No. 13-599

In the
Supreme Court of the United States

MINGO LOGAN COAL COMPANY,
Petitioner,
v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,
Respondent.

On Petition for a Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

BRIEF OF NATIONAL ASSOCIATION OF MANUFACTURERS, AMERICAN ROAD AND TRANSPORTATION BUILDERS ASSOCIATION, ASSOCIATED GENERAL CONTRACTORS OF AMERICA, ASSOCIATION OF AMERICAN RAILROADS, THE FERTILIZER INSTITUTE, AMERICAN SOCIETY OF CIVIL ENGINEERS, *ET AL.* AS *AMICI CURIAE* IN SUPPORT OF PETITIONERS
[Additional *amici* listed on inside cover]

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ADDITIONAL *AMICI CURIAE*:

AMERICAN COALITION FOR CLEAN COAL ELECTRICITY, METALS SERVICE CENTER INSTITUTE, AMERICAN COATINGS ASSOCIATION, MARCELLUS SHALE COALITION, LIGNITE ENERGY COUNCIL, INDUSTRIAL FASTENERS INSTITUTE, COUNCIL OF INDUSTRIAL BOILER OWNERS, NATIONAL OILSEED PROCESSORS ASSOCIATION, PRESSURE SENSITIVE TAPE COUNCIL, AMERICAN COUNCIL OF ENGINEERING COMPANIES, AMERICAN FUEL & PETROLEUM MANUFACTURERS, AND ASSOCIATED EQUIPMENT DISTRIBUTORS

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INTEREST OF *AMICI CURIAE*[1]

The National Association of Manufacturers ("NAM") is the nation's largest industrial trade association, representing small and large manufacturers in every industrial sector and in all 50 states. NAM's mission is to enhance the competitiveness of manufacturers by shaping a legislative and regulatory environment conducive to U.S. economic growth and to increase understanding among policymakers, the media and the general public about the vital role of manufacturing to America's economic future and living standards.

The American Road and Transportation Builders Association ("ARTBA")'s membership includes public agencies and private firms and organizations that own, plan, design, supply and construct transportation projects throughout the country. ARTBA's industry generates more than $380 billion annually in U.S. economic activity and sustains more than 3.3 million American jobs.

Established in 1918, the Associated General Contractors of America ("AGC") is the leading association in the construction industry. In conjunction with its nationwide network of 93 chapters, AGC represents

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[1] Pursuant to Supreme Court Rule 37.6, counsel for *amici* represent that they authored this brief in its entirety and that none of the parties or their counsel, nor any other person or entity other than *amici*, their members, or their counsel, made a monetary contribution intended to fund the preparation or submission of this brief. Pursuant to Rule 37.2(a), counsel for *amici* represent that all parties were provided notice of *amici*'s intention to file this brief at least 10 days before its due date. Counsel for Mingo Logan Coal Co. has given its blanket consent to the filing of amicus briefs. Counsel for the Environmental Protection Agency consented via a letter that is on file with the clerk.

and serves nearly 30,000 of the leading firms in the construction industry—including general contractors, specialty contractors and service providers and suppliers. Collectively, these firms account for much if not most of the public and private infrastructure on which the remainder of the nation's economy has to depend. Their critical work both sustains and enhances the nation's productivity and its quality of life.

The Association of American Railroads is a trade association whose membership includes freight railroads that operate 82 percent of the line-haul mileage, employ 95 percent of the workers, and account for 97 percent of the freight revenues of all railroads in the United States, as well as passenger railroads that operate intercity passenger trains and provide commuter rail service. As a group, the railroad industry in the United States operates over approximately 140,000 miles of right-of-way.

The Fertilizer Institute ("TFI") represents the nation's fertilizer industry. The producers, manufacturers, retailers, trading firms and equipment manufacturers that comprise TFI's membership are served by a full-time Washington, D.C. staff in various legislative, educational and technical areas, as well as with information and public relations programs.

Founded in 1852, the American Society of Civil Engineers ("ASCE") represents more than 145,000 members of the civil engineering profession worldwide and is America's oldest national engineering society. ASCE's mission is to provide essential value to its members and partners, advance civil engineering, and serve the public good. As part of this mission, ASCE is committed to protecting the health, safety and welfare of the public, including through the im-

provement of the nation's infrastructure. ASCE's 2013 *Report Card for America's Infrastructure* provides the most comprehensive and clear picture of the state of infrastructure in the United States.

The American Coalition for Clean Coal Electricity ("ACCCE") is a partnership of the industries involved in producing electricity from coal. ACCCE recognizes the inextricable link between energy, the economy and the environment, and supports policies that encourage the use of coal to ensure a reliable and affordable supply of electricity that meets our nation's growing demand for energy.

More than 100 years strong, Metals Service Center Institute ("MSCI") is the broadest-based, not-for-profit association serving the industrial metals industry. As the premier metals trade association, MSCI provides vision and voice to the metals industry, along with the tools and perspective necessary for a more successful business.

The American Coatings Association ("ACA") is a voluntary, nonprofit organization working to advance the needs of the paint and coatings industry and the professionals who work in it. Through advocacy of the industry and its positions on legislative, regulatory and judicial issues at all levels of government, the ACA acts as an effective ally in ensuring that the industry is represented and fairly considered. ACA also devotes itself to advancing the industry through product stewardship, focuses on advancements in science and technology, and offers essential business information to its members.

The Marcellus Shale Coalition ("MSC") was formed in 2008 and is currently comprised of approximately 300 producing and supply chain members who are fully committed to working with local, county, state

and federal government officials and regulators to facilitate the development of the natural gas resources in the Marcellus, Utica and related geological formations. MSC members represent many of the largest and most active companies in natural gas production, gathering and transmission in the country, as well as the suppliers, consultants and contractors who serve the industry. MSC member companies have a steadfast commitment to strengthen communities by making the region a better place to live, work and raise families—for present generations and for future generations.

The Lignite Energy Council is a trade association representing North Dakota's lignite mines, which produced 27.5 million tons of lignite in 2012, along with nine lignite-based power plants, the Dakota Gasification Company's synfuels plant and more than 375 companies that supply goods and services to the regional lignite industry.

The Industrial Fasteners Institute ("IFI") represents the North American Manufacturers of the nuts, bolts, screws, pins, rivets and other cold formed parts that hold together almost everything we drive, fly, work with, work on, live and work within, drive over and use in everyday life. The IFI represents about 85% of the production capacity for these products.

The Council of Industrial Boiler Owners ("CIBO") is a broad-based association of industrial boiler owners, architect-engineers, related equipment manufacturers, and University affiliates with members representing 20 major industrial sectors. CIBO members have facilities in every region of the country and a representative distribution of almost every type of industrial, commercial and institutional ("ICI") boiler and fuel combination currently in operation. Since its formation, CIBO has

been active in the development of technically sound, reasonable, cost-effective energy and environmental regulations for ICI boilers.

The National Oilseed Processors Association ("NOPA") is a national trade association that represents 13 companies engaged in the production of food, feed, and renewable fuels from oilseeds, including soybeans. NOPA's member companies process more than 1.6 billion bushels of oilseeds annually at 63 plants located in 19 states throughout the country, including 57 plants that process soybeans.

The Pressure Sensitive Tape Council ("PSTC") is a North American trade association representing pressure sensitive adhesive tape manufacturers and their affiliate suppliers. PSTC members produce over 90% of the $10 billion dollars of pressure sensitive adhesive tapes sold in North America. PSTC provides education and training, works with ASTM and global trade organizations to harmonize test methods, and monitors legislative and regulatory activities that affect this important industry.

The American Council of Engineering Companies ("ACEC") is the national nonprofit trade association of the engineering industry, representing more than 5,000 firms throughout the country. Founded in 1909, the Council's mission is to advance America's prosperity, health, safety and welfare through legislative advocacy and business education services on behalf of the engineering industry. ACEC is organized into 51 state and regional member organizations. Member firms employ more than 500,000 engineers, architects, surveyors, scientists, and other specialists, responsible for more than $200 billion of private and public works annually.

The American Fuel & Petrochemical Manufacturers ("AFPM") is a national trade association of more than 400 companies, including virtually all U.S. refiners and petrochemical manufacturers. AFPM members operate 122 U.S. refineries comprising approximately 98% of U.S. refining capacity. AFPM petrochemical members support about 1.4 million American jobs, including about 214,000 employed directly in petrochemical manufacturing plants.

Associated Equipment Distributors ("AED") is the trade association representing independent, factory-authorized companies involved in the distribution of construction, mining, forestry, energy, industrial, and power generation equipment in the U.S. and Canada. AED's U.S. dealer members employ approximately 47,000 people at more than 2,800 facilities. The estimated $27 billion that U.S. AED members earn annually from equipment sales, rental, and product support generates $86 billion in direct, indirect, and induced economic activity nationwide.

Amici and their members are both directly and indirectly affected by federal policies and regulations governing the issuance of Clean Water Act Section 404 permits. They regularly engage in a variety of activities that require compliance with Section 404 permits. They also rely on facilities and infrastructure that operate pursuant to their own Section 404 permits. The Environmental Protection Agency ("EPA")'s unprecedented nullification of a previously issued permit has upended the Section 404 permitting process, making it more difficult for *amici* and their members to rely on the Clean Water Act permits they need to conduct a wide range of economically beneficial activities and to accomplish environmental objectives through mitigation.

INTRODUCTION

Permits issued by the U.S. Army Corps of Engineers under Section 404(a) of the Clean Water Act have long balanced the general interest in protecting the natural environment with the important economic benefits generated by public and private investment. The Section 404 permitting program authorizes hundreds of billions of dollars of investment each year, while at the same time requiring permittees to avoid, minimize and mitigate the adverse environmental effects of their activities. The program accomplishes these goals through consistent application of detailed regulations promulgated by the Corps and careful compliance with EPA guidelines. Although "[t]he burden of federal regulation" created by this permitting regime is surely "not trivial," amounting to more than $1.7 billion in total costs annually (*Rapanos v. United States*, 547 U.S. 715, 721 (2006)), it has the cardinal virtue of providing permittees with certainty that compliance with their permit means compliance with the law.

EPA's actions and arguments in this case, as affirmed by the court below, would overthrow the Section 404 permitting program as it currently exists, sowing uncertainty among both current permit holders and potential investors whose projects are critically dependent on Section 404 permits. Until it "vetoed" the Section 404 permit that the Corps had issued to Petitioner Mingo Logan Coal Company four years earlier, EPA had always played an important, but subsidiary, role in the Section 404 permitting process. Now, relying on subsection 404(c), EPA has set itself up as the unfettered overseer of all Section 404 permits, past, present and future.

EPA's stunning, newfound authority to nullify a Section 404 permit, even years after it issues, inarguably increases the regulatory risks faced by public and private permit applicants. Some number of project proponents who were previously situated on the margins of the benefit-cost calculation will inevitably be pushed away from pursuing their plans by the possibility that EPA will override a Corps permitting decision. In an effort to quantify this effect, *amici* draw on the work of economist David Sunding to demonstrate that even a small risk of adverse EPA action against a permit dramatically decreases a project's benefit-to-cost ratio. As a result, projects that would have been built under the existing regime will be delayed or completely abandoned, causing both direct and downstream economic losses.

EPA intends its extraordinary revision to the longstanding Section 404 permitting regime to apply immediately and everywhere. The Agency's website already proclaims that its "Section 404(c) authority may be exercised before a permit is applied for, while an application is pending, or after a permit has been issued."[2] Indeed, EPA's interpretation of Section 404(c) would give it broader authority over already-issued permits than is retained by the Corps, which accounts for the permittee's reliance interests before modifying, suspending or revoking a permit. This power grab by EPA will significantly reduce investment by creating uncertainty for current and future Section 404 permittees. It should not be allowed to stand without this Court's full consideration.

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[2] *See* Section 404(c) "Veto Authority" Factsheet, *available at* water.epa.gov/lawsregs/guidance/cwa/dredgdis/upload/404c.pdf.

ARGUMENT

I. EPA's claim to unconstrained authority under Section 404(c) will harm the economy.

Section 404(a) of the Clean Water Act authorizes the Secretary of the Army to "issue permits . . . for the discharge of dredged or fill material into the navigable waters at specified disposal sites." 33 U.S.C. § 1344(a). The Corps, as the Secretary's delegatee, issues approximately 60,000 discharge permits under Section 404 every year, facilitating an estimated $220 billion of investment in the U.S. economy. App.2a. These investments run the gamut of economic activity, from vital infrastructure such as roads, pipelines and rail lines, to renewable energy projects like wind farms and solar arrays, to privately owned manufacturing facilities and agriculture related businesses. For the reasons discussed below, EPA's new claim of authority to disregard reasonable and settled expectations by interfering with the Corps' permitting process for these investments will have a direct, adverse effect on the U.S. economy that is worthy of the Court's attention.

A. EPA's actions have undermined the expectations of project proponents.

The foundation of a good permitting regime is predictability. The Corps has been permitting projects under Section 404 of the Clean Water Act for more than four decades. As part of its permitting process, the Corps complies with detailed regulations that describe the substantive and procedural requirements for obtaining a Section 404 permit. *See generally* 33 C.F.R. Parts 323, 325. In addition, the Corps must adhere to regulations promulgated by EPA that specifically allow the Corps to consider economic practicability when weighing the environmental effects of a

permit. *See, e.g.*, 40 C.F.R. § 230.10. Importantly, the Corps' regulations explain the circumstances under which a permit may be modified, suspended or revoked—including, among other things, consideration of the permittee's compliance with the permit terms, and the extent to which a change in the permit would adversely impact the permittee's plans, investments or actions. 33 C.F.R. § 325.7(a).

EPA's role in the Corps' Section 404 permitting process, which is also well defined by regulation, provides ample opportunity for the Agency to voice its objections ***before*** a permit issues. *See, e.g.*, 33 C.F.R. §§ 325.2(b)(1); 325.3(d). In addition, EPA and the Corps are parties to a Memorandum of Agreement that provides a framework for the formal resolution of EPA's objections, as well as the exercise of EPA's power to withdraw a disposal site specification pursuant to subsection 404(c)—again, before the permit issues. The expectations of permit applicants were built around the costs and risks of these regulatory provisions, until EPA acted against the permit at issue in this case.[3]

When EPA decided that it could rely on subsection 404(c) to nullify an already-issued permit, it com-

[3] EPA asserts that it has withdrawn just 13 disposal specifications since the passage of the Clean Water Act, but the number of times the Agency has formally acted under Section 404(c) represents a "miniscule fraction" of the instances in which it has "resolved issues" by threatening to act. App.33a. So even if EPA generally refrains from exercising its Section 404(c) authority against already-issued permits in the future, the threat of such authority will still upset the regulatory balance by increasing EPA's influence during—and after—the permitting process. Furthermore, if EPA has the power to nullify a permit after it issues, opponents of the permitted project will have an ongoing incentive to lobby for EPA action, removing any semblance of finality for the permit holder.

pletely overthrew the settled understanding of how the Section 404 permitting regime worked. As EPA itself acknowledged prior to taking action in this case, the Agency had "***never before*** used its Section 404(c) authority to review a previously permitted project . . . ." App.42a (emphasis added). The EPA press release announcing the proposed "veto" of Mingo Logan's Section 404 permit likewise proclaimed that the Agency had "never" used its Section 404(c) authority against "a previously permitted project." App.52a. Yet, in the court below, EPA took the astounding position that it can "withdraw ***any*** specification" at any time, including after permit issuance, simply by making "the requisite adverse-effect determination." EPA C.A.Br. at 28 (emphasis added); *see id*. at 30.

Perhaps recognizing the significance of such a dramatic change in the regulatory regime, EPA has argued in the course of litigation that there have been other instances in which it exercised its subsection 404(c) authority against existing Section 404 permits. *Amici* disagree with EPA's convenient reinterpretation of those other actions.[4] But those fine distinctions are ultimately beside the point. As EPA's contemporaneous statements clearly establish, the Agency's action against the permit issued to Mingo Logan represents, at the very least, the first wide public airing of EPA's alleged authority to nulli-

[4] A 2011 law review comment observed that "[o]nly one of the EPA's previous twelve vetoes has been used after the issuance of a section 404 permit. Even in that instance, the veto came only when the permit was being modified to allow garbage to be the fill material for the project." Amy Oxley, *No Longer Mine: An Extensive Look at the Environmental Protection Agency's Veto of the Section 404 Permit Held by the Spruce No. 1 Mine*, 36 S. ILL. U. L.J. 139, 147 (2011).

fy already-issued Section 404 permits by "withdrawing" a disposal site specification "at any time." Consequently, this is the case that has unsettled the regulated community's long-held expectations about the Section 404 permitting process.

B. Increasing permit uncertainty will reduce economic investment.

Uncertainty is the archenemy of project development. As Professor Sunding explains, "[p]roject development usually requires significant capital expenditure over a sustained period of time, after which the project generates some return." App.10a.[5] One difficulty with projects that require large, upfront expenditures before their benefits can be realized is that actions that "increase uncertainty" will "raise the threshold for any private or public entity to undertake the required early-stage investment." App.10a. Because projects with these characteristics often require the project proponent to secure a Section 404 permit, "EPA's action [in this case] has a chilling effect on investment . . . across a broad range of markets." App.10a.

Professor Sunding mathematically demonstrates the adverse investment incentive effect of increasing Section 404 permit uncertainty. The decision to invest in a project can be readily represented by a ratio of the project's present-value benefits to the total in-

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[5] Dr. David Sunding is the Thomas J. Graff Professor in the College of Natural Resources at the University of California-Berkeley. His research into environmental and natural resource economics and the economics of regulation was cited by this Court in *Rapanos*, 547 U.S. at 721. Professor Sunding's paper, *Economic Incentive Effects of EPA's After-the-Fact Veto of a Section 404 Discharge Permit Issued to Arch Coal* (App.1a-26a), was submitted to the district court and the Court of Appeals in this case.

vestment costs. App.10a. If the project benefits exceed the project costs, the ratio will be greater than one. But both public agencies and private firms also require a certain level of return on their investment—known as the "hurdle rate"—before they will move forward with a project. Crucially, "[w]hen uncertainty exists on the future benefits and cost of a project, firms and public agencies often use risk-adjusted hurdle rates." App.11a. In other words, when agencies and firms perceive greater risk, they demand greater levels of return before they will move forward with a project. If the project cannot provide those increased benefits, it will not be pursued.

EPA's effort to nullify the Section 404 permit issued to Mingo Logan will have a particularly pernicious effect on investment, as Professor Sunding has shown. The possibility of EPA action against a permit causes a distortion in the benefit-cost ratio of new investments. Using a formula derived by Professor Sunding, it can be seen that even a small change in the probability that EPA will attempt to nullify a permit causes large changes in investment incentives. For instance, if investors perceive a 1% chance per year of EPA action against a permit, the expected benefit-cost ratio of the project decreases by 17.5%. App.15a. A mere 2% chance of adverse EPA action decreases the benefit-cost ratio of the project by 30%. App.15a. These sharp declines in the benefit-cost ratio lead Professor Sunding to conclude that even "small changes" in the perceived possibility that EPA will act against a permit "can lead to ***dramatic reductions in private investment***." App.15a. And of course, there is no reason to expect the effect on public investments to be any different. In each instance, as Professor Sunding observes, this "possibility of revocation has the largest deterrent effect on

large projects," which generally face a greater "downside risk" due to the likelihood of stranded capital investment. App.15a.

If a project proponent still wants to invest despite the additional risks created by EPA's claims of unlimited authority under subsection 404(c), it may not be able to obtain necessary financing or public funding, as the case may be. Professor Sunding shows how banks could account for increased uncertainty by setting higher interest rates on projects that require a Section 404 permit. App.17a. Bond rating agencies may similarly take into account the new regulatory risks created by EPA when pricing a proposed bond issuance. App. 16a-17a. This will make borrowing more expensive for both public agencies and private firms whose projects require them to obtain a Section 404 permit. Such additional borrowing expenses may be the difference between moving forward with a project—albeit at a lower benefit-cost ratio—and declining to make a capital investment.

II. The decision below will stymie investment in areas where it is desperately needed.

Permitting a project under Section 404 is already an expensive, time-consuming process. In recent years, it has taken an average individual permit applicant 788 days and more than $270,000 to complete the process. *Rapanos*, 547 U.S. at 721. Large-scale projects like those undertaken by *amici* and their members can require even more time and money. Professor Sunding's study establishes that the threat of EPA permit nullification will dramatically increase these costs. In practical terms, that means public and private entities will not invest in projects that would have moved forward in the absence of EPA's effort to reshape the Section 404 regulatory

regime. Some of these lost investments could have devastating long-term consequences.

A. EPA's asserted Section 404(c) authority will disrupt vital infrastructure projects.

Every four years, *amicus* ASCE publishes a *Report Card for America's Infrastructure* that thoroughly documents the condition of the nation's water, transportation, energy and public infrastructure. The most recent of these reports, released in 2013, paints a problematic picture. The United States currently faces "a significant backlog of overdue maintenance across [its] infrastructure system" and "a pressing need for modernization." App.55a.[6] Cumulatively, ASCE gave the nation's infrastructure a "D+"—signaling a serious need to increase public investment in a wide range of infrastructure.

The weaknesses in the U.S. infrastructure system are glaring. "[F]orty-two percent of America's major urban highways [are] congested, costing the economy an estimated $101 billion in wasted time and fuel annually." App.60a. Eleven percent of the country's bridges are rated as structurally deficient. App.58a. There are 14,000 high-hazard dams, and 4,000 deficient dams, in the U.S. App.56a. The reliability of the nation's massive levee system—which increasingly protects developed communities, rather than farmland—is essentially unknown. App.57a. The list goes on. App.56a-62a.

The fact that these problems exist across the spectrum of infrastructure has an interactive adverse effect on the U.S. economy. A widespread decline in

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[6] For the sake of convenience, the Executive Summary from ASCE's 2013 *Report Card for America's Infrastructure* is reprinted in Appendix E. App.54a-63a. The full report is available at www.infrastructurereportcard.org/.

the quality of infrastructure prevents shippers from increasing efficiency by moving from one mode of transportation to another. App.65a-66a.[7] ASCE estimates that without additional investment in the nation's infrastructure between now and 2020, the economy could lose $1 trillion in business sales, resulting in 3.5 million lost jobs. App.66a. "[I]f current trends are not reversed, the cumulative cost to the U.S. economy between 2012-2020 will be more than $3.1 trillion in GDP and $1.1 trillion in total trade." App.66a.

Fixing these infrastructure deficiencies will not be easy. ASCE estimates that the infrastructure funding gap will exceed $1 trillion by 2020. App.64a. The federal government should be doing everything it can to facilitate vital infrastructure improvements. Raising new obstacles to public infrastructure investment, as EPA has done by claiming the authority to nullify Section 404 permits years after they issue, will have the opposite effect, multiplying the difficulty of achieving the necessary spending level. Without this Court's immediate attention, the cascade of harms described in ASCE's infrastructure reports looks increasingly inevitable.

B. If EPA can nullify already-issued permits, it will strongly deter private investment.

Private investment that requires Section 404 permitting may be even more vulnerable to EPA's attempt to wrest control of the regulatory process away from the Corps. Professor Sunding points out that

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[7] A portion of ASCE's study, *Failure to Act: The Impact of Current Infrastructure Investment on America's Economic Future*, is reprinted in Appendix F. The full report is available online at www.asce.org/uploadedFiles/Infrastructure/Failure_to_Act/ Failure_to_Act_Report.pdf.

private firms commonly seek greater returns on investment than public ones, setting hurdle rates that are three or four times the cost of capital. App.11a. Moreover, private entities tend to be more risk averse, and face a higher cost of capital, than government agencies, further increasing their hurdle rates. App.11a. As explained above, the uncertainty created by EPA's decision to nullify an already-issued Section 404 permit would further increase hurdle rates, thereby reducing the amount of investment by private firms. *Supra* at 12-14. Because of the wide variety of activities that are authorized by Section 404 permits, the adverse effects on project proponents would cause a chain reaction of injury throughout the economy.

Each dollar spent on a largely privately funded activity like housing construction, which frequently requires the builder to obtain a Section 404 permit, produces approximately three dollars in total economic activity. App.4a. Every $1 billion invested in residential construction, moreover, creates over 10,000 new jobs. App.4a-5a. A reduction in investment—such as what will be caused by EPA's effort to upset the existing Section 404 permitting regime—would have an equal but opposite effect, eliminating potential economic growth. App.4a-9a. What is more, projects that require a Section 404 permit tend to be the type of projects that spur other investment, or offer broader public benefits. App.5a-6a. These benefit-generating projects include numerous private sector activities, such as projects that increase the supply of housing or commercial space, or produce food for public consumption.

To take just one specific example, an Area-Wide Environmental Impact Statement prepared by the Corps for phosphate mining in central Florida docu-

ments billions in direct revenues from the proposed permitted activity over the course of fifty years.[8] But that is not the full extent of the benefits. Local governments will also see tens of millions in property and severance taxes. EPA's efforts to nullify the Mingo Logan Section 404 permit at issue in this case threaten all of that.

The uncertainty caused by EPA's actions against the Section 404 permit issued to Mingo Logan may have the additional effect of harming landowners whose property may include jurisdictional waters or wetlands. Professor Sunding notes that in a competitive land market, land prices reflect the returns that could be generated if property were dedicated to its highest and best use. App.17a. For undeveloped land, this price reflects the amount that developers would be willing to pay to acquire the land for a project. App.17a-18a. Because EPA's action has, at a bare minimum, lowered the expected returns for projects that require a Section 404 permit, a purchaser would not be willing to pay as much for land where development would require it to obtain a Section 404 permit. App.18a. This will reduce the equilibrium market price of land, harming both landowners who might be interested in selling their land, as well as long-term landholders (such as farmers) whose land is their primary asset. App.18a.

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[8] This Area-Wide Environmental Impact Statement is available on EPA's website (yosemite.epa.gov/oeca/webeis.nsf/EIS01/F5325DB2198729FC85257BEB001D991D?opendocument). Information on the economic effects of phosphate mining is discussed in § 4.12.6, and summarized in Table 4-138 on page 4-311.

* * *

Amici are asking the Court to grant Mingo Logan's petition because EPA's "veto" of an already-issued permit turns the Section 404 permitting process on its head. Rather than accounting for applicants' economic and reliance interests, as required by the Corps' regulations, the new regime that EPA has created presents substantially more regulatory risk for project proponents. Professor Sunding has shown that these risks will dramatically decrease the benefits-cost ratio for new projects, leading to reduced investment, and cascading harms throughout the economy. Such a consequential reinterpretation of a vital regulatory system should not occur apart from this Court's review.

CONCLUSION

The petition for a writ of certiorari should be granted.

Respectfully submitted,

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Appendix A

Economic Incentive Effects of EPA's After-the-Fact Veto of a Section 404 Discharge Permit Issued to Arch Coal

Prof. David Sunding[1]
UC Berkeley and The Brattle Group

May 30, 2011

1. Introduction

In 2007 the Army Corps of Engineers issued a Section 404 discharge permit to Arch Coal in connection with the Spruce No. 1 Mine located in Logan County, West Virginia. Arch Coal subsequently operated the mine in compliance with its permit. Nonetheless, more than three years after the Corps issued the 404 permit, EPA proposed to withdraw the discharge authorization granted to Arch Coal. Both the Corps and the State of West Virginia disagreed with the EPA decision, finding that there was no reason to take away the permit. This precedential decision by EPA -- to exercise its limited authority to withdraw a discharge authorization so as to effectively revoke the permit over the objections of the Corps and State has the potential to affect a wide range of economic activities that require authorization under Section 404 of the Clean Water Act.

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[1] David Sunding is the Thomas J. Graff Professor in the College of Natural Resources at UC Berkeley. His research concerns environmental and natural resource economics, and the economics of regulation. He is a Principal in the Litigation Practice of The Brattle Group.

This report discusses the economic impacts of EPA's actions with respect to the Spruce Mine discharge permit. EPA's after-the-fact veto of Arch Coal's permit makes it more difficult for project developers to rely on essential 404 permits when making investment, hiring or development decisions, and proponents must now account for the possibility of losing essential discharge authorization after work on the project has been initiated.

2. Permitting under Section 404 of the Clean Water Act

There are a variety of public and private sector projects permitted under Section 404 of the Clean Water Act. These activities are vital to the American economy, and include: pipeline and electric transmission and distribution; housing and commercial development; renewable energy projects like wind, solar, and biomass; transportation infrastructures including roads and rail; agriculture; and many others. The Army Corps of Engineers issues roughly 60,000 discharge permits annually under Section 404, and estimates that over $220 billion of investment annually is conditioned on the issuance of these discharge permits. Given the breadth of the statute, a large share of public and private infrastructure or development projects must receive and depend on the certain operation of the 404 permit.

Public and private activities requiring Section 404 authorization generate significant indirect and induced benefits to affiliated industries. Reduced levels of investment in projects requiring discharge authorization translate directly into lost jobs and lost economic activity across essentially the whole economy. Tables 1 and 1a show the monthly value of new construction put in place in the United States, which is

widely used as a measure of new construction spending. Table 2 gives the direct, indirect and induced output multipliers for key activities typically requiring a Section 404 permit.

There are numerous studies in the economics literature detailing the nationwide output and employment benefits various types of construction projects.[2] A study by the President's Council of Economic Advisors found that under the American Recovery and Investment Plan, construction and manufacturing were likely to experience particularly strong job growth from a recovery package emphasizing infrastructure, energy, and school repair.[3] Another study found that "greater use of renewable energy systems provides economic benefits through investments in innovation, and through new job creation, while at the same time protecting the economy from political and economic risks associated with [energy dependence]."[4] The benefits go beyond measures of output and employment – indeed, "research has shown that well designed infrastructure investments can raise economic growth, productivity, and land values, while also providing significant positive spillovers to

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[2] See Heintz, James, Pollin, Robert and Heidi Garrett-Peltier, How Infrastructure Investment Support the U.S. Economy: Employment, Productivity and Growth, Political Economy Research Institute, University of Massachusetts Amherst, January 2009.

[3] CEA, *The Job Impact of the American Recovery and Reinvestment Plan*, January 9, 2009, p. 2.

[4] Kammen, Daniel, Kapadia, Kamal and Matthias Fripp, *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?,* Energy and Resources Group, University of California at Berkeley, April 13, 2004, p. 3.

areas such as economic development, energy efficiency, public health and manufacturing.[5]

As of 2010, commercial construction activity comprised around 2.5 percent of GDP while residential construction makes up another 2 percent. Spending in these industries will grow as the economy continues to recover from the recession. Standard & Poor's forecasts a 14 percent increase (to $44.8 billion) in commercial construction starts and a 1.8 percent increase in residential housing investment in 2011.[6] The National Association of Home Builders forecasts a 42 percent increase in residential construction starts between 2011 and 2012, from 615,000 to 873,000.[7]

In March 2011, public and private investment in the construction of residential and commercial structures totaled over $300 billion for the previous 12 months.[8] This economic activity stimulates other sectors of the economy. Table 2 shows that every $1 of spending on residential construction, utility and transportation infrastructure or commercial construction generates roughly $3 of economic activity throughout the economy.

Construction spending also generates large numbers of jobs. As shown in Table 3, for each $1 billion spent in new residential construction in the United States, over 10,000 new jobs are created directly and indi-

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[5] Department of the Treasury with the CEA, An Economic Analysis of Infrastructure Investment, October 11, 2010, p.1.

[6] S&P, p. 4.

[7] A start is defined as excavation (ground breaking) for the footings or foundation of a residential structure. For a multifamily structure, all units are counted as started when the structure is started. NAHB/Housing Economics, April 2011.

[8] See Table 1.

rectly (i.e., in industries that support construction activity).[9] An additional 5,700 jobs are created through induced effects, meaning the economic activity resulting from increased earnings generated by the direct and indirect economic activity. Thus, in total every $1 billion of residential construction generates around 16,000 jobs. Spending on commercial and institutional facilities such as shopping centers, schools, office buildings, factories, libraries and fire stations has a somewhat larger job-creation effect, at around 18,000 jobs per $1 billion of spending.

Between 1987 and 2007, public spending on transportation and water infrastructure as a percentage of GDP remained steady between 2.3 and 2.6 percent.[10] In 2009, the federal government spent $39 billion on new highway infrastructure.[11] On balance, government spending on highway construction has increased during the past 30 years in real terms.[12] Not only are investments in these kinds of infrastructure critical to quality of life throughout the nation,[13] the multiplier effect on job creation resulting from such investment is substantial. In March 2011, the value of transportation and water infrastructure put in place amounted to roughly $160 billion. As shown in Table 3, every $1 billion in transportation and water infrastructure construction creates approximately 18,000 jobs total.

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[9] Direct and Indirect Effects.

[10] CBO, *Public Spending on Transportation and Water Infrastructure*, November 2010.

[11] CBO, *Spending and Funding for Highways*, January 2011.

[12] *Ibid.*

[13] See for example, Dalenberg, Douglas R. and Partridge, Mark D., "The Effects of Taxes, Expenditures, and Public Infrastructure on Metropolitan Area Employment," *Journal of Regional Science*, Vol. 35, No. 4, 1995, pp. 617-640.

Renewable energy is an example of an emerging sector of the economy that also relies on discharge permits. The United States spends 0.3 percent of its GDP on the production of clean technologies.[14] The renewables industry, however, has been expanding at a rate of 28 percent per year since 2008.[15] Further, in its 2011 release of the *Annual Energy Outlook*, the U.S. Energy Information Administration forecasts that cumulative additions to electricity generating capacity[16] from renewable sources will exceed 20,000 megawatts by 2020.[17] With fixed costs ranging from roughly $15 to $400 per kilowatt for renewable generation plants,[18] projected near-term future spending on infrastructure for renewables will be substantial.

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[14] Associated Press, "China Leads Push to Go Green," *New York Times*, May 8, 2011, accessible: http://www.nytimes.com/2011/05/09/business/energy-environment/09clean.html?scp=2&sq=renewable%20energy%20gdp&st=cse.

[15] *Ibid.*

[16] Net Summer Capacity.

[17] EIA, Table 9: Electricity Generating Capacity – Reference Case, Annual Energy Outlook 2011, April 2011.

[18] EIA, *Updated Capital Cost Estimates for Electricity Generation Plants*, November 2010.

Table 1. Annual Value of Public and Private Construction Put in Place, as of March 2011[1]

Type of Construction	($'m)
Residential Buildings	237,757
Commercial Buildings and Structures[2]	81,560
Health Care Institutions	39,448
Educational Institutions	80,764
Public Safety Institutions[3]	10,795
Transportation Infrastructure[4]	122,574
Communication Infrastructure	17,387
Power and Electric Infrastructure[5]	81,618
Sewage, Waste and Water Supply Infrastructure[6]	37,427
Total Construction[7]	*768,899*

[1] The annual value is calculated as the unadjusted Census survey estimate of new construction put in place during March 2011 multiplied by 12 and seasonally adjusted.
[2] Includes lodging and office.
[3] Includes correctional and fire/safety structures.
[4] Includes air, rail and water travel as well as highway and street-related infrastructure.
[5] Includes electric transmission and pipelines.
[6] Includes sewage and waste treatment and storage facilities as well as water supply treatment and storage facilities.
[7] The categories listed here do not add up to total construction because some categories have been omitted.
[8] March 2011 numbers are preliminary.

Source: US Census Bureau, *Value of Construction Put in Place*, March 2011.

Table 1a. Annual Value of Public and Private Construction Put in Place, as of March 2011[1] ($'m)

Type of Construction	Private	Public
Residential Buildings	229,065	8,692
Commercial Buildings and Structures[2]	65,770	15,167
Health Care Institutions	29,111	10,337
Educational Institutions	12,301	68,463
Public Safety Institutions[3]	n/a	10,658
Transportation Infrastructure[4]	9,043	113,408
Communication Infrastructure[5]	17,334	n/a
Power and Electric Infrastructure	70,139	11,479
Sewage, Waste and Water Supply Infrastructure[6]	n/a	36,272
Total Construction[7]	*476,111*	*292,788*

[1] The annual value is calculated as the unadjusted Census survey estimate of new construction put in place in March 2011 multiplied by 12 and seasonally adjusted.

[2] Public does not include lodging as it is not broken out separately but included in total.

[3] Not broken out separately for the private sector but included in the total.

[4] For private, Transportation Infrastructure spending does not include highway and street-related infrastructure as it is not broken out separately, but included in the total.

[5] Not broken out separately for the public sector but included in the total.

[6] Not broken out separately for the private sector but included in the total.

[7] The categories listed here do not add up to total construction because some categories have been omitted.

[8] March 2011 numbers are preliminary.

Source: US Census Bureau, *Value of Construction Put in Place*, March 2011.

Table 2. Output Impacts of $1 Spending in the US for Select Economic Activities

Area of Economic Activity	Corresponding IMPLAN Sector		Direct Effect[3]	Indirect Effect[4]	Induced Effect[5]	Total Effect
	Sector	Description				
Construction of Commercial and Institutional Structures[1]	34	Construction of new nonresidential commercial and health care structures	$1.00	$0.84	$1.16	$2.99
Construction of Utility, Energy and Transportation Infrastructure[2]	36	Construction of other new nonresidential structures	$1.00	$0.88	$1.15	$3.03
Construction of New Residential Housing Structures	37	Construction of new residential permanent site single- and multi-family structures	$1.00	$1.01	$1.00	$3.01

[1] Includes commercial development and public works such as schools, libraries and fire stations.

[2] Includes renewable energy projects, pipeline and electric transmission and transportation infrastructure such as roads and rail.

[3] The direct effect captures the initial change in economic activity resulting from the new investment.

[4] The indirect effect reflects new economic activity that is stimulated by the direct investment in industries that supply inputs to the sector of initial change.

[5] The induced effect captures the economic activity that results when the increased earnings generated by the direct and indirect economic activity is spent on local goods and services.

Source: IMPLAN version 3

Table 3. Employment Impacts of $1 Billion Spending in the US for Select Economic Activities

Area of Economic Activity	Corresponding IMPLAN Sector		Direct Effect[3]	Indirect Effect[4]	Induced Effect[5]	Total Effect
	Sector	Description				
Construction of Commercial and Institutional Structures[1]	34	Construction of new nonresidential commercial and health care structures	7,843	3,624	6,591	18,057
Construction of Utility, Energy and Transportation Infrastructure[2]	36	Construction of other new nonresidential structures	7,400	3,912	6,550	17,862
Construction of New Residential Housing Structures	37	Construction of new residential permanent site single- and multi-family structures	5,103	5,136	5,718	15,957

[1] Includes commercial development and public works such as schools, libraries and fire stations.

[2] Includes renewable energy projects, pipeline and electric transmission and transportation infrastructure such as roads and rail.

[3] The direct effect captures the initial change in economic activity resulting from the new investment.

[4] The indirect effect reflects new economic activity that is stimulated by the direct investment in industries that supply inputs to the sector of change.

[5] The induced effect captures the economic activity that results when the increased earnings generated by the direct and indirect economic activity is spent on local goods and services.

[6] Employment impacts are given in full-time equivalent jobs, *i.e.*, each job is equivalent to 2,080 hours of work.

Source: IMPLAN version 3

3. Direct Economic Impacts of EPA's After-the-Fact Veto

EPA's precedential decision to revoke a valid discharge authorization alters the incentives to invest in projects requiring a permit under Section 404. Project development usually requires significant capital expenditure over a sustained period of time, after which the project generates some return. Actions like the EPA's that increase uncertainty, raise the threshold for any private or public entity to undertake the required early-stage investment. For this reason, the EPA's action has a chilling effect on investment in activities requiring a 404 authorization across a broad range of markets.

Increasing the level of uncertainty can also reduce investment by making it more difficult to obtain project financing. Land development activities, infrastructure projects and the like often require a significant level of capital formation. Reducing the reliability of the Section 404 permit will make it harder for project proponents to find financing at attractive rates as lenders and bondholders will require higher interest rates to compensate for increased risk, and some credit rationing may also result.

Permit Uncertainty and the Hurdle Rate

The decisions to undertake an investment in a project can be considered as a comparison of the benefit-cost ratio of the project to a hurdle rate. Letting B denote the present value of net benefits from the project and C denotes the investment cost, the investment condition is to undertake the project when

$$\frac{Benefit}{Cost} > 1 + hurdle\ rate\ .$$

The hurdle rate represents the expected rate of return a firm requires on its investment. When uncertainty exists on the future benefits and cost of a project, firms and public agencies often use risk-adjusted hurdle rates. For private firms, hurdle rates of three or four times the cost of capital are common (Summers, 1987). For government agencies, with a lower cost of capital and less risk aversion, hurdle rates are typically lower, but are usually well in excess of 1.

It is especially common for firms and public agencies to select high hurdle rates when engaging in a project that involves irreversible investment. In this case, high hurdle rates emerge through inertia as decision makers are forced to trade-off the possibility of making an error in an immediate investment decision against the opportunity cost of delaying the investment. The optimal timing of investment in this case would occur when the expected benefit foregone over the interval before the investment is made exceeds the (probability-weighted) downside losses from a wrong investment. Under a present value criterion, the hurdle rate reduces to the discount rate, which is denoted here by r.

In uncertain investment settings with irreversible investment, Pindyck (1982, 1991) and Dixit (1992) characterize the optimal timing of an investment as the tangency between two curves; one describing the value of investing and the other describing the value of waiting. The equation for the value of investing is based directly on present value calculations: the value of an investment is positive if the discounted present value of expected returns exceeds the present value of the sunk, irreversible investment cost, C. The expression for the value of waiting is determined according to the value of the option to delay invest-

ment from the present period to subsequent periods. Doing so allows the firm an opportunity to acquire relevant market information over time, which reduces downside risk. The necessary and sufficient conditions for an optimal investment decision are the so-called "value-matching condition" and "smooth-pasting condition," effects that are described in Dixit and Pindyck (1994).

Abel (1983) shows that greater uncertainty over future market outcomes delays investment in situations where investments are irreversible. This outcome is a common theme in the early literature on quasi-option value (Arrow and Fisher, 1974; Henry, 1974; and Conrad, 1980), and the parallels between this literature and the more recent literature on investment under uncertainty have been demonstrated by Fisher (2000). It is also true for the case of uncertainty over future regulatory actions.

In the context of an investment decision, delaying investment essentially means reducing the level of investment in any given period. Consider a mine where the cost of extracting ore is $40/ton. With permit certainty, and considering the irreversible nature of investment in the mine, suppose the mine the hurdle rate test if the market price of ore were $50/ton. Market prices fluctuate and it may take some time for the price to hit this trigger point, but once it is achieved, the mine owner will commence investment. If the target price increases to $55/ton, it is less likely that the market price of ore will reach this new, higher level, and investment is delayed, meaning that there is less investment expected in any given period.

It is demonstrated in the appendix to this report that an increase in the threat of permit revocation in-

creases the hurdle rate, thereby delaying investment. The reason for this outcome is twofold. First, as in Abel (1983), delaying investment is valuable because market returns can be earned on financial capital during each period of delay, and this "outside option" is more valuable to firms the more volatile the expected future market returns from the project in relation to returns on the outside asset. Second, and quite unique to the present setting, delaying investment is valuable under the threat of permit revocation because delaying investment reduces the likelihood of stranded capital. This effect is strong --even in the case of small changes in the revocation probability-- as stranded capital can have substantial implications on the rate of return of firms relative to capital that simply earns below-market returns in response to adverse market outcomes. For these reasons, increasing the threat of permit revocation raises the hurdle rate that investors require to engage in projects, delaying investment.

The possibility of permit revocation has highly pernicious effects on investment. Investment, in some cases, is not only delayed, but entirely deterred. Indeed, under various circumstances in which investment would take place absent the threat of permit revocation, investment is deterred, and this is true even for extremely small probabilities of having a permit revoked. The reason is that firms cannot directly control the probability of having a permit revoked when revocation is not based on the firm's own compliance, and this fact introduces a new source of risk that makes investing in sectors of the economy that rely on discharge permits relatively unattractive. To better understand the deterrence effect of permit revocation on new investment, consider the effect of a small probability of revocation represented by the

variable p. Taking p to represent the expected annual probability that a discharge permit is revoked, the benefit-cost ratio (derived in the Appendix) of an investment with an expected annual net benefit of $B and an irreversible one-time capital investment level of $$K$ is

$$\frac{Benefit}{Cost} = \frac{B}{rK}\left(\frac{r(1-p)}{(r+p)}\right).$$

First consider the case in which discharge permits are certain and can be relied on by project proponents. In this case, the net present value of the benefit stream from the project is B/r and the initial capital outlay for the project is K. These terms, which appear to the left of the term in brackets, represent the standard benefit-cost ratio used in studies of irreversible investment (Dixit and Pindyck, 1994).

Now consider the distortion to the benefit-cost ratio of new investment projects under the threat of permit revocation. The term in brackets is the distortion to the benefit-cost ratio created by this threat. When $p = 0$, the distortion vanishes and the benefit cost ratio returns to the market value in standard case. Notice that this term is concave in the threat of permit revocation; that is, small changes in the threat of permit revocation in environments with little regulatory threat have larger impacts on investment decisions than small increments in the revocation probability at higher frequencies of government intervention.

An important implication of this result is that small changes in the probability that discharge permits are revoked have large effects on investment incentives even when revocation is infrequent in practice. To see this result, consider the magnitude of the distor-

tion to investment incentives (the term in the brackets of the equation above) in the case of a 5% discount rate.

At a 5% rate of discount (r = 0.05), if investors expect a 1% chance per year of permit revocation, the expected benefit-cost ratio of projects involving discharge permits decreases by 17.5%. That is,

$$\frac{.05(0.99)}{(.06)} = 82.5$$

in the term reflecting the regulatory distortion above.

If an observed regulatory action subsequently causes investors to expect a 2% chance per year of having a discharge permit revoked, the expected benefit-cost ratio of projects involving discharge permits decreases by 30%, and, if it turns out investors expect a 5% chance per year of having a discharge permit revoked, the expected benefit-cost ratio of projects involving discharge permits decreases by 52.5%. **Thus, small changes in the threat of permit revocation can lead to dramatic reductions in private investment**.

It should also be noted that the possibility of revocation has the largest deterrent effect on large projects. This effect is independent of the fact that large projects are the most likely to be controversial and have a higher chance of having their discharge authorization revoked. Large projects by definition have a higher level of capital outlay than smaller projects. Permit revocation increases the downside risk associated with a project, as revocation results in some level of stranded investment. This principle is demonstrated formally in the appendix.

To summarize this mainly conceptual discussion, raising the possibility that discharge permits can be revoked reduces investment incentives in two essen-

tial ways: (i) revoking permits raises hurdle rates among private investors; and (ii) revoking permits reduces the expected benefit-cost ratio of new projects. These effects will dampen investment rates in industries that rely on Section 404 permits, both by delaying and by deterring new projects from being built.

Project Financing

Another issue related to the effect of permit revocation on investment relates to capital formation. It is common for both private and public projects to be debt financed. In this case, corporations and governments raise revenue by issuing bonds. Though some investors have developed their own models for measuring the probability that the borrower will default, there are three principal rating services that have developed their own corporate and government bond ratings: Moody's, Standard & Poor's and Fitch.

Debt ratings are based on a combination of quantitative and qualitative factors that each rating agency considers to estimate the probability of a bond defaulting payment. Of particular relevance to the EPA's actions is that rating agencies typically consider regulatory risk as a principal consideration in its bond ratings:

> The analysis of credit risk may include, for example, business risk and financial risk in the case of rating a corporation or financial institution, or geopolitical risk in the case of a sovereign government. When assessing structured finance issues, the broad fundamental areas we typically consider include: asset credit quality, legal and regulatory risks, the payment

> structure and cash flow mechanics, operational and administrative risks, and counterparty risk (Standard and Poor's, 2010).

Increased regulatory risks could thus lower a corporation's or government's credit rating. This circumstance in turn could make it much more expensive to access capital.

It is possible that some project developers will be unable to obtain financing due to the increased risk of their investment. The practice of a bank that is unwilling to lend money, even when the borrower is willing to pay higher interest rates, is called credit rationing. There are multiple circumstances that can lead to credit rationing, for example a shortage of credit or a temporary, exogenous shock to the credit market. But, Stiglitz and Weiss (1981) show that credit rationing could be an equilibrium outcome even without a credit shortage.

Land Markets and Incidence of Regulation

Land is an asset that has a fixed location. Regulation that affects the returns to land ownership in defined areas thus has the potential to alter the equilibrium price of land. At present, there are over 100 million acres of land in the contiguous United States that contain wetlands and other waters subject to regulation under the Clean Water Act. Many more acres are within the drainage of waters of the United States and thus potentially come under the jurisdiction of the Army Corps of Engineers.

In a competitive land market, land prices reflect the discounted value of the returns earned from dedicating land to its highest and best use (Capozzaand Helsley, 1998). For undeveloped land, this sum is

typically equal to the value of rents when the land is in an undeveloped condition, plus the amount developers are willing to pay for land when they initiate their project.

Regulation that lowers the profits from future development will be capitalized into current land values, meaning that the equilibrium market price of land will be lower as a result. Thus, the EPA's action will, to a degree determined by local market conditions, be borne by landowners in areas containing wetlands and other waters of the United States.

4. Conclusions

The EPA's precedential decision to revoke a valid discharge permit will have a chilling effect on investment across a broad swath of the American economy. Activities ranging from residential and commercial development, roads, renewable energy, and other projects rely on discharge authorization under Section 404 of the Clean Water Act. These activities provide needed infrastructure, housing, and other services, and are a significant part of the annual value of economic activity in the country. They also generate hundreds of thousands of jobs nationwide, and stimulate economic activities in support sectors.

The types of projects that require discharge permits are usually capital intensive and involve irreversible investments, meaning that the project proponent cannot recoup costs if the necessary authorization is revoked by the EPA. Revoking discharge permits introduces two essential market distortions: (i) revoking permits raises hurdle rates among private investors; and (ii) revoking permits reduces the expected benefit-cost ratio of new projects. These effects are likely to dampen investment rates in industries relying on discharge permits, both by delaying and by

deterring new projects from being built. Importantly, I show that even small changes in the probability of ex post revocation can have a large effect on project investment.

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6. Appendix

This appendix develops the model of expected investment returns under the threat of permit revocation discussed in the report.

Let ct(q) denote the cost of investment in a project of size q at time t. Investment costs are considered to be divided into an initial and irreversible expenditure at time t=0 (the date of project approval), which is denoted K, and a series of recurring costs associated

with project operation in the subsequent periods t=1,...,T, denoted by the constant c. The present value of cost for a project of known size is

$$c_t = K + \sum_{t=1}^{T}\left(\frac{1}{1+r}\right)^t c, \qquad (1)$$

where r is the discount rate.

The expected return from the project is positive, in the sense that the expected benefit to the operator exceeds the sum of investment cost and recurring operational costs of the project. Let B denote the expected net benefit of the project in each period of operation, which is defined as the gross benefit less operational costs, c. For a project with an operating lifetime of T periods, the present value of the net benefit of the project is

$$NPV_0 = \sum_{t=1}^{T}\left(\frac{1}{1+r}\right)^t B - K, \qquad (2)$$

where costs in equation (1) are subsumed into the net benefit function. Equation (2) represents the standard present value criterion for evaluating projects.

Now suppose the regulator introduces threat of permit revocation. If firms perceive the likelihood of

$$NPV_0 = \sum_{t=1}^{T}\left(\frac{1-p}{1+r}\right)^t B - K. \qquad (3)$$

having their permit revoked in any given period to be p, then the net present value of a project with an operating lifetime of T periods is given by

Noting that the factor $(1-p)/(1+r)<1$, the net present value can be expressed as

$$NPV_0 = \frac{(1-p)B}{r+p}\left(1-\left(\frac{1-p}{1+r}\right)^T\right) - K. \qquad (4)$$

In the case where a permit has no explicit terminal time, T, it is convenient to treat the discounted net return of the project as the present value of an infinite annuity from the investment. In this case, equation (4) can be expressed as

$$NPV_0 = \frac{(1-p)B}{r+p} - K. \qquad (5)$$

Notice that equation (5) reduces to the conventional formula used by Pindyck (1991) and Dixit (1992) for the present value of an infinite annuity with expected return B/r.

Next consider the continuation value, or net payoff of an investment made in period t=1 as opposed to period t=0. To calculate the net payoff from an investment in period t=1, consider a discrete probability model of the form examined by Dixit and Pindyck (1994) and Fisher (2000) in which the expected net benefit function is given by

$$B = V\left[q(1+u) + (1-q)(1-d)\right].$$

In this expression, q is the probability of a high draw from the value distribution, in which case the net value of the project is $(1+u)V$, and1-q is the probability of a low draw from the value distribution, in which case the net value of the project is (1-d)V. Thus, if V is defined as net benefit, the value B in equation (5) can be interpreted as the contemporaneous expected net benefit of the project at time t=0.

To calculate option value from delaying investment until time t=1, suppose the true value of the project is revealed at time t=1 as being either $V(1+u)$ or $V(1-d)$ and that the continuation value of the project is

driven by high-draws from the value distribution. In this case, when waiting until time t=1 to make the investment decision, the investment is "in the money" only if a high draw is revealed. Under circumstances in which the project is worthwhile in both states of nature, there would be no option value to delaying an irreversible investment and investment would always take place. Irreversibility of investment would not impact the hurdle rate in this was the case.

The expected continuation value for the project must satisfy (in present value terms of period t=0):

$$\left(\frac{1}{1+r}\right)E_0(F_1)=\frac{q}{1+r}\left[\frac{V(1+u)(1-p)}{(r+p)}-(1-p)K\right]. \qquad (6)$$

Notice that, by delaying investment it is possible that the discharge permit is revoked between periods t=0 and t=1. The conditional probability of investment at time t=1 is $q(1-p)$.

The value of the option to delay investment is given by

$$OptionValue=\left(\frac{1}{1+r}\right)E_0(F_1)-NPV_0. \qquad (7)$$

The formula for option value in equation (7), which is analogous to a call option on a share of stock (Dixit and Pindyck, 1994), is the difference between the continuation value and the net present value of investment from the time t=0 perspective.
Substitution of terms from equations (5) and (6) and simplifying gives

$$OptionValue=\frac{-(1-p)}{(1+r)(r+p)}\left[rB+(1-q)(1-d)V\right]+K\left(1-\frac{q(1-p)}{1+r}\right)$$

The option value of delaying investment for one period is the sum of two terms. The first term is the foregone benefit from development in period t=0. The term in the square brackets sums the lost interest on expected earnings during the period in which investment is delayed and earnings in the non-investment state associated with a low draw. This term is negative. The second term represents the capital savings from delaying investment. This term is positive, not only because of the one period delay in investment but also because with probability p the permit was revoked during the period in which investment is delayed, stranding capital in the case of early investment. If the first term is larger in magnitude than the second term, for instance if the capital investment, K, is small or if capital is fully recoverable through re-sale in a salvage market, then there is no option value and consequently no return for delaying the investment.

In many settings, capital investment levels are sufficiently large that delaying investment creates a positive option value for firms. This also delays social benefits from arising that are indirectly related to the investment, for instance employment and induced local spending. Introducing the potential for permit revocation compounds this problem. To see this, notice that the option value of delaying investment is larger for larger values of the revocation probability, p:

$$\frac{\partial}{\partial p} OptionValue = \frac{[rB + (1-q)(1-d)V]}{(r+p)^2} + \frac{qK}{1+r} > 0$$

The implication is that increasing the threat of permit revocation delays investment from taking place. Positive option value increases the hurdle rate that

investors require to engage in projects. A greater threat of permit revocation raises the hurdle rate, delaying investment in cases where investment is not deterred.

The possibility of permit revocation has pernicious effects on investment. Under various circumstances where investment would have taken place absent the threat of permit revocation, investment is deterred entirely. To see this, it is helpful to convert net present value in equation (5) into a benefit-cost ratio,

$$\frac{B}{rK}\left(\frac{r(1-p)}{(r+p)}\right), \tag{8}$$

where the net present value of the future benefit stream from operating the project in an environment without threat of permit revocation is B/r and the initial capital outlay for the project is K. The term in brackets is the distortion to the benefit-cost ratio created by the threat of permit revocation. If $p = 0$ the distortion vanishes and the benefit cost ratio returns to the market rate.

Notice that equation (8) is concave in the threat of permit revocation. This implies that small changes in the probability that discharge permits are revoked for reasons unrelated to compliance greatly reduce investment incentives. To see this, consider the magnitude of the distortion to investment incentives (the term in the brackets of equation (8)) in the case of a 5% discount rate.

For $r = 0.05$, if investors expect a 1% chance per year of permit revocation, the expected benefit-cost ratio of projects involving discharge permits decreases by 17.5%; however, if investors expect a 5% chance per year of permit revocation, the expected benefit-cost ratio of projects involving discharge

permits decreases by 52.5%. Accordingly, small changes in the threat of permit revocation can lead to dramatic reductions in private investment.

Appendix B

TESTIMONY OF

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U.S. ENVIRONMENTAL PROTECTION AGENCY

BEFORE THE
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT
TRANSPORTATION AND INFRASTRUCTURE COMMITTEE
UNITED STATES HOUSE OF REPRESENTATIVES

May 11, 2011

Good morning Chairman Gibbs, Ranking Member Bishop, and Members of the Committee. I am Nancy Stoner, Acting Assistant Administrator for the Office of Water at the U.S. Environmental Protection Agency. I am pleased to have the opportunity to discuss EPA's use of its authority under Section 404(c) of the Clean Water Act to protect water quality. I appreciate your interest in EPA's Clean Water Act role in assuring effective protection of human health and the environment.

EPA's Clean Water Act Role

EPA and our state agency partners work every day toward the goal of protecting human health and the environment EPA's role in reviewing surface coal mining projects is conducted pursuant to the Clean Water Act, which Congress passed in order to ensure that our nation's waters are protected. Appalachian communities and all Americans depend upon these waters for drinking, swimming, fishing, farming, manufacturing, tourism, and other activities essential to the American economy and quality of life. Our work to review permit applications for Appalachian surface coal mining operations that affect streams is one way in which EPA carries out the mission Congress provided to us. We work hard to achieve our clean water goals in a way that protects public health, sustains our economy, and ensures that we provide clean water to future generations.

Background on Clean Water Act Section 404(c)

Passage of the Federal Water Pollution Control Act Amendments of 1972 (also known as the Clean Water Act) established a comprehensive program to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The Clean Water Act provided overall responsibility to EPA, in partnership with the states, to reduce pollution entering waters of the United States in order to protect their uses as sources of drinking water; habitat for aquatic wildlife; places for swimming, fishing, and recreation; and for other purposes. As part of the 1972 amendments, Section 404 gave specific roles to both the U.S. Army Corps of Engineers ("the Corps") and EPA in implementing a federal permitting program for activities proposing to discharge dredged or fill material in waters of the U.S. Section 404 of the

Act provides the Secretary of the Army acting through the Chief of Engineers the authority for implementing the administration of the Section 404 regulatory program, including deciding whether to issue or deny permits. The Act authorizes EPA, in conjunction with the Corps, to develop the substantive environmental criteria applied in Section 404 permit reviews. The Section 404(b)(1) Guidelines, are regulations promulgated by EPA, in consultation with the Corps, and are set forth at 40 C.F.R. Part 230.

Under Section 404(c), the Act authorizes EPA to review activities in waters of the U.S. to determine whether such activities would result in significant and unacceptable adverse effects on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas, and to prohibit, restrict or deny, including withdrawal, of the use of any defined area as a disposal site. EPA does not view this authority as an opportunity to second guess the Corps's decisionmaking, but rather as an important responsibility to conduct an independent review of projects that have the potential to significantly impact public health, water quality, or the environment, and which EPA has rarely used to prohibit or withdraw the use of an area. Specifically, the Act states:

> "The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to restrict or deny the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever he deter-

> mines, after notice and opportunity for public hearings, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas." 33 U.S.C. § 1344(c).

The procedures for implementation of Section 404(c) are set forth in EPA regulations at 40 C.F.R. Part 231. These procedures provide for a science based and transparent review of projects, with opportunity for meaningful dialogue among EPA, the Corps, the permit applicant or project proponent), the state, and the public. Key aspects of the 404(c) review process include an opportunity for discussion between EPA and the project proponent and opportunities for public involvement.

Use of Clean Water Act Section 404(c)

EPA works constructively with the Corps, the states, and other partners to assist applicants in developing environmentally sound projects in cases where a discharge of dredged or fill material into waters of the U.S. is proposed. EPA takes very seriously our responsibilities under the Clean Water Act, and believes that prudent and careful use of this authority is an effective provision for encouraging innovation to protect public health and preserving valuable environmental resources and our Nation's economic security.

EPA has used its veto authority sparingly, completing only 13 final decisions, known as Final Determinations, since 1972. To put this in perspective, over the past 39 years, the Corps is estimated to have authorized more than two million activities in

waters of the U.S. under the Clean Water Act Section 404 regulatory program. To emphasize the significance of the few projects reviewed by EPA under Section 404(c), these 13 completed Final Determinations have protected tens of thousands of acres of wetlands and other aquatic resources, as well as more than 35 miles of rivers and streams.

Examples where EPA used its Section 404(c) authority demonstrate the significance of potential project impacts and the important role that Section 404(c) plays in protecting human health and the environment. Prior veto actions by EPA include:

- The Yazoo Pumps Project[1] in 2008 to avoid significantly degrading the critical ecological functions provided by up to 67,000 acres of wetlands, including bottomland hardwood forests, in the Yazoo Backwater Area, Mississippi. These wetlands provide important habitat for an extensive variety of wetland dependent animal and plant species, including the federally protected Louisiana black bear, and serve as an integral part of the economic and social life of local residents and sportsmen from around the Nation;
- An action in 1990 on the Two Forks Dam, Colorado, to protect approximately 30 miles of the South Platte River corridor that have extraordinary aquatic resource values, including supporting an outstanding recreational fishery that the State of Colorado has designated a "gold medal" trout stream;

[1] Discharges associated with these two projects were evaluated under the Corps' Civil Works program and not under the Corps' Section 404 permitting program.

- An action in 1985 on the proposed Bayou aux Carpes flood control project[1] in Louisiana to protect a diverse, 3,000-acre coastal wetland complex consisting of forested wetland, shrub wetland, cypress-tupelo swamp, marsh, and open water; and
- An action in 1985 on Jehossee Island, South Carolina, to protect 900 acres of productive coastal marsh habitat.

As the numbers above demonstrate, EPA is able to work with the Corps and permit applicants to resolve issues without exercising its Section 404(c) authority in all but a miniscule fraction of cases. EPA's Section 404(c) procedures provide an effective, meaningful opportunity for EPA, the Corps, and the project proponent to discuss opportunities for reducing environmental impacts and preventing unacceptable adverse effects. These procedures also allow for significant public involvement in EPA's Clean Water Act review process to ensure that the agency's decisions are scientifically sound and transparent.

Spruce No. 1 Surface Mine

EPA's recent decision under Clean Water Act Section 404(c) involved the Spruce No. 1 Surface Mine in Logan County, West Virginia, one of the largest surface coal mining projects ever proposed in the Appalachian coalfields. First proposed in 1997, the project's unprecedented environmental impacts raised significant concerns for federal agencies, local communities, and the public from the beginning. The project was originally authorized under a Clean Water Act Section 404 general permit (also known as a "nationwide" permit). Litigation commenced immediately upon issuance of this permit authorization by environmental and community groups and the pro-

ject was halted by a Federal District Court. The Corps subsequently agreed to withdraw the permit authorization as part of a settlement agreement. Under this agreement, the Corps agreed to review the proposed Spruce No. 1 Mine under an individual permit application and to prepare an Environmental Impact Statement. EPA was a cooperating agency on the Corps lead EIS.

EPA expressed its concerns about the environmental and water quality impacts of the Spruce No. 1 Mine consistently as scientific studies began to suggest that the associated impacts would be far more significant than initially understood. For example, in 1998 and 2002, EPA expressed significant concerns about the project's potential water quality effects in connection with EPA's review of draft state Clean Water Act NPDES permits for the Spruce No. 1 Mine. EPA noted that preliminary scientific studies were beginning to demonstrate the potential for significant negative impacts to water quality and wildlife from mining operations similar to the Spruce No. 1 Mine. In 2006, EPA expressed concern and provided technical comments and recommendations for revision of the project in connection with our review under the National Environmental Policy Act.

A second permit for a modified Spruce No. 1 project was issued in January 2007 and was quickly challenged through litigation. Under an agreement with plaintiffs in the litigation, the company agreed to proceed with mining on only a portion of the project site. The permit would have authorized filling approximately 7.5 miles of pristine mountain streams. The project would have impacted three streams: Seng Camp Creek; Pigeonroost Branch; and Oldhouse Branch in addition to their tributaries. The

latter two streams and their tributaries (6.6 miles total) represent some of the last remaining, least disturbed, high quality stream and riparian resources within the Coal River watershed and contain important wildlife resources and habitat. These streams are located within the Coal River watershed, one of the most impacted in all of Appalachia. More than 257 past and present surface mining permits have been issued in the Coal River subbasin, and the corresponding mines collectively occupy more than 13 percent of the land area. Within the smaller Spruce Fork subwatershed in which the Spruce No. 1 project is located, more than 34 past and present surface mining permits have been issued, and the corresponding mines collectively occupy more than 33 percent of the land area. The Spruce No. 1 Mine would have occupied a surface area of 2,200 acres, or more than three square miles.

As limited mining operations proceeded on the Spruce No. 1 site, EPA's concerns regarding the Spruce No. 1 Mine increased as a growing volume of scientific studies detailed the adverse water quality impacts associated with surface coal mining projects in central Appalachia and confirmed EPA's earlier articulated concerns.

EPA's Section 404(c) Review of the Spruce No. 1 Mine

EPA began its Section 404(c) review of the Spruce No. 1 Mine in response to significant new scientific information that emerged regarding the impacts of surface coal mining operations on Appalachian watersheds and on the coalfield communities that depend on clean water for their way of life, in addition to the jobs that coal mining provides. This scientific information has been published in peer reviewed sci-

entific literature and supplemented by research by scientists at EPA, FWS and USGS. Peer reviewed science reflects a growing consensus regarding the importance of Appalachian headwater streams and the significant impacts to these streams from surface coal mining – impacts that cannot be readily mitigated by methods such as stream creation or restoration. These advances in scientific knowledge heightened EPA's long standing concerns that the Spruce No. 1 Mine would result in unacceptable adverse effects on wildlife, adverse water quality impacts, and significant cumulative effects.

EPA's Section 404(c) review began in September 2009 with an attempt to work with the Corps and the company to modify the Spruce No. 1 Mine permit in a way that would reduce environmental impacts, prevent the significant environmental effects that science shows would occur, and allow mining to proceed. EPA was eager to discuss alternative project designs that would reduce environmental impacts, assure a cost-effective mining operation, and preserve coal mining jobs on the project site. Unfortunately, while EPA offered various alternatives, EPA and the company were unable to reach agreement on changes to the project that EPA viewed as necessary to reflect best available science and prevent significant adverse effects to the aquatic environment. As a result, EPA Region 3 published a Proposed Determination under Section 404(c) in March 2010. EPA took public comment on its Proposed Determination, gathering more than 50,000 comments, and held a public hearing in Charleston, West Virginia. The majority of these comments supported EPA's Section 404(c) action to prohibit the burial of high-quality streams on the project site. After evaluating these comments,

EPA Region 3 issued a Recommended Determination in September 2010 that recommended to EPA Headquarters that the filling of two high quality streams be prohibited.

Following the EPA Region 3 Recommended Determination, EPA Headquarters invited Arch Coal Company, state representatives, land and mineral rights owners, and the Corps to meet regarding the Recommended Determination and to discuss mining alternatives at the Spruce No.1 Mine that could reduce environmental and water quality impacts. Following an in-person meeting on November 16, 2010, EPA again reached out to Arch Coal on November 22 to reiterate its interest in finding alternative mine designs that might reduce anticipated environmental and water quality impacts. Again, while EPA offered various alternatives, EPA and the company could not reach agreement on options for redesigning the mine in ways that would meaningfully reduce anticipated unacceptable adverse environmental and water quality effects. After reviewing EPA Region 3's recommendations and comments provided by the public, the West Virginia Department of Environmental Protection, and Arch Coal Company, EPA Headquarters issued a Final Determination on the Spruce No. 1 Mine in January 2011, prohibiting new impacts to streams at the site but allowing significant ongoing mining activities to proceed.

Conclusions of EPA's Section 404(c) Review

EPA's Final Determination concluded that by filling 6.6 miles of streams on the project site – Pigeonroost Branch, Oldhouse Branch, and their tributaries – the Spruce No. 1 Mine would have resulted in unacceptable adverse environmental effects on wildlife. EPA's scientific review revealed that the wildlife

communities in these streams are of high quality in comparison to other streams throughout the central Appalachian region and the State of West Virginia. Pigeonroost Branch, Oldhouse Branch, and their tributaries perform critical hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the broader watershed.

In their final determination, EPA concluded impacts from the Spruce No. 1 Mine would be unacceptable in several ways. The project would have eliminated more than 35,000 feet – or 6.6 miles – of high quality streams, which would have buried and killed fish, small invertebrates, salamanders, and other wildlife that live in them. The project would have also resulted in indirect impacts to stream life below the valley fills. In addition, in EPA's judgment, the proposed mitigation, which included in part reliance on sediment ditches at the mine, would not have offset the mine's significant environmental impacts to miles of high quality streams that would be buried and polluted by mining at the Spruce No. 1 Mine.

Uniqueness of the Spruce No. 1 Mine

Significant attention has been focused on the fact that EPA took action under Section 404(c) after issuance of the Spruce No. 1 Mine's Clean Water Act permit by the Corps. EPA's action on the Spruce No. 1 Mine represents only the second time that EPA has used its authority under Section 404(c) to withdraw authorization to discharge under a previously issued permit in the 39 years since the Clean Water Act was passed. EPA recognizes that such action should only be taken in exceptional circumstances. The Spruce

No. 1 Mine represents such an exceptional set of circumstances.

Adverse environmental and water quality impacts associated with the Spruce No. 1 Mine are among the most extensive and significant of any surface coal mining project ever proposed in the Appalachian coalfields. In the case of the Spruce No. 1 Mine, as the result of a voluntary agreement between environmental and community groups and the mining company, discharges had only occurred on a portion of the project site at the time EPA initiated and completed its Section 404(c) action. EPA's action prohibits only the discharges that had not yet occurred – into Pigeonroost Branch, Oldhouse Branch, and their tributaries – and did not affect ongoing mining activities elsewhere on the project site.

EPA's Section 404(c) decision explicitly states the Agency's willingness to work with the Corps and the company to evaluate a future mining configuration at the Spruce site that avoids the unacceptable adverse effects on wildlife that would have been caused by the Spruce No. 1 Mine. EPA is also committed to working with others, including the mining industry and the states, under the Clean Water Act to encourage mining practices that protect Appalachian communities and the mining jobs on which these communities depend. EPA's repeated attempts to reach out to the company were guided by our recent experience with other mining projects, where it has been demonstrated that we can work together to develop innovative, cost effective, and balanced approaches to mining practices that not only protect water quality, but also create jobs. As EPA has repeatedly stated, its action on the Spruce No. 1 Mine represents an exceptional circumstance, and the

Agency is not contemplating the use of Section 404(c) on any other previously permitted surface coal mining projects in Appalachia.

Conclusion

We are committed to work together with our federal and state partners, coal companies, and the public to assure that decisions under the Clean Water Act are consistent with the law and best available science. We also recognize the significant contribution of coal mining to the Nation's economic and energy security. I want to assure you that we will use our Clean Water Act Section 404(c) authority in a responsible and environmentally effective manner, and in careful consideration of potential environmental justice and economic implications. I am confident we can work with our federal and state partners, the public, and the Congress to promote the Nation's energy and economic security and provide the environmental and public health protections required under the law. Appalachian families should not have to choose between healthy watersheds and a healthy economy – they deserve both. We look forward to working with you to achieve these important goals.

I appreciate the opportunity to be here today. I am pleased to answer any questions you might have.

Appendix C

October 16, 2009

Colonel Robert D. Peterson
District Engineer
U.S. Army Corps of Engineers, Huntington District
502 Eighth Street
Huntington, West Virginia 25701

Re: Spruce No. 1 Surface Mine Permit 199800436-3 (Section 10: Coal River); Logan County, West Virginia; Mingo Logan Coal Company

Dear Colonel Peterson:

The U.S. Environmental Protection Agency (EPA) has received your September 30, 2009 response to our September 3 letter denying EPA's request; pursuant to 33 C.F.R. § 325.7, that you re-evaluate the decision to issue a Clean Water Act Section 404 permit for the Spruce No. 1 Surface Mine, particularly given that discharges authorized by the permit have not occurred while litigation is ongoing in Federal District Court. We recognize the issued permit contains several provisions that may be intended to address water quality and mitigation based upon information and data available at the time. However, in light of new data and information since permit issuance, EPA remains concerned with much of the analysis set forth in your letter, particularly as it relates to the potential for adverse water quality impacts, further avoidance and minimization measures, the potential for cumulative impacts, and identification and enforceability of success criteria for mitigation.

Consequently, this letter notifies you that, pursuant to 40 C.F.R. § 231.3(a), EPA has reason to believe that the Spruce No I mine, as currently authorized, may result in unacceptable adverse impacts to fish and wildlife resources. We intend to issue a public notice of a proposed determination to restrict or prohibit the discharge of dredged and/or fill material at the Spruce No. 1 Mine project site consistent with our authority under Section 404(c) of the Clean Water Act and our regulations at 40 C.F.R. Part 231. We are taking this unusual step in response to our very serious concerns regarding the scale and extent of significant environmental and water quality impacts associated with the Spruce No. 1 mine, which are explained below. The Spruce No. 1 mine represents the largest authorized mountaintop removal operation in Appalachia and occurs in a watershed where many streams have been impacted by previous mining activities. While we recognize that the project has been modified to reduce projected impacts, the project will still bury more than seven miles of streams and additional analyses by EPA and in a TMDL prepared by the West Virginia Department of Environmental Protection (WVDEP) and approved by EPA provide evidence that there is the potential for its associated discharges to cause further stream degradation. In addition to the cumulative adverse water quality impacts that include those associated with the Spruce No. 1 mine, there are 12 additional surface mining projects either proposed or authorized but not built in the same watershed. The cumulative impacts on the degraded sub-basin of Spruce No. 1 together with these 12 additional projects, if all built, have not been assessed and factored in the regulatory context. In addition, the permit does not contain conditions suffi-

cient to ensure effective compensation for stream functions destroyed by this mining project.

Region III is aware that EPA has never before used its Section 404(c) authority to review a previously permitted project since Congress enacted the Clean Water Act in 1972. That it is necessary in this circumstance to initiate Section 404(c) review reflects the magnitude and scale of anticipated direct, indirect, and cumulative adverse environmental impacts associated with this mountaintop removal mining operation — the largest strip mining operation ever proposed in Appalachia when it was first permitted by the Corps. EPA emphasizes that the Spruce No.1 represents an unusual set of circumstances we do not expect to be repeated again.

EPA's regulations on Section 404(c) procedures provide for further coordination between EPA, and the Corps of Engineers and the applicant. Consistent with EPA regulations at 40 C.F.R. § 231.3(a)(2), EPA is providing the Corps and the applicant with an opportunity to submit any additional information for the record to demonstrate that no unacceptable adverse effects would occur from this project, either standing alone or in combination with operation of other mines proposed and/or authorized in the Coal River sub-basin, or that satisfactory corrective action will be taken to prevent such adverse effects.

EPA is available to meet with you and the applicant during the next 15 days to discuss options for further reducing adverse environmental impacts associated with the proposed project. We stand ready to work with you and your staff to modify the permit to address our concerns. We encourage you to contact us to schedule a discussion as soon as possible.

Key Background Information

The Coal River sub-basin has approximately 283 miles of designated high quality streams, which are designated as such because they have five or more miles of desirable warm water fish populations or have native or stocked trout populations that are utilized by the public. Direct impacts to the macroinvertebrates, amphibians, and other aquatic fish and wildlife resources of the headikater streams that feed these systems are extensive and far ranging. In addition, disruptions in the biological processes of first- and second-order streams impact not only aquatic life within the stream, but also the functions aquatic life contribute to downstream aquatic systems in the form of nutrient cycling, food web dynamics, and species diversity (Cummins 1980, Merritt et al. 1984).

The Coal River Sub-basin has approximately 51 species listed as endangered, threatened or state rare species. Many of these species rely on the aquatic ecosystem for either habitat or foraging. Non-aquatic species such as avian and bat species rely on aquatic insects as their food source. Salamanders within the southern Appalachians, one of the richest areas of salamander faunas in the world (Petranka 1998, Stein et al 2000), require these aquatic systems for habitat.

Based on information available to EPA, the project as authorized includes construction of six valley fills for placement of excess spoil material generated through surface coal mining activities, associated sediment control structures, and one mine-through area. Since the project was originally proposed, it has been modified to reduce some adverse impacts to aquatic resources. The project has incorporated fill minimization techniques including a mine design that utilizes the Approximate Original Contour Plus

(AOC+) policy. EPA acknowledges the West Virginia AOC+ policy was adopted *as* an approved method to minimize impacts to jurisdictional waters. However, the policy sets minimally acceptable methods and every effort should be employed to maximize avoidance to aquatic resources in consideration of safety and design stability. In addition, EPA believes opportunities exist to incorporate additional methods to avoid and minimize impacts to aquatic resources, such as sequencing fill construction, consideration of the direction of mining, use of side hill fills and placing the fill back to back to maximize the backfill. This list is not all inclusive, but rather examples of additional minimization considerations.

The Clean Water Act Section 404(b)(1) Guidelines require that "no discharge of dredged or fill material shall be permitted if it causes or contributes, after consideration of disposal site dilution and dispersion, to violation of any applicable State water quality standard." In addition, the Guidelines prohibit any discharge of dredged or fill material that would cause or contribute to significant degradation of the aquatic ecosystem, with special emphasis placed on the persistence and permanence of effects, both individually and cumulatively. Recent scientific studies (references included) have consistently indicated that surface mining with valley fills in Central Appalachia are strongly related to downstream degradation often rising to the level of biological impairment. These studies show that surface mining impacts on aquatic life are strongly correlated with ionic strength in the Central Appalachian stream networks. This increase in conductivity impairs aquatic life use, is persistent over time, and cannot be easily mitigated or removed from stream channels. Based on available infor-

mation, EPA is concerned the project may cause or contribute to a violation of the State's water quality standards or antidegradation policy.

With respect to water quality, we recognize the Corps has followed applicable procedural steps; specifically, procuring a certification from the State pursuant to Section 401 of the Clean Water Act, relying upon the National Pollutant Discharge Elimination System (NPDES) permit, and reviewing analyses of hydrologic consequences prepared pursuant to requirements of the Surface Mining Control and Reclamation Act, that are intended to ensure water quality is protected. Nevertheless, EPA believes the analyses relied upon by the Corps did not sufficiently consider the potential impact of this project with respect to narrative criteria and downstream aquatic life uses. As described in more detail above, the collective science strongly suggests that projects similar to the Spruce No. 1 project are associated with impairment of downstream aquatic life use.

Water Quality Studies

EPA has worked hard to assess the effects of surface coal mining on water quality in streams below mining activities. What we have learned is compelling and further substantiates the scientific literature that points to a high potential for downstream water quality excursions under current mining and valley fill practices. To assess the potential for each project to cause excursions from water quality standards, we compared measured water quality data from streams within which valley fills are proposed, to the nearest stream within which valley fill discharges are already occurring. In over 80% of the cases, we found two results: first, in streams where valley fills were proposed but not yet constructed water quality was

within scientifically defensible, acceptable levels to support native aquatic life; second, in the streams where valley fills or mining disturbances were evident, water quality as Measured by conductivity levels was substantially above levels believed to cause excursion of water quality standards or significant degradation as that term is defined in the Section 404(b)(1) Guidelines. Similar data from nearby streams associated with existing mining operations strongly suggest that construction of the Spruce No. 1 mine has potential to cause or contribute to impairments downstream.

Once again, scientific literature, including EPA's own 2008 published study, show clear evidence that discharges associated with the construction of valley fills are very likely to elevate conductivity and thus negatively affect healthy aquatic communities. That 2008 study demonstrates that using West Virginia's approved methodology, the West Virginia Stream Condition Index, to assess down stream impacts to biological communities, EPA found that nearly 65% of the time, narrative water quality standards were exceeded. Using the more sensitive GLIMPSS, a genus-level multi-metric index methodology, the naturally occurring aquatic communities in more than 90% of streams below valley fills were degraded. Despite years of post-mining recovery time, many streams evaluated were degraded or exhibited an excursion from narrative standards 15 to 20 years after construction of the upstream facility was completed. A clear association of these adverse impacts with upstream mining and with conductivity measures above 500 ttS/cm (frequently less) was discovered.

Environmental and Water Quality Impacts

Specific to Spruce No. 1, the Little Coal River watershed contains 98 miles of impaired streams, representing 33% of the watershed, and the Coal River sub-basin has 743 miles of impaired streams, representing 30% of the sub-basin. Spruce Fork, the Little Coal River, and Seng Camp Creek have approved total maximum daily loads (TMDLs). Both Pigeonroost Branch and Oldhouse Branch are not listed for water quality impairments and may be providing clean freshwater dilution to Spruce Fork which has measured conductivity readings above 500 µS/cm. West Virginia Stream Condition Index scores indicate that Spruce Fork is in poor condition. In addition, the TMDL for the Coal River sub-basin provides evidence supporting this conclusion. When the TMDL was developed, the WVDEP identified several streams as biologically impaired due to conductivity from mining sources. Two of these streams, Rockhouse Creek and Left Fork/Beach Creek are in the Spruce Fork watershed where the Spruce No. 1 mine will be located. This is evidence that mining in this watershed is likely to be associated with elevated conductivity and impaired biological condition. The TMDL is designed to address then-existing impairment, not potential future impairment. While the TMDL may have considered discharges from the Spruce No. 1 project with respect to already impaired waters, it did not address the potential of the then-proposed Spruce No. 1 project to cause impairment in receiving waters that were not impaired at the time of the TMDL.

Cumulative Adverse Impacts.

We understand there are 12 mining operations either proposed or authorized but not constructed in addition to Spruce No. 1 in the Coal River Sub-Basin.

The potential cumulative impacts from these operations have not been sufficiently analyzed. The Section 404(b)(1) Guidelines require consideration of impacts individually and cumulatively. Our new understanding of potential mining-induced cumulative impacts within the sub-watershed, and even within the larger 8-digit HUC sub-basin, compels us to ensure a full understanding of watershed services, resiliency, and mitigation opportunities are achieved before appropriate decisions can be made to assure protection of the environment and public health. In addition to historic and ongoing mining, the 12 known additional mining projects proposed within the Coal River Subbasin include four pending projects under consideration within the enhanced coordination review process established in the Memorandum of Understanding signed June 11, 2009, six other permits that have been issued by the Corps but for which work has not yet commenced due to ongoing litigation, and two new proposals recently issued on Public Notice. The Spruce No. 1 proposal along with these 12 additional projects in the Coal River Sub-basin, if constructed as proposed, would impact approximately 35.6 miles (188,353 linear feet) of stream channels. EPA wants to ensure that a robust cumulative impacts analysis has been undertaken.

Mitigation

With respect to mitigation, we understand that the permit conditions include monitoring for biological and chemical function, as well as habitat. Nevertheless, it does not appear that the permit identifies actions to be taken when the monitoring being conducted indicates the biological and chemical parameters are being adversely impacted. For example, while Special Condition 13 suggests biological scores

"should" be comparable to baseline scores, Special Condition 5 states that the compensatory mitigation obligation is satisfied when the Corps has verified that the mitigation area is "intended" to become jurisdictional waters functioning ecologically as set forth in the mitigation plan, rather than actually functioning as intended. In addition, in light of the potential for the mitigation areas to become conduits for exporting poor water quality, we believe that mitigation success criteria should include appropriate levels for conductivity and/or total dissolved solids.

Conclusion

Section 404(c) authorizes EPA to prohibit, deny or restrict use of any defined area for specification as a disposal site. In this instance, while the permit contains some provisions designed to address some of EPA's concerns, further modifications to the permit are necessary if this project is to meet fully the requirements of the Clean Water Act and the agencies' regulations. Specifically, the applicant should be required to achieve further avoidance and minimization of anticipated project impacts, construct the project sequentially to allow monitoring data from each portion of the project to inform decisions regarding how and whether the remainder of the project should be constructed, that the permit should require specific actions in response to monitoring data showing adverse changes in water quality, that there must be a mechanism to respond to monitoring data showing significant degradation of waters of the United States or a violation of water quality standards, that the permit should more clearly specify success criteria for mitigation, and the permit should identify steps to be taken if mitigation success criteria are not achieved. In addition, the Coal River watershed

should be assessed for the potential effects of this, and all other reasonably foreseeable projects, to the water quality and other ecological services provided.

I appreciate your prompt attention to this matter. If you have any questions or wish to arrange a meeting to discuss potential project modifications to reduce the adverse impacts, please contact me at 215-814-2900, or John R. Pomponio, Director of the Environmental Assessment and Innovation Division, EPA Region III at 215-814-2702.

Sincerely,
/s/ William C. Early

William C. Early
Acting Regional Administrator

cc: Peter Silva
Assistant Administrator
Office of Water, EPA
Randy Huffman
Director, West Virginia DEP
Mingo Logan Coal Company
Allegheny Land Company
United Affiliates Corp.
Kelly Hatfield Land Company
Penn Virginia Resources Corp.

Appendix D

EPA Proposes Veto of Mine Permit Under the Clean Water Act

Release Date: 03/26/2010
Contact Information: EPA Press Office,
press@epa.gov, 202-564-6794, 202-564-7873

WASHINGTON – The U.S. Environmental Protection Agency (EPA) today announced its proposal under the Clean Water Act to significantly restrict or prohibit mountain top mining at the Spruce No. 1 surface mine in Logan County, W. Va. Spruce No.1 mine is one of the largest mountaintop removal operations ever proposed in Central Appalachia. The project was permitted in 2007 and subsequently delayed by litigation. The Spruce No. 1 mine would bury over 7 miles of headwater streams, directly impact 2,278 acres of forestland and degrade water quality in streams adjacent to the mine.

EPA's proposed determination comes after extended discussions with the company failed to produce an agreement that would lead to a significant decrease of the environmental and health impacts of the Spruce No. 1 mine.

"Coal, and coal mining, is part of our nation's energy future, and for that reason EPA has made repeated efforts to foster dialogue and find a responsible path forward. But we must prevent the significant and irreversible damage that comes from mining pollution -- and the damage from this project would be irreversible," said EPA Regional Administrator for the Mid-Atlantic, Shawn Garvin. "This recommendation is consistent with our broader Clean Water Act efforts in Central Appalachia. EPA has a duty under

the law to protect water quality and safeguard the people who rely on these waters for drinking, fishing and swimming."

EPA has used its Clean Water Act veto authority in just 12 circumstances since 1972 and never for a previously permitted project.

The proposed determination, signed today by Regional Administrator Garvin, identifies numerous potential adverse impacts associated with the Spruce No. 1 project:

Water Quality Impacts: The mine will cause adverse impacts to drinking water, native aquatic and water-dependent communities in the Spruce Fork watershed. Drainage from the Spruce No. 1 project is likely to include high levels of total dissolved solids (TDS) and selenium which adversely affect the naturally occurring aquatic communities. These include birth defects in fish and other aquatic life and can also result in toxic effects to embryos, resulting in abnormal development or death for those organisms.

Fish and Wildlife Impacts: Mining waste placed into headwater streams will impact fish and wildlife which depend for all or part of their lifecycles on these headwater systems. Ecosystem functions performed by headwaters are lost when the headwater stream is buried or removed. These functions are lost not only to the headwater stream itself, but also to downstream aquatic ecosystems.

Mitigation Impacts: The project's mitigation plan inadequately evaluates the nature and extent of mining related aquatic impacts and therefore fails to replace streams' lost ecological services. Natural stream channels buried by mining will be replaced, in part, by ditches being built to drain stormwater off of the mine, not to compensate for natural stream

losses. These ditches will also drain water contaminated by mining into streams adjacent to the mine.

Cumulative Mining Impacts: EPA believes that the Spruce No. 1 project, in conjunction with numerous other mining operations either under construction or proposed for the Coal River basin, will contribute to the cumulative loss of water quality, aquatic systems, and forest resources. The Coal River basin is already heavily mined and substantially impaired. Landscape and site specific assessments reveal that past and current mountaintop mining has caused substantial, irreplaceable loss of resources and an irreversible effect on these resources within the Coal River basin.

CWA Section 404(c) authorizes EPA to restrict or prohibit placing certain pollutants in streams, lakes, rivers, wetlands and other waters if the agency determines that the activities would result in "unacceptable adverse impacts" to the environment, water quality, or water supplies. This authority applies to proposed projects as well as projects previously permitted under the CWA. A final decision to restrict or prohibit the Spruce No.1 mine will be made in EPA Headquarters based on a recommendation from the Regional Administrator, public comments, and discussions with the Army Corps of Engineers and the Mingo Logan Coal Company.

The proposed determination is being published in the federal register and EPA is taking public comment for 60 days. EPA is also scheduling a public hearing in West Virginia to provide an additional opportunity for public input.

The proposed determination:
http://www.epa.gov/region03/mtntop/spruce1documents.html

Appendix E

2013 Report Card for America's Infrastructure
American Society of Civil Engineers

Overview: Executive Summary

Every family, every community and every business needs infrastructure to thrive. Infrastructure encompasses your local water main and the Hoover Dam; the power lines connected to your house and the electrical grid spanning the U.S.; and the street in front of your home and the national highway system.

Once every four years, America's civil engineers provide a comprehensive assessment of the nation's major infrastructure categories in ASCE's Report Card for America's Infrastructure (Report Card). Using a simple A to F school report card format, the Report Card provides a comprehensive assessment of current infrastructure conditions and needs, both assigning grades and making recommendations for how to raise the grades. An Advisory Council of ASCE members assigns the grades according to the following eight criteria: capacity, condition, funding, future need, operation and maintenance, public safety, resilience, and innovation. Since 1998, the grades have been near failing, averaging only Ds, due to delayed maintenance and underinvestment across most categories.

Now the 2013 *Report Card* grades are in, and America's cumulative GPA for infrastructure rose slightly to a D+. The grades in 2013 ranged from a high of B- for solid waste to a low of D- for inland waterways and levees. Solid waste, drinking water, wastewater, roads, and bridges all saw incremental improve-

ments, and rail jumped from a C- to a C+. No categories saw a decline in grade this year.

The 2013 *Report Card* demonstrates that we can improve the current condition of our nation's infrastructure – when investments are made and projects move forward, the grades rise. For example, greater private investment for efficiency and connectivity brought improvements in the rail category; renewed efforts in cities and states helped address some of the nation's most vulnerable bridges; and, several categories benefited from short-term boosts in federal funding.

We know that investing in infrastructure is essential to support healthy, vibrant communities. Infrastructure is also critical for long-term economic growth, increasing GDP, employment, household income, and exports. The reverse is also true -- without prioritizing our nation's infrastructure needs, deteriorating conditions can become a drag on the economy.

While the modest progress is encouraging, it is clear that we have a significant backlog of overdue maintenance across our infrastructure systems, a pressing need for modernization, and an immense opportunity to create reliable, long-term funding sources to avoid wiping out our recent gains. Overall, most grades fell below a C, and our cumulative GPA inched up just slightly to a D+ from a D four years ago.

We invite you to take a deeper look at the nation's infrastructure conditions in the 2013 Report Card – from the states infrastructure facts, to the interactive charts, to our three key solutions.

A brief summary of the findings for each category is below. Click on any heading to get more detailed information on the category and explore the interactive content.

Dams: Dams again earned a grade of D. The average age of the 84,000 dams in the country is 52 years old. The nation's dams are aging and the number of high-hazard dams is on the rise. Many of these dams were built as low-hazard dams protecting undeveloped agricultural land. However, with an increasing population and greater development below dams, the overall number of high-hazard dams continues to increase, to nearly 14,000 in 2012. The number of deficient dams is currently more than 4,000. The Association of State Dam Safety Officials estimates that it will require an investment of $21 billion to repair these aging, yet critical, high-hazard dams.

Drinking Water: The grade for drinking water improved slightly to a D. At the dawn of the 21st century, much of our drinking water infrastructure is nearing the end of its useful life. There are an estimated 240,000 water main breaks per year in the United States. Assuming every pipe would need to be replaced, the cost over the coming decades could reach more than $1 trillion, according to the American Water Works Association (AWWA). The quality of drinking water in the United States remains universally high, however. Even though pipes and mains are frequently more than 100 years old and in need of replacement, outbreaks of disease attributable to drinking water are rare.

Hazardous Waste: There has been undeniable success in the cleanup of the nation's hazardous waste and brownfields sites. However, annual funding for Superfund site cleanup is estimated to be as much as

$500 million short of what is needed, and 1,280 sites remain on the National Priorities List with an unknown number of potential sites yet to be identified. More than 400,000 brownfields sites await cleanup and redevelopment. The Environmental Protection Agency (EPA) estimates that one in four Americans lives within three miles of a hazardous waste site. The grade for hazardous waste remained unchanged at a D.

Levees: Levees again earned a near failing grade of D – in 2013. The nation's estimated 100,000 miles of levees can be found in all 50 states and the District of Columbia. Many of these levees were originally used to protect farmland, and now are increasingly protecting developed communities. The reliability of these levees is unknown in many cases, and the country has yet to establish a National Levee Safety Program. Public safety remains at risk from these aging structures, and the cost to repair or rehabilitate these levees is roughly estimated to be $100 billion by the National Committee on Levee Safety. However, the return on investment is clear as levees helped in the prevention of more than $141 billion in flood damages in 2011.

Solid Waste: In 2010, Americans generated 250 million tons of trash. Of that, 85 million tons were recycled or composted. This represents a 34% recycling rate, more than double the 14.5% in 1980. Per capita generation rates of waste have been steady over the past 20 years and have even begun to show signs of decline in the past several years. The grade for solid waste improved in 2013, and it earned the highest grade of B-.

Wastewater: The grade for wastewater improved slightly to a D. Capital investment needs for the na-

tion's wastewater and stormwater systems are estimated to total $298 billion over the next 20 years. Pipes represent the largest capital need, comprising three quarters of total needs. Fixing and expanding the pipes will address sanitary sewer overflows, combined sewer overflows, and other pipe-related issues. In recent years, capital needs for the treatment plants comprise about 15%-20% of total needs, but will likely increase due to new regulatory requirements. Stormwater needs, while growing, are still small compared with sanitary pipes and treatment plants. Since 2007, the federal government has required cities to invest more than $15 billion in new pipes, plants, and equipment to eliminate combined sewer overflows.

Aviation: Despite the effects of the recent recession, commercial flights were about 33 million higher in number in 2011 than in 2000, stretching the system's ability to meet the needs of the nation's economy. The Federal Aviation Administration (FAA) estimates that the national cost of airport congestion and delays was almost $22 billion in 2012. If current federal funding levels are maintained, the FAA anticipates that the cost of congestion and delays to the economy will rise from $34 billion in 2020 to $63 billion by 2040. Aviation again earned a D.

Bridges: Over two hundred million trips are taken daily across deficient bridges in the nation's 102 largest metropolitan regions. In total, one in nine of the nation's bridges are rated as structurally deficient, while the average age of the nation's 607,380 bridges is currently 42 years. The Federal Highway Administration (FHWA) estimates that to eliminate the nation's bridge backlog by 2028, we would need to invest $20.5 billion annually, while only $12.8 bil-

lion is being spent currently. The challenge for federal, state, and local governments is to increase bridge investments by $8 billion annually to address the identified $76 billion in needs for deficient bridges across the United States. However, with the overall number of structurally deficient bridges continuing to trend downward, the grade improved to C+.

InlandWaterways: Our nation's inland waterways and rivers are the hidden backbone of our freight network they carry the equivalent of about 51 million truck trips each year. In many cases, the inland waterways system has not been updated since the 1950s, and more than half of the locks are over 50 years old. Barges are stopped for hours each day with unscheduled delays, preventing goods from getting to market and driving up costs. There is an average of 52 service interruptions a day throughout the system. Projects to repair and replace aging locks and dredge channels take decades to approve and complete, exacerbating the problem further. Inland waterways received a D- grade once again as conditions remain poor and investment levels remain stagnant.

Ports: This new category for 2013 debuted with a grade of C. The U.S. Army Corps of Engineers estimates that more than 95% (by volume) of overseas trade produced or consumed by the United States moves through our ports. To sustain and serve a growing economy and compete internationally, our nation's ports need to be maintained, modernized, and expanded. While port authorities and their private sector partners have planned over $46 billion in capital improvements from now until 2016, federal funding has declined for navigable waterways and landside freight connections needed to move goods to and from the ports.

Rail: Railroads are experiencing a competitive resurgence as both an energy-efficient freight transportation option and a viable city-to-city passenger service. In 2012, Amtrak recorded its highest year of ridership with 31.2 million passengers, almost doubling ridership since 2000, with growth anticipated to continue. Both freight and passenger rail have been investing heavily in their tracks, bridges, and tunnels as well as adding new capacity for freight and passengers. In 2010 alone, freight railroads renewed the rails on more than 3,100 miles of railroad track, equivalent to going coast to coast. Since 2009, capital investment from both freight and passenger railroads has exceeded $75 billion, actually increasing investment during the recession when materials prices were lower and trains ran less frequently. With high ridership and greater investment in the system, the grade for rail saw the largest improvement, moving up to a C+ in 2013.

Roads: Targeted efforts to improve conditions and significant reductions in highway fatalities resulted in a slight improvement in the roads grade to a D this year. However, forty-two percent of America's major urban highways remain congested, costing the economy an estimated $101 billion in wasted time and fuel annually. While the conditions have improved in the near term, and federal, state, and local capital investments increased to $91 billion annually, that level of investment is insufficient and still projected to result in a decline in conditions and performance in the long term. Currently, the Federal Highway Administration estimates that $170 billion in capital investment would be needed on an annual basis to significantly improve conditions and performance.

Transit: The grade for transit remained at a D as transit agencies struggled to balance increasing ridership with declining funding. America's public transit infrastructure plays a vital role in our economy, connecting millions of people with jobs, medical facilities, schools, shopping, and recreation, and it is critical to the one-third of Americans who do not drive cars. Unlike many U.S. infrastructure systems, the transit system is not comprehensive, as 45% of American households lack any access to transit, and millions more have inadequate service levels. Americans who do have access have increased their ridership 9.1% in the past decade, and that trend is expected to continue. Although investment in transit has also increased, deficient and deteriorating transit systems cost the U.S. economy $90 billion in 2010, as many transit agencies are struggling to maintain aging and obsolete fleets and facilities amid an economic downturn that has reduced their funding, forcing service cuts and fare increases.

Public Parks and Recreation: The popularity of parks and outdoor recreation areas in the United States continues to grow, with over 140 million Americans making use of these facilities a part of their daily lives. These activities contribute $646 billion to the nation's economy, supporting 6.1 million jobs. Yet states and localities struggle to provide these benefits for parks amid flat and declining budgets, reporting an estimated $18.5 billion in unmet needs in 2011. The federal government is also facing a serious challenge as well since the National Park Service estimates its maintenance backlog at approximately $11 billion. The grade for parks remained unchanged at a C-.

Schools: Almost half of America's public school buildings were built to educate the baby boomers – a generation that is now retiring from the workforce. Public school enrollment is projected to gradually increase through 2019, yet state and local school construction funding continues to decline. National spending on school construction has diminished to approximately $10 billion in 2012, about half the level spent prior to the recession, while the condition of school facilities continues to be a significant concern for communities. Experts now estimate the investment needed to modernize and maintain our nation's school facilities is at least $270 billion or more. However, due to the absence of national data on school facilities for more than a decade, a complete picture of the condition of our nation's schools remains mostly unknown. Schools received a D again this year.

Energy: America relies on an aging electrical grid and pipeline distribution systems, some of which originated in the 1880s. Investment in power transmission has increased since 2005, but ongoing permitting issues, weather events, and limited maintenance have contributed to an increasing number of failures and power interruptions. While demand for electricity has remained level, the availability of energy in the form of electricity, natural gas, and oil will become a greater challenge after 2020 as the population increases. Although about 17,000 miles of additional high-voltage transmission lines and significant oil and gas pipelines are planned over the next five years, permitting and siting issues threaten their completion. Thus, the grade for energy remained a D+.

Conclusion

Infrastructure is the foundation that connects the nation's businesses, communities, and people, driving our economy and improving our quality of life. For the U.S. economy to be the most competitive in the world, we need a first class infrastructure system transport systems that move people and goods efficiently and at reasonable cost by land, water, and air; transmission systems that deliver reliable, low-cost power from a wide range of energy sources; and water systems that drive industrial processes as well as the daily functions in our homes. Yet today, our infrastructure systems are failing to keep pace with the current and expanding needs, and investment in infrastructure is faltering. We must commit today to make our vision of the future a reality an American infrastructure system that is the source of our prosperity.

Appendix F

Failure to Act: The Impact of Current Infrastructure Investment on America's Economic Future

American Society of Civil Engineers

Introduction

Infrastructure is the physical framework upon which the U.S. economy operates and the nation's standard of living depends. Everything depends on this framework, including transporting goods, powering factories, heating and cooling office buildings, and enjoying a glass of clean water. The preceding four Failure to Act reports compared current and projected needs for infrastructure investment against the current funding trends in surface transportation; water and wastewater; electricity; and airports, inland waterways, and marine ports. Our projections included both the cost of building new infrastructure to service increasing populations and the cost of expanded economic activity; and for maintaining or rebuilding existing infrastructure that needs repair or replacement. The total documented cumulative gap between projected needs and likely investment in these critical systems will be $1.1 trillion by 2020. The subsequent analyses focused on the long-term effects associated with infrastructure investments and did not consider the immediate benefits associated with the construction process. The results show that deteriorating infrastructure, long known to be a public safety issue, has a cascading impact on the nation's economy, negatively affecting business productivity, gross domestic product (GDP), employment, personal income, and international competitiveness.

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The categories of infrastructure systems analyzed in the preceding *Failure to Act* reports were reviewed in isolation by each study. However, it is clear that there is an interactive effect between different infrastructure sectors and a cumulative impact of an ongoing investment gap in multiple infrastructure systems. For example, regardless of how quickly goods can be offloaded at the nation's ports, if highway and rail infrastructure needed to transport these goods to market is congested, traffic will slow and costs to business will rise, creating a drag on the U.S. economy that is ultimately reflected in a lower GDP.

This fifth and final report analyzes the interactive effect between investment gaps in the infrastructure sectors addressed in each of the preceding studies. It presents an overall picture of the national economic opportunity associated with infrastructure investment and the consequences of failing to fill the investment gap. The overall impact of deficient infrastructure associated with a general failure to invest cannot be estimated by simply adding the impacts found in each report because the degradation of surface transportation, water delivery and wastewater treatment, electricity, inland waterways, and marine ports each affect business productivity differently. Shifts to other production methods or modes of infrastructure may be possible given a decline in one system, which could mitigate the economic impacts of failing to invest in that system. For example, rail, in-

land waterways, and trucks are used to get goods to retail shelves—deteriorating conditions in one sector tend to make the other sectors more competitive. However, a general decline in infrastructure conditions across multiple sectors would preclude such strategies. In addition, the consequences of infrastructure shortfalls differ by each system. With degrading surface transportation, trips can still be made, but they would take longer and be less reliable, and travel could be less safe. Declining airport and marine port infrastructure directly impacts the nation's ability to import and export goods efficiently, driving up costs to U.S. consumers. Overall, if the investment gap is not addressed throughout the nation's infrastructure sectors, by 2020, the economy is expected to lose almost $1 trillion in business sales, resulting in a loss of 3.5 million jobs. Moreover, if current trends are not reversed, the cumulative cost to the U.S. economy from 2012–2020 will be more than $3.1 trillion in GDP and $1.1 trillion in total trade.

Often, estimates of economic activity and job creation focus on the design and construction period for infrastructure projects, such as a project to rebuild an aging bridge. However, this study focuses on the incremental and gradual decline of infrastructure systems under current investment scenarios, and it shows that the negative impacts on the nation's economy are exacerbated over time as needed investments are deferred. Conversely, this study demonstrates that the economic benefits of infrastructure investment reverberate through every sector of the economy over time.