhood Boundaries

Soil and surface sampling

69 total sites, 26 sites in control area

Public parks, bus stops and intersections

0 1 2 4 Miles



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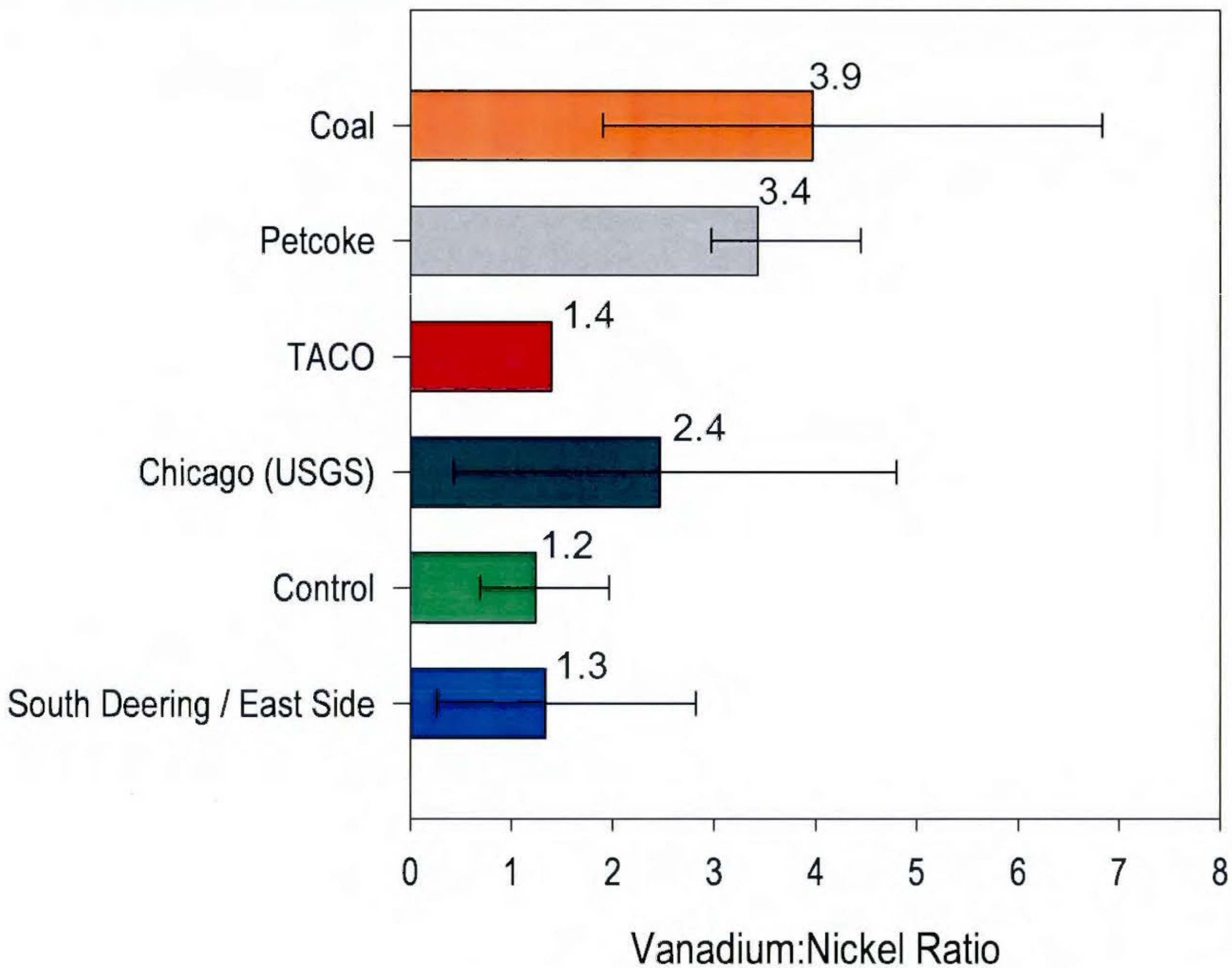
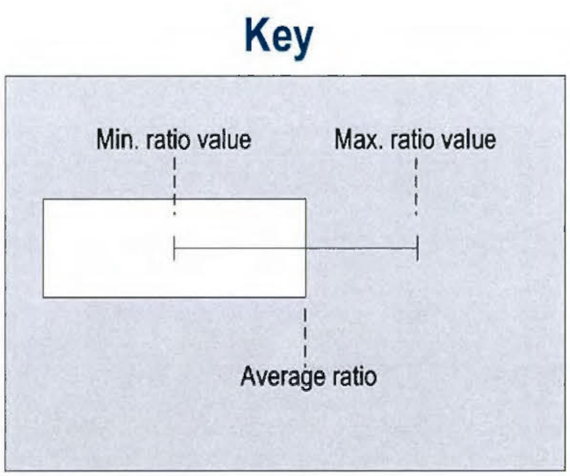
Signature Metal Ratios

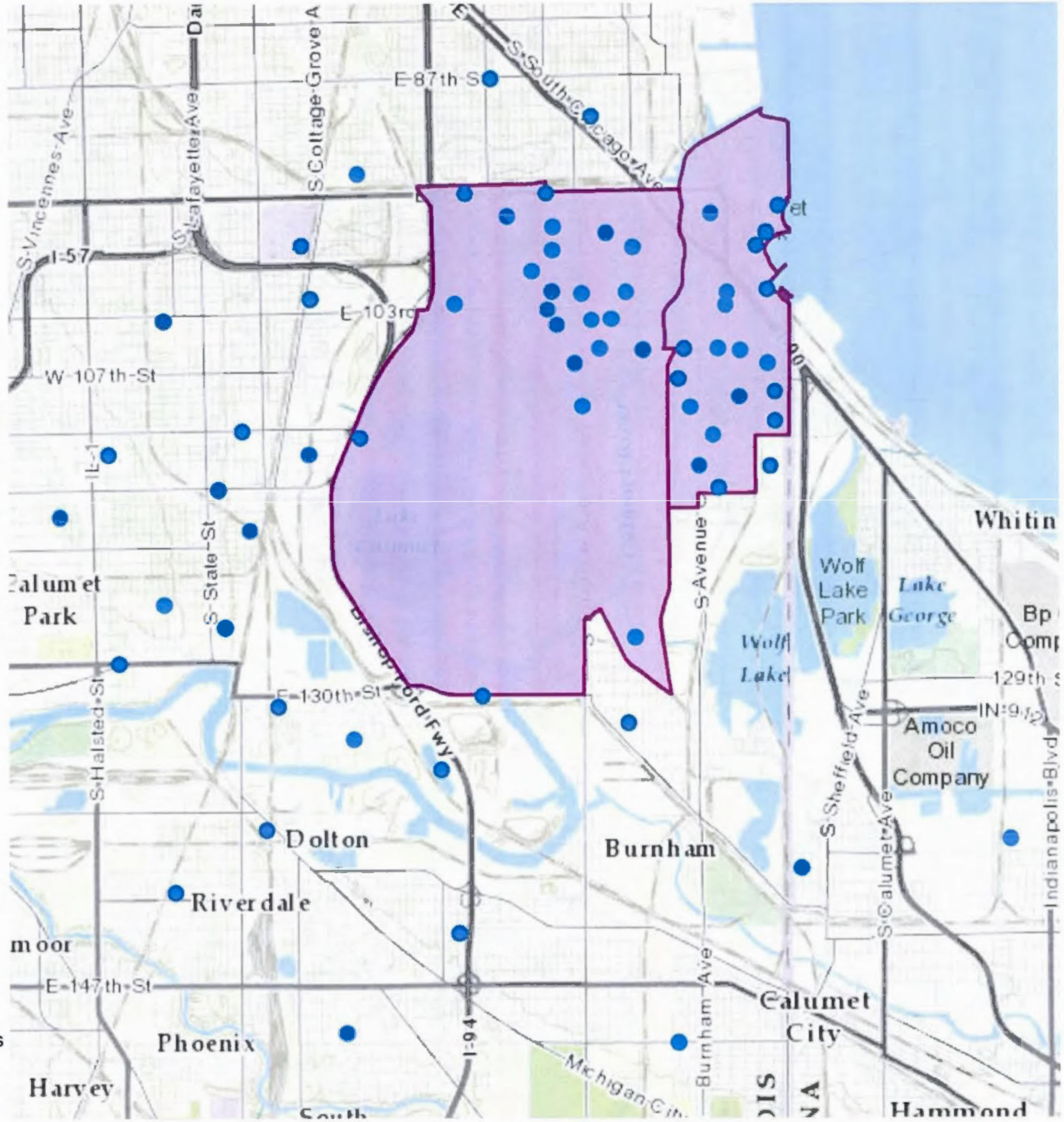




Sampling Locations

S. Deering / East Side

Mean V:Ni Ratio	
S. Deering/East Side	1.3
Control	1.2
Chicago (USGS)	2.4
TACO	1.4
Petcoke	3.4
Coal	3.9



0 1 2 4 Miles

Environmental Health & Engineering, Inc.

For more information:
www.eheinc.com
800-825-5343

ENVIRONMENTAL
HEALTH & ENGINEERING

Exhibit 6

U.S. Department of Energy, The Energy Information Administration (EIA)
EIA-923 Fuel Stocks Data at All Electric Power Sector Generating Facilities, 2013 October
Sources: EIA-923 and EIA-860 Reports

	Coal Stock (Thousand Tons)												Petroleum Liquids (Thousand Barrels)															
Region_Name	Coal_Jan	Coal_Feb	Coal_Mar	Coal_Apr	Coal_May	Coal_Jun	Coal_Jul	Coal_Aug	Coal_Sep	Coal_Oct	Coal_Nov	Coal_Dec	Oil_Jan	Oil_Feb	Oil_Mar	Oil_Apr	Oil_May	Oil_Jun	Oil_Jul	Oil_Aug	Oil_Sep	Oil_Oct	Oil_Nov	Oil_Dec	PetCoke_Jan	PetCoke_Feb	PetCoke_Mar	PetCoke_Apr
New England	866	712	647	707	1,051	1,197	1,017	1,080	1,145	1,283			2,281	2,257	2,497	2,460	2,449	2,428	2,326	2,594	3,088	3,495						
Connecticut	108	37	59	59	143	128	155	155	150	150			1 174	1 133	1 159	1 152	1 150	1 138	1,074	1 060	1,165	1,221						
Maine	0	0	0	0	0	0	0	0	0	0			157	202	321	288	281	270	224	212	417	520						
Massachusetts	432	420	355	352	550	668	514	524	533	663			744	748	811	818	820	826	859	1 052	1 238	1 466						
New Hampshire	326	254	234	296	358	402	348	401	463	471			136	103	137	134	132	128	107	208	207	230						
Rhode Island													21	22	22	22	22	21	21	21	21	19						
Vermont													50	49	48	47	46	45	41	41	40	39						
Middle Atlantic	7 179	6 772	6 467	6 531	6 946	6 749	5 384	5,438	5,689	6 162			5,021	4,980	5 100	5,053	5 015	4 955	4 693	4 804	4,687	4,656			0	0	0	0
New Jersey	682	838	815	817	859	885	877	928	953	998			1.022	1.015	979	954	951	947	906	898	822	819						
New York	486	385	329	417	413	520	417	465	499	490			3 130	3 117	3.296	3,275	3.258	3,210	3 003	3 118	3,100	3.134			0	0	0	0
Pennsylvania	5 810	5 548	5 323	5,296	5 674	5 344	4,090	4,047	4 236	4 674			870	848	825	824	805	798	784	788	765	702			0	0	0	0
East North Central	33,489	31,504	30,098	29,779	31,538	31,683	29,975	29,911	29,421	29,814			1,188	1 166	1 166	1,191	1 153	1 121	1,113	1 121	1,101	1 102			55	58	60	48
Illinois	8,418	7,366	6,669	6,077	6,694	6,445	6,229	6,386	6,339	6,288			114	115	113	110	105	106	102	101	94	95						
Indiana	8,680	8,439	8,706	8,715	8,969	9,204	8,666	8,717	8,513	8,316			112	107	110	118	114	111	108	103	102	104			0	0	0	0
Michigan	5,894	5,624	4 954	5,160	5 885	6,115	5,715	6,025	5 702	6 148			432	431	431	429	420	407	411	414	409	416			10	7	4	5
Ohio	5 990	5 934	6 091	6 205	5 920	5 970	5,579	4,973	4 993	5 051			292	277	279	308	286	269	267	272	277	267			23	28	34	23
Wisconsin	4,509	4 140	3 677	3,623	4 069	3 948	3,787	3,810	3,873	4 010			238	237	233	227	228	228	226	230	219	220			22	22	22	21
West North Central	29,925	29 332	28 980	28,505	28,707	27 878	26,346	24,985	25,220	24 314			1 032	1 023	1,016	1 006	987	972	972	961	958	964			0	0	0	0
Iowa	8,442	8 334	8 193	8,085	7 974	7 773	7,503	7,207	7 188	7 114			154	151	145	143	141	140	141	135	135	135			0	0	0	0
Kansas	3 545	3 466	3 546	3,485	3,598	3,609	3,311	3,161	3,164	3 055			160	162	161	162	159	152	161	159	159	151			0	0	0	0
Minnesota	2 579	2 591	2,620	2,911	3 002	2,990	2,685	2,326	2,404	2 345			164	163	158	157	154	152	152	154	152	149			0	0	0	0
Missouri	10,249	10 139	9 807	9,254	9 212	8 734	8 297	7,812	7,980	7 618			306	303	304	294	291	291	284	283	284	296			0	0	0	0
Nebraska	3 223	3 075	3 152	3,018	3 078	3 123	3 103	3,071	3 041	2 826			130	130	126	127	122	122	122	121	117	119						
North Dakota	1 616	1 485	1 417	1,515	1 648	1 447	1,208	1,190	1 212	1 134			37	36	41	45	44	38	37	39	38	42						
South Dakota	271	243	242	238	198	202	241	217	231	222			80	77	80	78	76	76	75	71	73	71						
South Atlantic	37 669	37 435	36 745	38,008	38,685	36,502	33 614	32,397	32,200	32 692			13 447	13 116	13 449	13,202	13 271	13 274	13 049	13 017	12,689	12 680			91	120	66	83
Delaware	221	225	213	211	223	189	116	113	112	118			390	391	391	391	390	368	371	371	370	369						
Florida	5 666	5 979	5 867	5 809	5.591	5 431	5,414	5 249	5 227	5 092			7 029	6,698	6 940	6,836	6 930	6 960	6,812	6 793	6,480	6 476			91	120	65	82
Georgia	9 966	10 042	10 127	10,086	9 839	9,063	8,491	8,249	8 147	8 474			915	916	915	912	912	911	908	906	903	902						
Maryland	1 723	1 581	1 473	1 605	1 541	1 443	1,308	1 312	1 380	1 507			820	820	802	789	785	784	751	773	762	757						
North Carolina	6.830	6 704	6 505	6 821	6.990	6.474	5.693	5.383	5 508	5 433			1 126	1.112	1 224	1 104	1 101	1 103	1 091	1 085	1 097	1 077						
South Carolina	5 979	5 949	5 841	5,958	6.072	5.819	5 500	5,345	5 284	5 279			639	631	635	628	620	620	604	602	597	596			0	0	0	0
Virginia	1 901	1,640	1 135	1 332	1,582	1 487	1,285	1,236	1 403	1,424			2 371	2 397	2,391	2,400	2 398	2 361	2 372	2 353	2,347	2 335						
West Virginia	5 381	5 315	5.585	6.187	6,847	6.594	5,808	5,511	5.139	5 366			157	150	151	141	135	147	140	134	144	168			1	1	*	1
East South Central	18.966	18 872	18 678	18,648	18.730	17,718	16,694	15,966	16 021	16 376			2 026	2 113	2 092	2,075	2 065	2 044	2 033	2 011	1 998	1 988			49	49	86	76
Alabama	5 997	6 051	5 752	5 613	5,298	4 937	4,696	4 381	4 134	3 954			320	319	317	312	312	310	312	312	309	305						
Kentucky	7,709	7 151	7,544	8,028	8,175	7,851	7,216	6,905	7,278	7 681			259	255	263	261	262	266	261	259	260	257			49	49	86	76
Mississippi	2 042	2 065	2 044	1 957	1 979	1 692	1,545	1,494	1,510	1 527			564	566	562	563	568	566	570	570	569	567						
Tennessee	3 219	3,605	3 339	3,050	3 278	3.238	3,237	3 185	3 098	3 214			883	973	950	939	925	903	890	870	860	860						
West South Central	28 778	28 709	28 493	29,930	29.913	28.587	26,870	25,243	24 091	24 332			2.513	2.498	2 445	2,444	2 439	2 451	2,412	2 368	2,323	2 319			209	184	164	220
Arkansas	4.146	3 804	3 621	3.649	3 692	3 479	3,044	2,534	2 515	2 914			242	241	239	243	240	239	232	230	227	226						
Louisiana	3 116	3 193	3 195	3 353	3 838	3,643	3.747	3 743	3 570	3 786			655	671	660	660	654	652	654	651	647	644			196	171	151	207
Oklahoma	4,720	4 749	4 782	4,927	4 809	4 890	4,546	4,162	3 568	3 225			196	196	195	193	191	198	170	126	102	98						
Texas	16,796	16 962	16 896	17 008	17 576	16 576	15,532	14,804	14 439	14 403			1 420	1 390	1 352	1,349	1 352	1 362	1 355	1 362	1,346	1 352			13	13	13	13
Mountain	19 711	19 740	19 502	19,694	19 304	18,559	18 063	17,653	16 959	17 039			672	667	651	656	653	657	654	653	643	639			36	30	31	26
Arizona	4 202	4 352	4 246	4,020	3,889	3 661	3,435	3,263	2 921	2 902			224	223	210	213	214	212	208	209	204	207						
Colorado	3,966	4,106	4 109	4,169	3,976	3,795	3,735	3,662	3 640	3 727			126	125	124	125	125	125	124	123	120	120						
Idaho													0	0	0	0	0	0	0	0	0	0						
Montana	1 019	1,002	953	984	948	993	946	1,006	1 006	1 022			18	18	17	17	16	15	17	17	17	16			36	33	31	26
Nevada	1 111	965	958	1,037	1,050	892	835	719	727	815			179	179	179	179	180	179	179	180	179	179						
New Mexico	1 003	1 008	998	998	968	973	967	957	948	934			47	45	45	44	43	48	50	47	47	42						
Utah	4,627	4,577	4,611	4 804	4 874	4,891	4,914	4 750	4,479	4 497			50	48	50	47	44	45	46	44	44	44						
Wyoming	3,783	3,730	3 626	3 683	3,599	3 354	3 231	3,295	3 239	3 143			27	28	28	30	30	32	31	33	31	31						
Pacific Contiguous	1 603	1 659	1 300	1,239	1 187	1,052	960	836	828	731			406	403	401	386	389	388	391	387	381	378			0	0	0	1
California	31	36	38	20	26	28	17	28	3	2			200	199	198	186	186	186	191	189	185	185			0	0	0	1
Oregon	954	937	911	854	706	603	626	572	580	500			100	99	98	97	100	100	101	99	98	94						
Washington	619	685	352	385	365	422	317	238	246	230			106	106	105	103	103	102	100	99	98	98						
Pacific Noncontiguous	562	591	609	606	610	609	611	609	612	609			2,576	2 657	2 861	2,579	2 475	2,336	2 261	2 413	2,347	2,266						
Alaska	499	503	507	510	517	529	536	540	545	546			250	235	215	187	168	152	125	98	81	65						
Hawaii	63	88	102	95	93	79	76	70	67	63			2,326	2 422	2 646	2,392	2 307	2 184	2 156	2 314	2,267	2,201						
U.S. Total	178 747	175 325	171 518	172 654	176 670	170,534	159 536	154 119	152,185	153 252			31,163	30 880	31,678	31 052	30 894	30 626	29 924	30 328	30,2'5	30,487			442	442	406	455

Petroleum Coke (Thousand Barrels)							
PetCoke_May	PetCoke_Jun	PetCoke_Jul	PetCoke_Aug	PetCoke_Sep	PetCoke_Oct	PetCoke_Nov	PetCoke_Dec
0	1	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
79	61	69	56	108	77		
0	0	0	0	0	0		
5	4	5	5	20	26		
53	43	50	35	75	33		
20	14	14	16	14	18		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
89	90	78	44	34	50		
89	90	78	43	34	49		
0	0	0	0	0	0		
1	1	1	0	0	0		
28	27	47	30	27	27		
28	27	47	30	27	27		
218	203	171	95	107	106		
211	172	140	93	105	104		
[illegible]	30	31	2	7	2		
28	26	28	34	32	31		
28	26	28	34	32	31		
1	1	1	1	1	0		
1	1	1	1	1	0		
442	407	394	260	309	291		

Exhibit 7

DAVID L. MACINTOSH, Sc.D., C.I.H. CHIEF SCIENCE OFFICER

PROFESSIONAL SUMMARY

David L. MacIntosh, Sc.D., C.I.H, is Chief Science Officer at Environmental Health & Engineering, Inc. (EH&E) in Needham, Massachusetts. Dr. MacIntosh oversees the scientific aspects of projects conducted by scientists, industrial hygienists, and engineers who specialize in diagnosing and analyzing the complex relationships among sources, pathways, and receptors of environmental stressors that influence health in the built environment. His recent activity has focused on problematic building materials, ambient air quality, heavy metals, naturally occurring radioactive materials, persistent organic pollutants, and risk analysis training materials. Dr. MacIntosh is also an Adjunct Associate Professor of Environmental Health at the Harvard School of Public Health where he teaches a course on exposure assessment. Prior to joining EH&E, Dr. MacIntosh was a tenured faculty member at the University of Georgia. He earned a doctorate in Environmental Health from the Harvard School of Public Health and a M.S. and B.S. from Indiana University. Dr. MacIntosh is active in professional service through organizations such as the International Society for Exposure Science, the Centers for Disease Control and Prevention, and the World Health Organization.

PROFESSIONAL BACKGROUND

2012-	Chief Science Officer, Environmental Health & Engineering, Inc., Needham, MA
2010-2012	Principal Scientist and Associate Director of Advanced Analytics and Building Science, Environmental Health & Engineering, Inc., Needham, MA
2009-	Adjunct Associate Professor of Environmental Health, Harvard School of Public Health, Boston, MA
2007-2011	Instructor of Environmental Management, Harvard Extension School, Cambridge, MA
2005-	Adjunct Associate Professor of Environmental Studies, Brandeis University, Waltham, MA
2005-2010	Principal Scientist and Associate Director of Advanced Analytics, Environmental Health & Engineering, Inc., Needham, MA
2002-2005	Principal Scientist, Environmental Health & Engineering, Inc., Needham, MA
2001-2002	Associate Professor (Tenured), Department of Environmental Health Science, University of Georgia, Athens, GA
1996-2001	Assistant Professor, Department of Environmental Health Science, University of Georgia, Athens, GA
1996-2002	Adjunct Assistant Professor, Department of Environmental and Occupational Health, Emory University, Atlanta, GA
1995-1996	Research Associate, Department of Environmental and Occupational Health, Emory University, Atlanta, GA

EDUCATION

Sc.D. Harvard School of Public Health, Boston, MA, Environmental Health, 1995
M.S. Indiana University, Bloomington, IN, Environmental Science, 1991
B.S. Indiana University, Bloomington, IN, Decision Science, 1985

PROFESSIONAL REGISTRATION

American Board of Industrial Hygiene, Certified in Comprehensive Practice

PROFESSIONAL AFFILIATIONS

International Society of Exposure Analysis
- Membership and Web Committee, 2008
- Membership Committee Chair, 2003-2008
- Councilor, 2003-2006
- Nominations Committee Chair, 1998-2001
- Member, 1995-

Air and Waste Management Association
- Member, 2003-

Society for Risk Analysis
- Member, 2005-

American Industrial Hygiene Association
- Member, 2010-

International Society of Indoor Air Quality and Climate
- Member, 2011-

PROFESSIONAL SERVICE

World Health Organization
- First Draft Author, *Human Health Risk Assessment Toolkit*, World Health Organization, Geneva, 2011.
- Peer Reviewer and Rapporteur, *A Toolkit for Chemical Risk Assessment*, International Programme on Chemical Safety, World Health Organization, Lyon, France, 2009.
- First Draft Author, *Public Health Management of Chemical Incidents*, World Health Organization, Geneva, 2009.
- Instructor, WHO Training on Public Health Management of Chemical Incidents and Emergencies, Beijing, China, April 26-27, 2007.
- Technical Advisor, Pediatric Dental Fluorosis and Mt. Nyriagongo, Democratic Republic of Congo, 2006-7.
- Technical Advisor, Pesticide Exposure Assessment in Somalia, 2003.
- Contributor, *Report on Global Burden of Air Pollution*, 2000.
- First Draft Author, *Environmental Health Criteria 214: Human Exposure Assessment*, International Programme on Chemical Safety, WHO, Geneva, 2000.
- Chair, Environmental Health Criteria on Human Exposure Assessment Editorial Committee, 1998.
- Rapporteur, Task Group Meeting for the Environmental Health Criteria on Human Exposure Assessment, 1998.
- Chair, Exposure Assessment Textbook Committee, 1996.

Massachusetts Environmental Health Association
Presidents Award, 2011.
U.S. Centers for Disease Control and Prevention
Gulf Coast Children's Study, Technical Advisory Panel, 2010-
National Nanotechnology Coordination Office
Session Co-Chair, Human and Environmental Exposure Workshop, National Science and Technology Council, National Nanotechnology Initiative, Bethesda, Maryland, 2009.
U.S. Environmental Protection Agency
Member, Peer Review Panel, Human Exposure and Atmospheric Sciences Division, U.S. National Exposure Research Laboratory, 2008.
Panel Member, Benzene Peer Consultation, Voluntary Children's Chemical Evaluation Program, 2006.
Member, FIFRA Science Advisory Panel, 2003-2005.
Review Panel Member, Aggregate Exposure Model Companion Workshop, 2002.
Review Panel Member, Dietary Exposure Research – Future Steps, 2002.
Member, FIFRA Science Advisory Panel, 2000.
Invited Participant, Workshop on NHEXAS data analysis, 1999.
National Institute for Environmental Health Sciences
Invited Participant, Workshop on Human Exposure Assessment, Washington, DC, 1999.
International Life Sciences Institute
Invited Participant, Generalizing and Utilizing Aggregate Residential Exposure Data – A Conversation between Regulators, Modelers, and Research Scientists, 2003.
Invited Participant, Information Sharing Workshop on Aggregate Exposure Models, 1999.

PUBLICATIONS

Allen JG, Zwack LM, **MacIntosh DL**, Minegishi T, Stewart JH and McCarthy JF. 2012. Predicted indoor radon concentrations from a Monte Carlo simulation of 1,000,000 granite countertop purchases. *Journal of Radiological Protection.* Accepted.

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Stewart JH, **MacIntosh DL**, Allen JG, McCarthy JF. 2012. Germanium, Tin and Copper. In *Patty's Toxicology, Sixth Edition.* Bingham E and Cohrssen B, eds. New York, NY: John Wiley and Sons, Inc.

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MacIntosh DL. (Expert Committee Member). 2011. Evaluating and Mitigating the Risk of Disease Transmission at Airport and on Aircraft. National Academy of Sciences: Washington, DC, USA.

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MacIntosh DL, Zimmer-Dauphinee SA, Manning RO, Williams PL. 2000. Aldehyde concentrations in ambient air of coastal Georgia, USA. *International Journal of Environmental Monitoring and Assessment.* 63:409-429.

Owens J, Dickerson S, **MacIntosh DL**. 2000. Demographic covariates of residential recycling efficiency. *Environment and Behavior.* 32(5):637-650.

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MacIntosh DL, Williams PL, Hunter DJ, Sampson LA, Morris SC, Willett WC, Rimm EB. 1997. Evaluation of a food frequency questionnaire-food consumption approach for estimating dietary

intake of inorganic arsenic and methylmercury. *Cancer Epidemiology, Biomarkers, and Prevention.* 6:1043-1050.

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Minegishi T, Allen JG, Coghlan KM, **MacIntosh DL**. 2011. PCB Emission Rates and Flux from Legacy Construction Materials at *Indoor Air 2011: The 12th International Conference on Indoor Air Quality and Climate*. Austin, TX, USA. June 5-10, 2011.

Myatt TA, Minegishi T, Allen JG, **MacIntosh DL**. 2011. Control of $PM_{2.5}$ Infiltration in High Rise Residential Buildings: A Modeling Analysis at *Indoor Air 2011: The 12th International Conference on Indoor Air Quality and Climate*. Austin, TX, USA. June 5-10, 2011.

MacIntosh DL. 2011. Managing PCBs in Building Materials at *Massachusetts Environmental Health Association (MEHA) Annual Meeting and Educational Seminar*. Woburn, MA, USA. May 4, 2011.

Minegishi T, Allen J, **MacIntosh D**. 2010. Predicting Seasonal Indoor PCB Concentrations Based on Fundamental Equations at the *30th International Symposium on Halogenated Persistent Organic Pollutants (POPs)*. San Antonio, TX, USA. September 12-17, 2010.

Allen J, Myatt T, Jessup D, Ludwig J, McCarthy J, **MacIntosh D**. 2009. Assessing Risk of Nosocomial Legionnaires Disease from Environmental Sampling – The Limits of Using a Strict Percent Positivity Approach at *Society of Risk Analysis 2009 Annual Meeting*. Baltimore, MD, USA. December 6-9, 2009.

Minegishi T, Allen J, **MacIntosh D**. 2009. Characterization of Subslab-to-Indoor-Air Attenuation Factors in the U.S. EPA Vapor Intrusion Database at the *International Society of Exposure Science 2009 Annual Conference*. Minneapolis, MN, USA. November 1-5, 2009.

Allen J, Minegishi T, Myatt T, McCarthy J, **MacIntosh D**. 2009. Assessing Exposure to Radon and Radiation from Granite Countertops: Part 1 – Radon at *Healthy Buildings 2009: 9th International Conference and Exhibition*. Syracuse, NY, USA. September 13-17, 2009.

Myatt T, Allen J, Minegishi T, McCarthy W, **MacIntosh D**, McCarthy J. 2009. Assessing Exposure to Radon and Radiation from Granite Countertops: Part 2 – Radiation at *Healthy Buildings 2009: 9th International Conference and Exhibition*. Syracuse, NY, USA. September 13-17, 2009.

Allen J, Minegishi T, Myatt T, McCarthy J, **MacIntosh D**. 2009. Assessing Exposure to Radon and Radiation from Granite Countertops at *X2009: Sixth International Conference on Innovations in Exposure Assessment*. Boston, MA, USA. August 17-20, 2009.

Myatt T, Minegishi T, Allen JG, **MacIntosh DL**. 2008. Mitigation of asthma triggers in indoor air: a comparison of air cleaning options at the *American Public Health Association Annual Meeting*. San Diego, CA, USA. October 25-29, 2008.

Minegishi T, Kaufman M, Allen J, **MacIntosh DL**. 2008. Assessing the Impact of Traffic-Related Air Pollution Associated with a Proposed Development in a Densely Populated Urban Area at the *American Public Health Association Annual Meeting*, San Diego, CA, USA. October 25-29, 2008.

MacIntosh DL, Minegishi T, Levy JI, Myatt T. 2008. In-Duct Air Cleaning: A Modeling and Health Impact Assessment at the *American Public Health Association Annual Meeting*, San Diego, CA, USA. October 25-29, 2008.

MacIntosh DL, Stewart JH, Sabato J, Myatt T, Flowers G, Brown K, Hlinka D, Sullivan D. Determination of the Population at Risk of Heavy Metal Exposure from a Former Smelter at the *International Society for Exposure Science / International Society for Environmental Epidemiology Joint Annual Meeting*, Pasadena, CA, USA. October 16, 2008.

Minegishi T, Suh HH, Kaufman M, Allen J, Zamore W, Lipson S, **MacIntosh DL**. 2008. Traffic-related Air Pollution in a Densely Populated Urban Area at the *International Society for Exposure Science / International Society for Environmental Epidemiology Joint Annual Meeting*. Pasadena, CA, USA. October 13, 2008.

Myatt T, Minegishi T, Kaufman M, Baker B, **MacIntosh DL**. 2007. Application of GIS to Estimate Public Health Benefits of Whole House In-Duct Air Cleaning at the *ESRI 2007 Health GIS Conference*. Tucson, AZ, USA. October 8-10, 2007.

MacIntosh DL, McCarthy JF, Ludwig JF, Naeher LP, Suh HH, Spengler JD. 2006. Reductions in Aerosol Exposure Afforded by Indoor Air Cleaning Systems at the *International Society for Exposure Science Annual Meeting*. Paris, France. September 2-6, 2006.

MacIntosh DL, McCarthy JF, Ludwig JF, Naeher LP, Suh HH, Spengler JD. 2006. Whole House Air Cleaning by In-Duct and Portable Cleaners at *Healthy Buildings 2006*. Lisbon, Portugal. June 4-8, 2006.

Myatt TA, Naeher LP, **MacIntosh DL**, Suh HH. 2004. Markers of Inflammation in Alveolar Cells Exposed to Fine Particulate Matter from Atlanta at the *American Association for Aerosol Research 2004 Conference*. Atlanta, GA, USA. October 4-9, 2004.

MacIntosh DL, Kabiru C, and Ryan PB. 2000. Pesticide Residues in Duplicate Diet Samples from the NHEXAS-Maryland Investigation at the *10th Annual* Conference *of the International Society* of *Exposure Analysis*. Monterey, CA, USA. October 24-27, 2000.

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