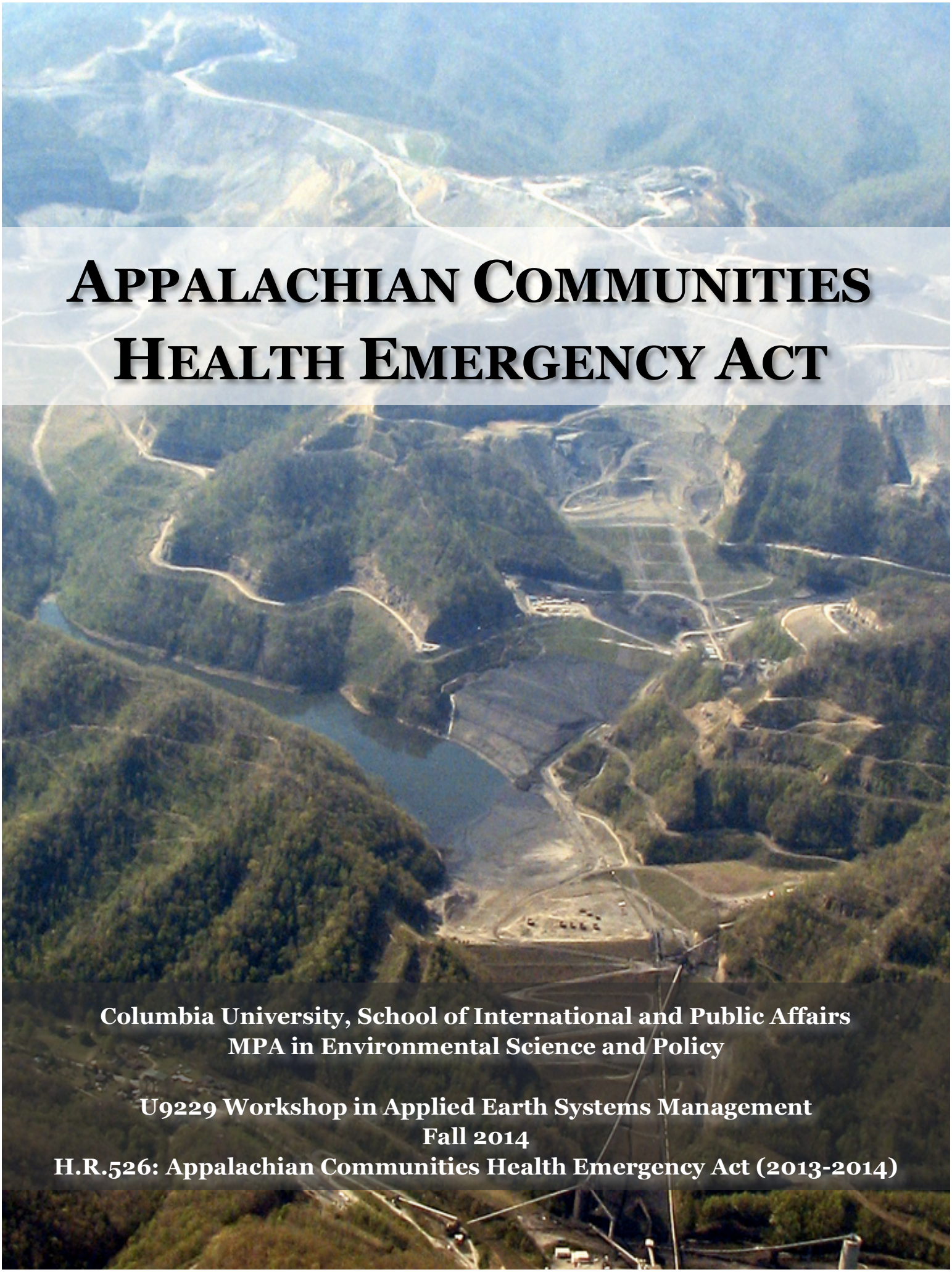
APPALACHIAN COMMUNITIES HEALTH EMERGENCY ACT



Columbia University, School of International and Public Affairs
MPA in Environmental Science and Policy

U9229 Workshop in Applied Earth Systems Management
Fall 2014
H.R.526: Appalachian Communities Health Emergency Act (2013-2014)

Final Report

H.R.526: Appalachian Communities Health Emergency Act

U9229 Workshop in Applied Earth Systems Management
December 3, 2014

Team Manager	Meiyi (May) Chen
Team Deputy Manager	Tom Pellicano
Team Members	Madison Baxter
	Shannon Craig
	Tianhua (Nick) Gao
	Joseph Manning
	Bumpei Sugano
	Alisha Sunderji
	Denis Tan
	Jingyu (Hebe) Zhou
Faculty Advisor	Professor Kathleen Callahan

Executive Summary

Mountaintop removal coal mining is an extractive surface mining practice that is unique to the Appalachian region of the United States, specifically in the states of West Virginia, Virginia, Kentucky, and Tennessee. The practice involves the heavy use of explosives in order to blast away the tops of mountains within the Appalachian Mountain range in an attempt to expose the coal seams just below the mountaintops for excavation. Digging a bit deeper, mountaintop removal mining is comprised of three main components: the abovementioned explosive blasting process, valley filling, and the post mining slurry process. Since its inception, mountaintop removal mining has been a contentious issue amongst the scientific and coal mining communities regarding its potential hazardous impact on the environment and surrounding ecosystems. As a result, the US government has regulated mountaintop removal mining by means of the Surface Mining Control and Reclamation Act (SMCRA) of 1977.

As previously mentioned, the environmental implications of mountaintop removal mining regarding pollution of the surrounding air, water, and soil has been scrutinized and studied rather extensively. However, recently the conversation has shifted toward a focus on the potential connection between the processes involved in mountaintop mining and observed adverse human health outcomes within surrounding Appalachian communities. Specifically, are the negative impacts on the surrounding environment in Appalachia, as a result of mountaintop removal processes, causing the adverse health outcomes that are being experienced by everyday citizens in the area; in spite of the regulatory framework previously laid out within the SMCRA. Further, can a definitive link be made between mountaintop mining and declining public health when accounting for other confounding factors such as poverty, access to healthcare, and other traditional coal mining activities. These very questions have provided the impetus for the Appalachian Communities Health Emergency (ACHE) Act.

Research has alluded to a correlation between higher than average levels of deaths from cancer, respiratory disease, and cardiovascular disease as a result of the processes involved in mountaintop removal mining. However, the ACHE Act aims to identify whether a definitive causal relationship can be determined between the aforementioned adverse health outcomes and mountaintop removal mining. In order to accomplish this task, the ACHE Act proposes two primary solutions and two peripheral solutions. Firstly, the act places a moratorium on the issuance of new mountaintop mining permits and requires the National Institute of Environmental Health Sciences (NIEHS) to conduct a comprehensive health risk assessment within the moratorium period. Moreover, the act calls for mandatory continuous impact monitoring to be carried out by all existing mountaintop-mining companies that wish to continue to operate in

Appalachia. Additionally, a means of financial support is explicitly defined within the legislation to fund the health risk assessments.

The subsequent report provides insight behind the scientific underpinnings of the mountaintop removal mining process, as well as the adverse health impacts being observed within the surrounding Appalachian communities. Furthermore, it serves as an implementation plan for the legislation upon adoption. The report aims to highlight preliminary program design elements including organizational structure, program timeline, a performance management system, and a budget and revenue plan. Additionally, the programs first year activities will be detailed in greater depth in order to establish basic program elements such as a the overall master calendar and total program cost, which is estimated to be approximately $17 million. Ultimately, the success of the program and legislation will be determined in large part by whether or not a conclusive health risk assessment was properly designed and implemented.

Acknowledgement

Meiyi (May) Chen
mc3926@columbia.edu

Tom Pellicano
tap2139@columbia.edu

Madison Baxter
mmb2260@columbia.edu

Shannon Craig
sec2182@columbia.edu

Tianhua (Nick) Gao
tg2491@columbia.edu

Joseph Manning
jmm2378@columbia.edu

Denis Tan
dwt2118@columbia.edu

Bumpei Sugano
bs2870@columbia.edu

Alisha Sunderji
ans2176@columbia.edu

Jingyu (Hebe) Zhou
jz2586@columbia.edu

Professor Kathleen Callahan
callahan166@gmail.com

Table of Contents

I. INTRODUCTION 7

II. OVERVIEW OF THE ACHE ACT 12

III. PROGRAM DESIGN 18

IV. PROGRAM BUDGET AND REVENUE PLAN 33

V. CONCLUSION 40

VI. APPENDIX 40

VII. REFERENCES 41

I. Introduction

a. What is mountaintop removal mining

Mountaintop removal coal mining is an extractive practice common to Appalachia, namely, Kentucky, Tennessee, Virginia, and West Virginia (see Figure I-1). This is a form of surface mining in which the tops of mountains are removed using explosives in order to mine the coal beneath the surface. There are three major components of mountaintop removal coal mining processes: explosive blasting, valley filling, and the post-mining process. The following section will explore these components in-depth and articulate how they jeopardize both the surrounding ecosystems and human health.

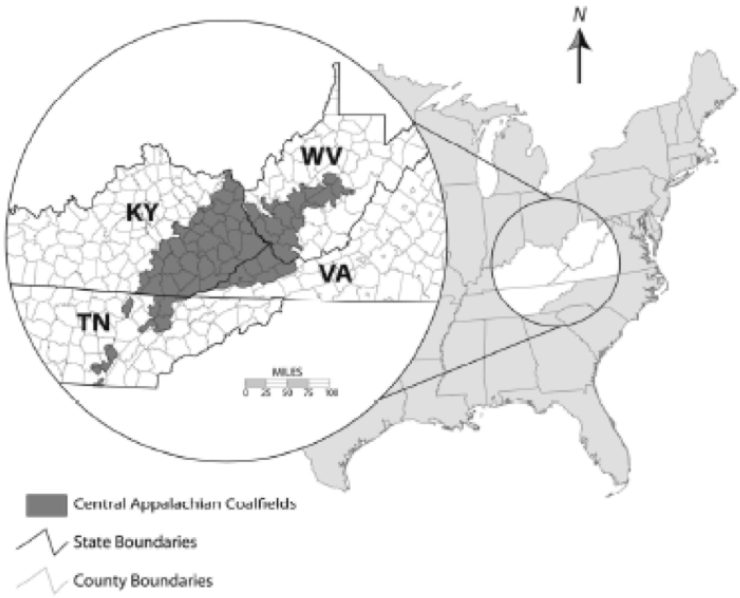


Figure I-1 - Locations of Surface Mining Coalfields (Source: USEPA)

Explosive Blasting

Mountaintop mining uses explosives to expose coal seams that lie beneath mountaintops. The explosives used contain large amounts of ammonium nitrate and diesel fuel. The explosions release coal dust and fly rock containing sulfur compounds, fine particulates, including particulate matter, metals, silica and nitrogen dioxide, into the air. These air pollutants are highly mobile and can travel far beyond the mining site (Hendryx et al., 2008).

Valley Fills

Mountaintop removal coal mining takes place over steep terrain where options for disposal of mine tailings are limited. As a result, the spoils of the mining activities are

deposited into nearby valleys, known as "valley fills." Valley fills often have a detrimental effect on ecosystems, especially the surrounding watersheds, and have the potential to bring contaminants in close proximity to local communities (USEPA, 2012a).

As previously mentioned, valley filling involves depositing non-coal spoils, or excess rock, into nearby valleys (see Figure I.2). Valley fills permanently bury headwater streams under hundreds of meters of coal excavation waste. As a result, there are chemical reactions which take place between One example is the dissolution of the coal seam mineral, pyrite (FeS_2), when it comes into contact with water. The dissolution of pyrite forms sulfuric acid (H_2SO_4), which further dissociates to hydrogen and sulfate (SO_4^{2-}) ions. Sulfate in particular plays a major role in the water quality of the buried headstreams surrounding the mining sites (Lindberg, 2011).

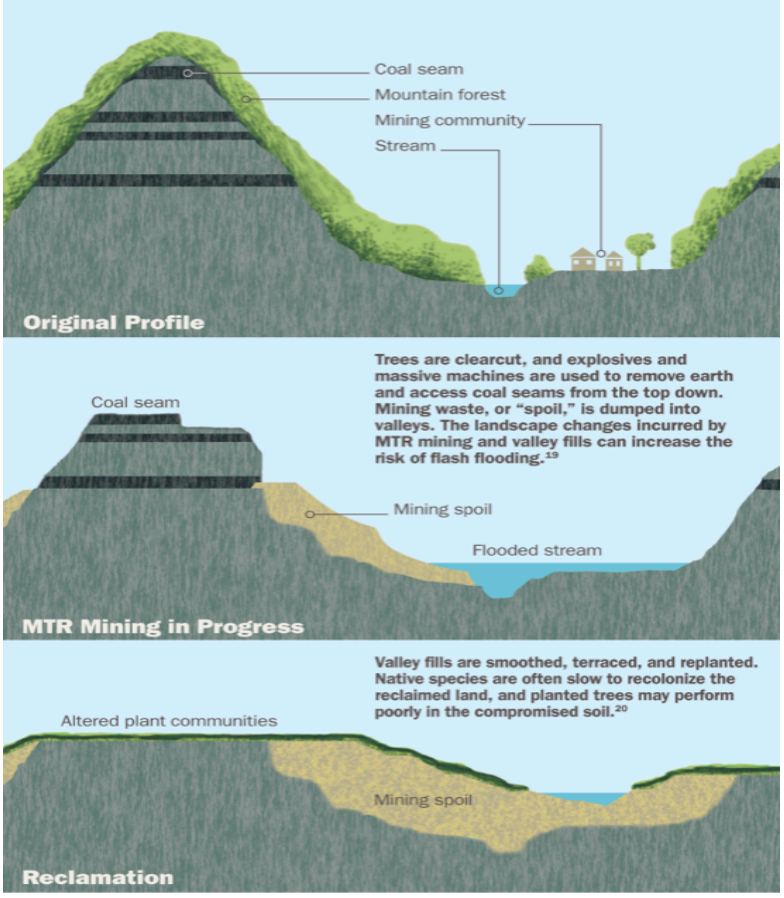


Figure I-2 - Valley Fill Process for Mountaintop Removal (Source: J. Tart, EHP)

Once in the watershed, sulfate increases aquatic pH levels, leading to higher amounts of dissolved selenium, manganese, iron and aluminum. Streams buried by sulfate laden mountain top spoil have dangerously high concentrations of elements such as selenium. Dissolved metal contaminants include manganese, iron, and aluminum, though

selenium is by far of the most concerning for human health. Selenium can significantly alter the biotic factors of the stream ecosystem, and has a high bioaccumulation rate, meaning that its toxicity increases as it moves up the food chain. In the case of the valley fill process, selenium tends to start off in sediment and the water column and move through the food chain via absorption through plants, microorganisms, and eventually fish native to Appalachian streams, such as the catfish and bluegill sunfish species (Savage, 2013). The EPA has a chronic standard for selenium in freshwater of 5 µg/L. Self reported figures of selenium discharge by current mining operations range in values from 14 µg/L to as high as 79 µg/L. In addition, studies have shown levels over the EPA standard of 5 µg/L are highly toxic to the fish and aquatic life of the streams buried by the valley fills (Lemly, 2009).

The Post Mining Process

After coal is mined, it is washed in a mixture of chemicals to reduce impurities that include clay, non-carbonaceous rock, and heavy metals to prepare for use in combustion. This processing activity contaminates billions of gallons of water, which is then held in unlined open storage pits held back by earthen dams. This "coal slurry" contains toxic sludge laced with various toxic chemicals such as lead, mercury, chromium and most importantly, arsenic. Since these pits are not lined, there is a high risk for these chemicals to leach into the groundwater and contaminate both private drinking water wells and the public drinking water supply (Epstein et al., 2011). Moreover, dam failures can expose communities to highly concentrated "coal slurry," with potentially environmental and human health consequences (see Figure I-3) (KnoxNews, 2008).

b. Impact of mountaintop removal coal mining

These mining processes have led to the pollution of the air, soil and water of the surrounding areas. Residents of nearby towns have complained of the constant coal dust--particulate matter from pulverization of rock and coal--as well as the odorous aroma of hydrogen sulfide gas produced when bacteria encounter sulfate within the mining run-off (WHO 2003). Along with being unsightly, inhalation of particulate matter is a known cause of cardiovascular and respiratory stresses or disease (Hendryx et al 2008).

A 2010 EPA study revealed that the current valley fills have buried almost 2,000 miles of headwaters to the Mississippi River (USEPA, 2010). Reports show that water downstream from mountaintop removal mines and valley fills had salt concentrations up to 10 times that of water in un-mined watersheds. Changes in salt concentrations

alter the life cycle of benthic macroinvertebrates and other aquatic organisms. These organisms are often used as a warning indicator for public health concerns (Holzman 2011).

Several peer-reviewed studies published in the past decade focus on the relationship between mountaintop removal coal mining and its health impacts on local residents. Most of these studies conclude that mountaintop mining correlates with negative health outcomes in Appalachian communities, such as chronic cardiovascular disease, cancer, and respiratory disease. Zullig and Hendryx (2011) note that even after controlling for socioeconomic factors in a statistical regression model, mountaintop removal coal mining still plays a role in a local population's health outcomes. Other studies highlight similar conclusions. The Appalachian mining areas exhibit significantly higher chronic cardiovascular mortality rates than other non-mining areas (Esch and Hendryx, 2011). Both poverty and mountaintop removal coal mining factors are independently associated with such high mortality rates, which suggests that mining activities contribute to environmental and human health degradation in Appalachia (Hendryx, 2011).

A comprehensive report by Appalachian Voices (2012) supports these findings. Based on data collected by the Centers for Disease Control and Prevention and the National Center for Health Statistics, Appalachian states rank top among the states with the lowest health outcomes in the nation. Additionally, deaths from cancer, respiratory disease, and chronic cardiovascular disease during the period of 1999 to 2007 in counties with a large number of mountaintop removal coalmines in Appalachia significantly outnumber deaths in counties located in states without coalmines (see Figure II-1).

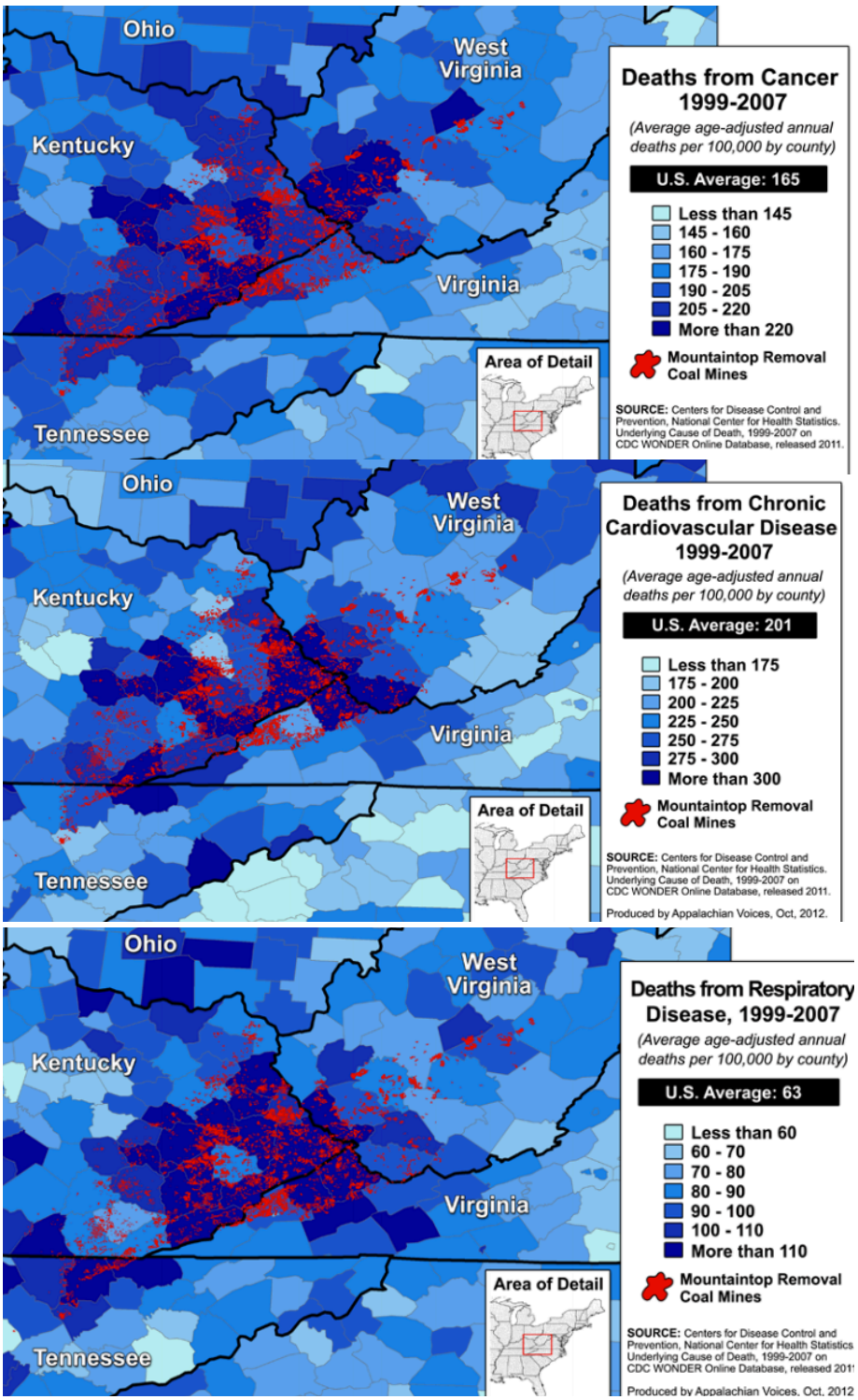


Figure I-3 - Cancer, Cardiovascular, and Respiratory Disease Death Rates in Appalachia (Source: CDC & Appalachia Voices)

II. Overview of the ACHE Act

a. Legislative summary

Recent peer-reviewed scientific findings show the Appalachian community, or the area within the states of Kentucky, Tennessee, West Virginia, and Virginia, has an increased level of health risks such as birth defects and circulatory and respiratory problems. Clusters of these risks are correlated with mountaintop removal coal mining activities conducted near the community. The Act consists of four parts designed to determine the impacts of mountaintop removal coal mining and protect the health of Appalachian communities.

Health Risk Assessment

The Act instructs that the Director of the National Institute of Environmental Health Sciences study, support, and publicize a report on the health impacts of mountaintop removal mining, so that the Secretary of Health and Human Services can determine if such coal mining activities impose any health concerns to local communities. Moreover, a report on the results should be made publicly. As the key measure of success of the Act, this section will require the risk assessment processes based on four indicators: design of the assessment, selection of the data and the methods, communication to the public, and review and accountability of the assessment.

Mining Permit Moratorium

The Act requires that no future permit for implementation or expansion of mountaintop mining be issued until the completion of the health impact study. Furthermore, it is not outside the realm of possibilities that this moratorium may stay in place, particularly if the Secretary of Health and Human Services formally recognizes negative health consequences are occurring as a result of mountaintop mining practices. This section aims to alleviate any potential harm imposed upon the surrounding communities by future mining activities until a determination can definitively be made.

Continuous Impact Monitoring

While scientific investigation proceeds, existing projects can advance, as long as corporations continuously monitor and report associated air, water, and soil pollution.

Failure to comply with continuous monitoring requirements will result in the suspension of permits or authorization for existing projects. It can be inferred that this section of the legislation represents a political and economic compromise between the mining industry, which urges continuous operation of the mining activities, and the environmentalists, who call on the necessity of full moratorium of the operation.

Financial Support

In order to pay for the health risk assessment and continuous monitoring, a one-time fee will be levied against entities currently employing mountaintop removal mining practices. Once the fee is collected, Congress will need to designate the money to the NIEHS during the appropriations process.

b. Issue and political analysis

Relationship to Current Legislation

There are two primary statutes that govern mountaintop mining and waste disposal processes: 1) the Surface Mining Control and Reclamation Act of 1977 (SMRCA), which is administered by the U.S. Department of Interior's Office of Surface Mining (OSM) and 2) the Clean Water Act of 1973 (CWA) which is administered by the EPA and the U.S. Army Corps of Engineers (Perk 2012). Consistent and complete interpretation of the Clean Water Act, which prohibits the dumping of pollutants into waterways without a permit, aims to ensure that all mining companies are abiding by the same criterion (Evans 2010). Similarly, the SMCRA establishes performance standards that mines must follow while operating and reclaiming mined lands and states that mining companies must restore the land to the same or better condition than when purchased (Kenney 2007). Under the SMCRA, mountaintop mines cannot be allowed within 100 feet of active streams, unless it can be shown that the streams will not be damaged and stream water quality will not fall below established standards, which are enforced through permits obtained by mining companies before conducting operations (Vollers 1999).

Despite these stringent standards needed to obtain mining permits, varying or loose interpretation of legislative language–taking some points into account, while disregarding others–indicates the limitations of current standards. Poor enforcement or interpretation of the current legislation by the agency issuing the permits may be to blame for current issues.

Policy Objectives

Mountaintop removal coal mining began in Appalachia during the 1960s, but rose in prominence in the 1990s, partly because of increased electricity demand and a decline in easily accessible coal mines. Mountaintop removal mining is both faster and less labor intensive than underground mining, and allows profitable access to shallow layers of coal seams. Surface mining accounts for approximately 34 percent of coal mined in Central Appalachia, and provide 7 percent of electricity in the United States (Perk 2012).

Surface mining has been widely recognized as a controversial practice due to its numerous environmental impacts, among which include the permanent degradation in the quality and biodiversity of Appalachian forests and watersheds. Focus on the public health impacts of mountaintop removal coal mining is a nascent trend that became the subject of academic research in the early 2000s. While the 1.2 million people living in Central Appalachia have long been recognized to have disproportionately poor health outcomes in comparison to the rest of the United States, a growing body of evidence points to a relationship between surface mining and elevated risks of cancer, cardiovascular disease, mortality and overall-health related quality of life. While it is unclear if a specific event or outcome spurred research into the public health effects associated with mountaintop removal coal mining, one possible explanation is that the aforementioned health outcomes have a long latency period and take time to be detected. In addition, extensive data and public health records that accumulated over time are needed to conduct epidemiological research.

The ACHE Act contains two main policy objectives in response to the potential adverse health impacts of mountaintop removal coal mining. An indefinite moratorium on the issuance of permits for new or expansion of existing mountaintop mining projects would bring any further health effects to a halt. Comprehensive health impact studies would be conducted during the moratorium period to ascertain the true health impact accruing from mining activities on the surrounding communities.

The other two sections of the act are peripheral solutions intended to support the two primary solutions. First, continuous impact monitoring serves as a compromise to companies currently conducting mountaintop mining, as well as the surrounding communities. It allows these companies to continue their existing operations as long as environmental pollution is monitored and reported. Second, the Act's financial support section provides a revenue stream to fund the pollution monitoring activities, as well as health impact studies.

The Act asks that the Director of the National Institute of Environmental Health Sciences study, support, and publicize the health impacts of mountaintop removal

mining, and that the Secretary of Health and Human Services determine if such coal mining activities impose any health concerns to local communities. The Act operates under four general rules and/or principles separated into the four sections of the Act: a health risk assessment, continuous impact monitoring, a mining permit moratorium, and means of financial support through a one time fee administered to entities currently employing mountaintop removal mining operations.

Political Environment

In order for the ACHE Act to be enacted, certain aspects of the current political setting would need to change. From an energy sector point of view, large fluctuations in the price of coal or changes in the efficiency of coal's energy production would have significant political implications that would shape the outcome and feasibility of the Act. For example, if the price of coal increased significantly, to the point where coal was no longer a cheap source of energy, major changes in the energy sector would take place, possibly allowing the Act to achieve its proposed goals and solutions.

The employment opportunities provided by mountaintop removal coal mining in Appalachian communities for residents add another layer of complexity to the politics associated with the Act. Because the ACHE Act would place a moratorium on future mountaintop removal coal mining permitting, possible pending employment opportunities would not be available.

However, mountain removal coal mining is not as labor intensive as conventional mining and due to technological advancements, employs less people today than it did historically, but produces significantly more coal (Appalachian Voices 2013). About 130,000 people in West Virginia were once employed in the mining industry, which today stands at a number closer to 20,000 miners (Appalachian Voices 2013).

Declining coal production, coupled with the mechanization of mountaintop removal coal mining has led to a rapid decrease in employment in Appalachia. Between 1973 and 2003, surface coal production in Appalachia fell by 6.82 percent while employment fell by 43.2 percent. The number of mountaintop removal coal mining jobs is relatively economically insignificant in Appalachia. In West Virginia, surface mining directly accounted for 0.89 percent of all jobs in the state in 2006. During the same year in Kentucky, surface mining directly accounted for 0.03 percent of jobs; in Virginia, 0.04 percent of jobs; and in Tennessee, 0.01 percent (Appalachian Voices 2013). There are approximately 14,000 strip miners in Appalachia, compared to a peak of over 150,000 in the 1950s; mining jobs account for less than 1 percent of all the jobs in the region. In some counties where surface mining comprises a larger level of employment, mining

wages account for a large percentage of total wages in the area because jobs are generally scarce (Appalachian Voices 2013).

Even in places where the coal industry employs a majority of individuals, the number of jobs provided by mountaintop mining is set to decline. A study by the U.S. Geological Survey has predicted that high-quality Appalachian coal beds will last no more than 10 to 20 years into the future, after which coal production is set to decline (Perks 2013).

Past history would suggest that aspects of the ACHE Act would be heavily litigated. For instance, in July of 2010, lawyers for the National Mining Association sued the U.S. EPA and the Army Corps of Engineers in an effort to slow down the strict regulation efforts put forth by the Obama Administration (Ward 2010). In 2012, U.S. District Judge Reggie B. Walton ruled "that the EPA infringed on the authority given to state regulators by federal clean-water and surface-mining laws" (Raby 2012). The National Mining Association criticized the EPA's proposed guidelines, calling them "job destroyers" (Raby 2012). Ironically, being the ACHE Act was proposed by a Democratic representative from Kentucky, the Governor of Kentucky, Steve Beshear, was pleased with the ruling, calling it "a victory for coal miners who have seen mines close and their jobs put in jeopardy due, in part, to the actions of the federal EPA" (Raby 2012).

Supporters and Opponents

The Act was proposed by John Yarmuth, a representative from Kentucky's 3rd District, and has 46 co-sponsors, all democrats, with a significant proportion (11) coming from California (H.R. 526). Led by a movement of affected Appalachian coalfield organizations, the ACHE Act has the backing of the major environmental groups in Washington, D.C., including Earthjustice and the Sierra Club, as well as West Virginia Highlands Conservancy, the Ohio Valley Environmental Coalition, and Southern Appalachian Mountain Stewards (H.R. 526).

Coal industries have deep political ties in the Appalachian region. Often coal is referred to as the "third rail" of Appalachian politics and to touch it means certain political death (House & Howard 2009). Critics argue that coal holds no political loyalties and both Democrats and Republicans alike in the region suffer from a moral cowardice when it comes to standing up to the coal industry. This deep tie to the coal industry by local politicians makes it extremely difficult for legislation such as the ACHE Act to be passed by Congress.

West Virginia offers a poignant example of how the coal industry has influenced the political process. For example, Governor Cecil Underwood, a former coal executive, who held office from 1996 to 2001, was the beneficiary of $250,000 in campaign donations

from various coal companies. Governor Underwood later pushed a bill through state legislature to make mountaintop removal coal mining easier and more profitable by allowing companies to mine up to 480 acres of drainage above any stream, an increase from the former level of 250 acres, before paying mitigation costs to the state (Vollers 1999). The Peoples Election Reform Coalition cites that contributions from the coal industry and its supporters have contributed to over $2,136,969 to governors for their campaigns and inaugural parties between 1996 and 2004 in West Virginia (Keating 2005).

Beyond receiving financial support from the coal industry through donations, some politicians are directly affiliated with the coal industry, such as those who hold shares in coal companies and earn income from mining companies. Senator Joe Manchin, from West Virginia, reported earnings exceeding 1.7 million dollars from EnerSystems, a coal brokerage company that he ran just 19 months before winning his Senate seat. Manchin transferred day-to-day control of EnerSystems to his son before election and continues to support coal industry interests (Quinones & Schorse 2011). The Senator's first bill in 2010, called the "EPA Play Fair Act", was aimed at stopping the EPA from retroactively vetoing mountaintop removal coal mining (Manchin Senate 2011). The abovementioned examples illustrate the coal industry's strong political influence in Appalachia.

Unresolved Issues

There are many unresolved implementation issues in the ACHE Act. A lack of detailed instructions within the Act would make program implementation difficult, as the scope, timeline, and funding are all undefined. As mentioned previously, the political circumstances in which the ACHE Act will be considered also contribute to uncertainty regarding its outcome. The Act does specify who will be in charge of comprehensive health studies on the health impacts of mountaintop removal coal mining, stating "the Director of the National Institute of Environmental Health Sciences, in consultation with the Administrator of the Environmental Protection Agency and the heads of such other Federal departments and agencies as the Director deems appropriate, shall: conduct or support comprehensive studies on the health impacts, if any, of mountaintop removal coal mining on individuals in the surrounding communities…" (H.R. 526). However, the coordination and inclusion of other agencies makes the political landscape in which the Act is situated more complex. Past programs can serve as a model for accomplishing such collaborations.

III. Program Design

The major mandate of the ACHE states that the Director of the National Institute of Environmental Health Sciences (NIEHS) shall conduct or support health studies to determine the health risk of mountaintop removal mining on neighboring communities. We formulated a program design, in which NIEHS will lead the study, to actuate this mandate.

There are a few reasons why the NIEHS was chosen to lead the study on a federal level.

Firstly, the National Institute of Environmental Health Sciences' (NIEHS) mission is to determine how the occurrences in the physical environment affect human health. Located in Research Triangle Park, North Carolina, the NIEHS conducts long term, high risk studies centered on epidemiological studies and toxicity testing. Over 200 fellows and post-doctoral scientists are trained on-site annually. Consequently, NIEHS has a proven track record in conducting health impact studies. Hence, we expect studies undertaken by NIEHS to be objective and reliable.

Secondly, by leaving the implementation to federal rather than state authorities, decisions made at the federal level can influence state regulatory choices in a positive manner, resulting in a greater level of state regulation (Adler, 2007).

Thirdly, the NIEHS is an ethically conscionable organization that adheres to ethical norms in research (Resnick, 2011) The adherence to ethical norms "promote the aims of research," "promote the values that are essential to collaborative work," "ensure researchers can be held accountable to the public," "help to build public support for research," and "promote a variety of other important moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and health and safety" (Resnick, 2011). Hence, an NIEHS-lead study can set a positive example for environmental health authorities within each state to influence state regulatory choices to abide by ethical norms in the long term.

Lastly, the NIEHS welcomes community involvement through public meetings and opportunities for the public to comment on research plans, budget priorities, and the use of research findings. The NIEHS also holds informational sessions and campus tours for students and teachers K through 12. Given that NIEHS-led studies are likely to be objective and reliable, we believe that this option would be acceptable to the environmental and community advocacy groups in Appalachia.

We must, however, note that there are some drawbacks with regards to this design. Firstly, NIEHS researchers may be unfamiliar with the cultural and geographical traits

that characterize Appalachia and its people. Consequently, research conducted by the NIEHS may not be able to holistically account for such factors. This issue can be ameliorated if NIEHS contracts local academics or cultural expects to assist in the studies. Another alternative would be to involve the local community by setting up a local advisory committee to ensure that all geospecific traits of Appalachia are considered in the health risk assessment.

Additionally, elected State officials may be against this option as there is the potential that they perceive the plan to be infringing upon their states authority and power.

Also important to note, the NIEHS is housed in North Carolina, and not one of the four states located within the Appalachian region (Tennessee, West Virginia, Virginia, and Kentucky). As a result, any economic impacts, in terms of employment and associated results, would not directly benefit Appalachian communities. This is relevant for our purposes, as Environmental health studies can be lengthy and costly.

Lastly, since the NIEHS researchers are based in North Carolina, expenses will be incurred for travelling and transporting collected samples to and from Appalachia. Although the permitting fee included in the ACHE Act will provide a means of financial support for the necessary health risk assessment, off-site research activities may not constitute a prudent use of limited funds.

On the balance of evidence, we believe that this remains the most optimal program design option despite the drawbacks raised. Moreover, the drawbacks can be minimized through proper regulatory oversight, including the inclusion of a local advisory committee and audits to ensure the prudent use of travel funds.

a. Organizational structure and staffing plan

We recommended implementing the ACHE act through NIEHS-led studies given their proven track record in environmental risk assessments. Moreover, NIEHS adheres to ethical norms in research (Resnick, 2011) as norms "ensure researchers can be held accountable to the public," and "help to build public support for research," (Resnick, 2011). To design a detailed organizational contracting and staffing plan for NIEHS to lead the health studies, we need to understand the existing organizational hierarchy and functional properties.

Existing Organizational Properties of NIEHS

(1) National Institute of Environmental Health Sciences

The NIEHS oversees both intramural and extramural environmental health science research. It also implements environmental health science studies related to the National Toxicology Program (NTP) through the National Toxicology Program Division (NTPD). The NTP is an interagency program whose mission is to evaluate agents of public health concern by developing, applying tools of modern toxicology and molecular biology, and testing and evaluating various substances and chemicals found in the environment (NTP, 2014a). On the other hand, NTPD is a division within NIEHS that implements environmental health aspects of NTP.

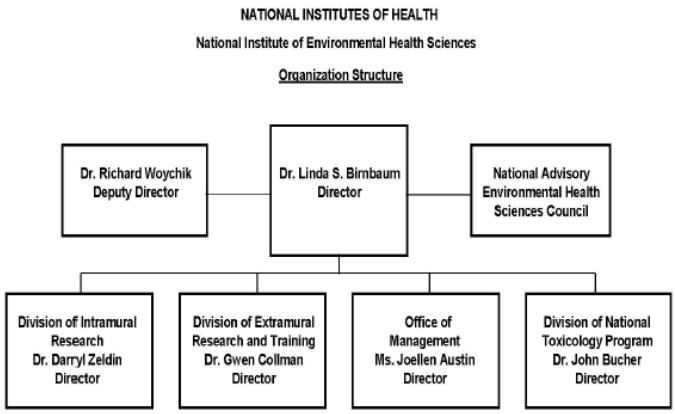


Figure III-1 – Organizational Structure of NIEHS

(2) National Toxicology Program

The National Toxicology Program (NTP) is housed within the NIEHS. The Director of NTP oversees daily activities within the program. The program provides toxicological evaluations on substances of public health concern, develops and validates improved toxicology methods, develops approaches and generates data to strengthen the science base for risk assessments, and communicates results with all stakeholders

The National Toxicology Program Division includes four separate branches as well as the NTP laboratory. These branches are Biomolecular Screening Branch, Cellular and Molecular Pathology Branch, Program Operations Branch, and the Toxicology Branch.

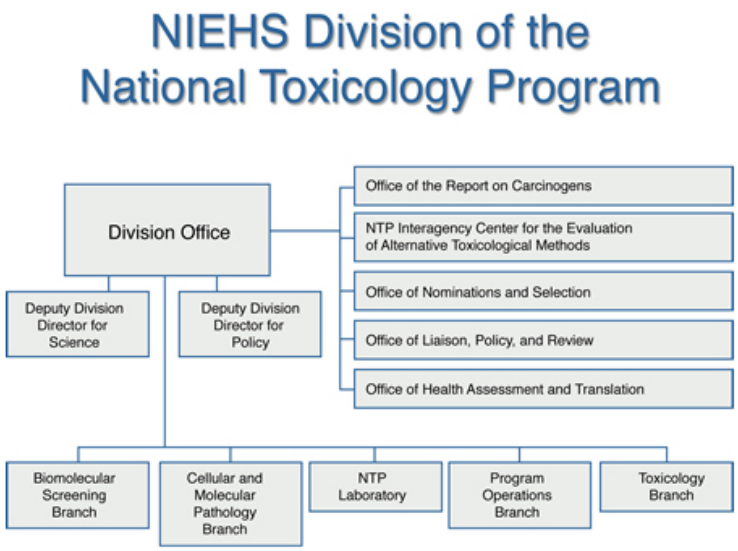


Figure III-2 – Organizational Structure of National Toxicology Program Division

Proposed Organizational Structure

(1) Background Analysis

We recommend contracting out ("purchasing") the research work to independent laboratories, consulting organizations, university researchers instead of implementing the research in NIEHS through expanding its internal capacity ("producing"). This way, we can augment and supplement existing NIEHS researchers with external researchers that have expertise in other subjects while keeping a tight rein on costs (Cohen & Eimicke, 2011). Cost is driven down through both incentive compatibility, since private contractors maximize profits by reducing cost in face of fixed revenues as stipulated in the contracts, and through the competitive tender process (Domberger & Jensen, 1997). Moreover, existing research shows that contracting enhances flexibility in staff selection, and enables more rapid implementation (Cohen & Eimicke, 2011). While NTP has its own slate of toxicology researchers, the contracting process allows it to expand its research capacity without being constrained by civil service operating protocols regulating manpower allocation. As NTP decides on which hazardous substances to study through its nomination program (NTP, 2014b), there is valid concern that adding mountaintop mining health risk assessments to its portfolio would crowd out focus on other hazardous substances. Contracting out the resource-intensive mountaintop removal mining health assessment would not slow its research on other hazardous substances.

The responsibility for negotiating contracts and monitoring contractor performances will fall under the purview of the National Toxicology Program Division. We propose the following structural relationship:

Figure III-3 – Proposed Organizational Structure of Program Design

In the proposed structure, NTP directs the health studies and reports findings to the Deputy Director of Science of NIEHS. We recommend introducing one new position, which is called Principal Investigator into NTPD to oversee the contracting processes. Besides, we propose to create the program coordinator who is responsible for monitoring contract performance and other daily administrative issues. We also advise forming two independent committees as accountability mechanisms for the contracting process.

(2) Creation of new position in NTPD

NTPD needs manpower to manage the tender and contracting process, as well as to oversee the performance of the contract through its entirety. Moreover, manpower is needed to serve as the secretary to the two advisory committees. To this end, we propose the creation of two new positions both of which under the direct supervision of the Deputy Director of Science of NTPD.

The principal and assistant investigator will be responsible for overall leading and overseeing of the health assessment process. They will be the bridge between upper NIEHS management and contractors and two advisory committees. Moreover, analyzed data and preliminary conclusions from the contractors will be compiled to them for further investigation. Principal investigator will make the final decision on whether mountaintop removal coal mining is associated with health problems in the surrounding communities.

The coordinator will compose the tender's contractual terms, and serve as the communication channel between the contractor, the two accountability committees, and principal investigator. The coordinator will also consult with the Toxicology Branch and the NTP Laboratory of NTPD to monitor the contractor's work. In addition, the coordinator is charged with reporting the research progress to the Deputy Director of Science in NTPD, handling operational and administrative matters with regards to the contractual relationship between NTPD and the contractor, and act concurrently as the permanent secretary to the two advisory committees.

(3) Accountability Mechanisms

The contractor's performance will be tracked by the program coordinator in consultation with the senior management of NTPD. Unsatisfactory performance can trigger contract review. The quality of the health study is also kept in check by the Local Advisory Committee and Scientific Advisory Committee, as well as the double-blind peer-review mechanism when the contractor eventually publishes its findings through NIEHS.

(4) Local Advisory Committee

The Local Advisory Committee (LAC) will be charged with advising NTPD on local cultural traits, concerns, and interests. The comments made by the committee will be passed to the contractor via the program coordinator. They will meet on a monthly basis with travel allowances provided by NTPD. They will also advise NTPD on outreach programs meant to inform the public about the health study and its progress. It will comprise of 15 to 20 members evenly divided into 4 Appalachian states: Virginia, West Virginia, Kentucky, and Tennessee. Each state will be represented by 4 to 5 committee members with background in various fields of public health, commerce, environment, community leadership. The committee will internally elect a Committee Chair. The committee will also be staffed by an NTPD officer who will act as the committee's secretary.

Members of the community in the 4 states can self-nominate to serve on the committee, subject to approval by the Deputy Director of Policy of NTPD. The Deputy Director of Policy of NTPD can also offer committee positions to individuals deemed to be held in high regard by the respective communities.

(5) Independent Scientific Advisory Committee

The Scientific Advisory Committee (SAC) will be charged with providing technical advice to NTPD in areas such as study methodology and data quality. The comments

made by the committee will be passed to the contractor via the program coordinator. They will meet on a monthly basis with travel allowances provided by NTPD. It will comprise of 5 to 10 members consisting of esteemed members of academic community that have expertise in risk assessment and environmental science, including but not limited to: physical scientists, social scientists, toxicologists, risk assessors, as well as medical doctors. Appointments to the panel will be made by the Deputy Director of Science of NTPD in consultation with the NTP Board of Scientific Counselors. Scientists may self-nominate to serve on the committee, subject to approval by the Deputy Director of Science of NTPD in consultation with the Board of Scientific Counselors. The committee will similarly elect a Committee Chair.

(6) Potential Contractors

Research universities, engineering firms, and environmental consulting companies are expected to compete for the competitive tender to conduct the health risk assessment. For instance, top toxicology departments around the country, like the Columbia University School of Public Health and the Toxicology departments of Cornell University and North Carolina State University, can compete for the tender. Engineering firms like CH2M Hill and URS Corp and consulting firms like Stratus Consulting, TDC, and CTEH have a track record of undertaking public health risk assessments and may also be interested in competing for this contract. However, we recommend prioritizing tenders from research universities as the public may have greater confidence in the objectivity and rigor of their work. This can be built into the tender mechanism and communicated to the parties interested in competing for the contract.

(7) Scope of Contract

The contract will stipulate that terms of reference for the contractor as well as the duration of the contract. If available, the contractor will be provided access to data and information submitted by mountaintop removal mining companies as per the continuous monitoring provision of the Appalachian Communities Health Emergency (ACHE) Act. Upon receipt of such data, the contractor can use the data appropriately to determine and prioritize the scope of contaminants and the location of communities that their study will focus on. The contract will have a built-in clause mandating the consideration of Appalachian specific factors to separate the causal impact of mountaintop removal mining on health from mere correlations. The contract will allow for contractor to sub-contract out non-peripheral operations subject to the approval by NTPD. The contractor is vicariously liable for non-performance of their sub-contractors.

The contract will mandate that the contractor submit quarterly reports of their progress and findings to the program coordinator as well as meet the coordinator monthly to

follow-up on concerns expressed by the LAC and SAC. This ensures that all community concerns are internalized and communicated while advice from scientific experts is followed. In addition, the contract will mandate quarterly meetings between the contractor, senior management of NTPD, the program coordinator, and the chairs of the LAC and SAC for performance evaluation. The contract will also have provision for contract review in cases of unsatisfactory performance. Moreover, the contract will attribute the rights to the concluded health studies to NIEHS.

Finally, the contract requires the contractor to propose an acceptable and reasonable estimated duration for comprehensive health risk assessment. The submitted duration will be built into the tender final award using incentive compatible design of imposing financial penalties for exceeding the duration while not reducing revenue for early completion.

b. Program timeline and master calendar

As a means of determining a feasible timeline (and budgetary estimates) for a human health risk study of this size and caliber, previous and ongoing health risk assessments that are similar in scope will be used for comparative purposes. One such study that has been heavily utilized as a frame of reference is the Gulf Long-term Follow-up Study (GuLF study) that was similarly undertaken by the NIEHS in order to study the long-term health impacts of the Deepwater Horizon oil spill that occurred in 2010. There are many parallels that exist between the two studies relating to the scope, estimated time frame, type of study, and agencies involved in implementation. For example, both studies are charged with conducting a health risk assessment spanning four different states, under the direction of the NIEHS, and utilize external contractors as well as in house resources for their program design. Furthermore, the type of data to be collected in both studies are similar with regards to the collection of air, water, and soil samples as well as surveying of biological and epidemiological related human conditions. Given the above considerations, GuLF study budgeted a five-year period for the initial stage of health risk assessment. Similarly, we determined that the preliminary timeline of the health risk study for mountaintop removal mining in Appalachia would be five years.

Given that this program is designed as five-year-long project, we suggest that we divide the program into three phases. The first year primarily focuses on administration setups, research planning, hiring contractors and initial data collection. During the second to fourth year, the program will mostly include activities for actually conducting the health study and facilitating the continuous impact monitoring data collection. The fifth year consists of data analysis, risk characterization and final report completion.

After the fifth year, a determination on the causal relationship between mountaintop removal coal mining and adverse health effect in the Appalachian region will be made.

Among the three phases, the first year is the key to setting the measure of the health risk assessment in the following years since the first year process includes the establishment of several important criteria, plans and strategy for the future. Therefore, this memo is mainly focused on the timeline and activities in the first year by clarifying specific steps in order to examine the performance measurement. Then, this memo explains the overall steps beyond the first year based on the plan established in the first year.

First year activities

First year's activities are fourfold: 1) administrative tasks, 2) research planning, 3) contractual activities, and 4) review period. Administrative tasks will lay the foundation for the entire year's program, which primarily include staff reorganization, establishment of local and scientific advisory committees, as well as advisory committee meetings.

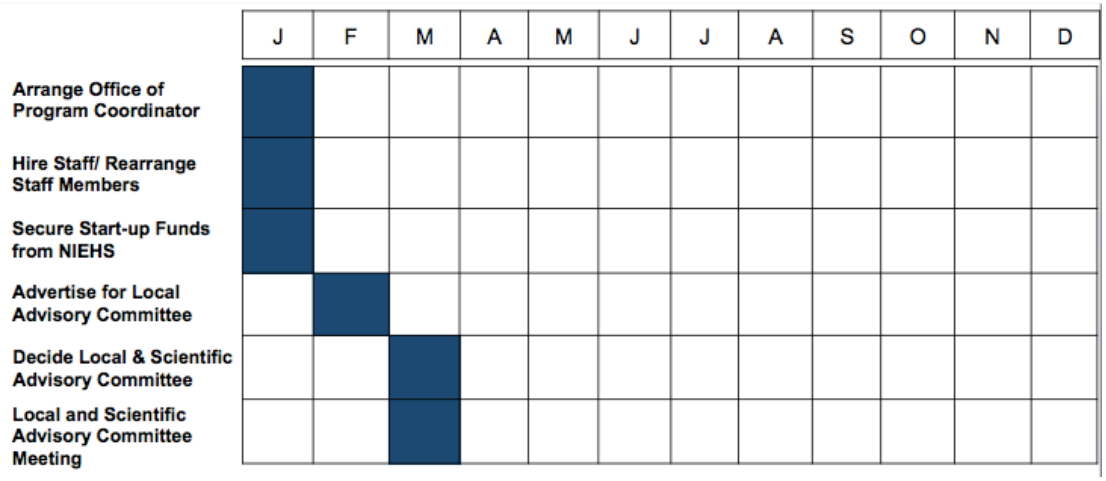


Figure III-4 – First Year Administrative Tasks Timeline

Research planning consists of critical activities during the first year, which includes the completion of a comprehensive literature review, formulation of a quality assurance plan, and the establishment of a continuous monitoring database.

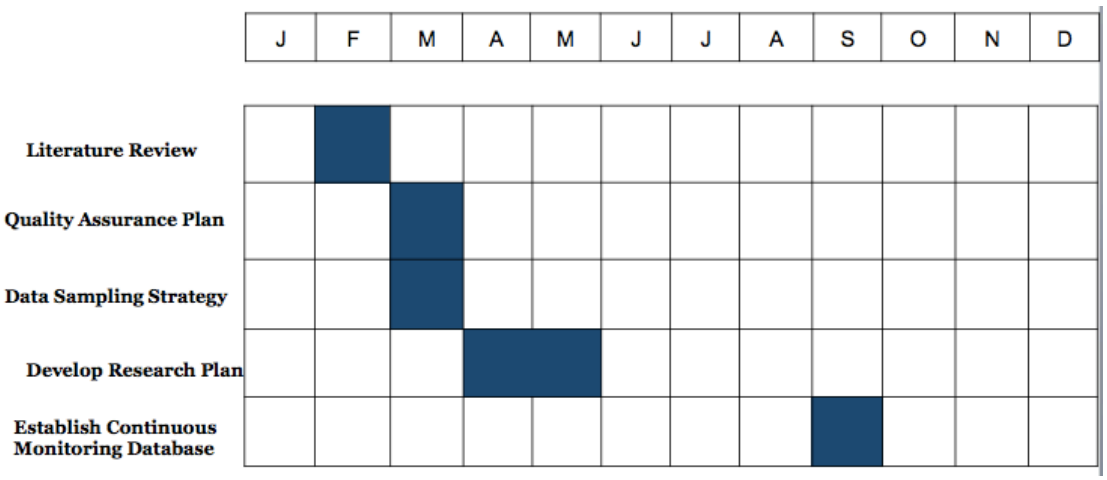


Figure III-5 – First Year Research Planning Timeline

Contractual activities will consume the bulk of the first year. These activities include the formulation of the contract itself, the approval from the Institutional Review Board, a six-month application period, a period of contract review, and finally the selection of a single contractor.

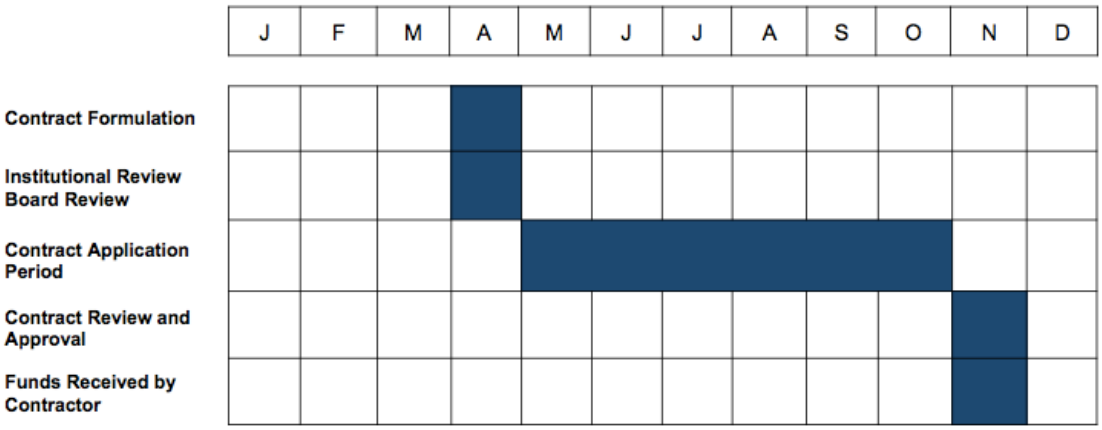


Figure III-6 – First Year Contractual Activities Timeline

Finally, the review period includes activities such as a budget review, NIEHS program review, and the publishing of an annual report. These three aspects of the program review will need to be completed at specified intervals for the remainder of the project.

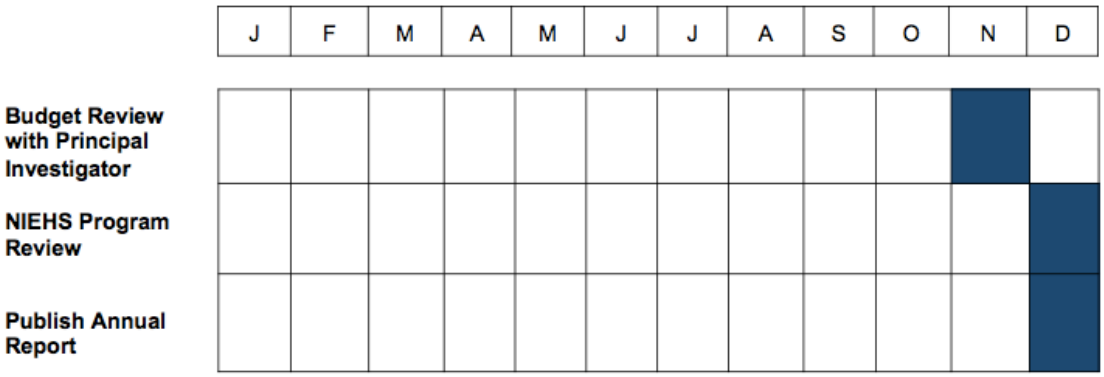


Figure III-7 – First Year Review Period Timeline

c. Performance management system

We overall divide the entire process into three parts: the first year, the second to the fourth year, and the fifth year. The first serves to prepare and set the stage for the entire data collection process. The second to fourth year will contain the phases required for conducting the health study and running the program. The fifth year will be used for the preparation of the final report that determines the causality of mountaintop mining and its health impact based on data analysis. As the first year is the key to setting the measure of the health risk assessment in the following years, we focused on measuring specific activities in the first year.

Monthly Activities

We plan to have several monthly activities. Firstly, we organize the external advisory committee meetings every month. The program coordinator is in charge of organizing the meeting. These meetings are important in obtaining input from advisory groups on the progress of the outcome of our health risk assessment. We suggest that advisory meeting performance be measured by whether or not the attendance of advisors is more than 80% for each scheduled meeting.

Also, we suggest that the team reviews the budget on a monthly basis. This review is conducted by the principal investigator based on the measure of whether the funds are spent within 5% of the planned budget.

In addition, it is necessary to complete staffing reorganization within the first three months. We aim to have 50% of the necessary staff in place by the end of the first month, 80% by the end of the second month, and 100% by the end of the third month. The principal investigator will oversee this reorganization process.

Quarterly Activities

We also plan to have several quarterly activities. First, we will check the progress of the project every three months through several criterion we set in the first year such as submission of the proposal request to the potential contractor, development of a sufficient quality assurance plan, and the creation of a data sampling strategy, which are explained below.

Moreover, we suggest that the principal investigator monitors individual performance based on specific personnel evaluation criteria such as timely completion of the tasks, teamwork, sufficient communication with other workers, and leadership when applicable. Although we suggest that the official personnel evaluation is conducted semi-annually, this quarterly evaluation will help individuals to improve their performance more efficiently.

First Year Overview

The first year of implementation is essential to ensuring that the NIEHS fulfills its mandate to produce a health impact assessment capable of determining a causal relationship between mountaintop removal mining and negative health outcomes in Appalachia. The success of the first year of our program will hinge upon the completion of 3 primary activities: hiring staff, developing a research plan, and selecting contractors.

Beginning in the first month of the program, the Deputy Director of Science will initiate the staffing process. Staff positions that need to be filled include a Principal Investigator, five Assistant Investigators, a Program Director and 2 Program Assistants. All of these staff positions will be filled through reorganization of existing NIEHS staff. One hundred percent of staff will need to be in place by beginning of month three of the program.

By the end of the third month of the program, the Principal Investigator will need to produce a Research Plan that outlines the strategy for how causation will be determined. Such a research plan requires several secondary activities be completed in order to inform the research plan. These activities include: a literature review, a quality assurance plan, and data sampling strategy. All of these secondary activities are to be completed by the end of the second month of the program.

In order to ensure that data, which will ultimately underpin the health impact study, will be collected in a timely and efficient manner a contractor must be selected by the end of the eighth month of the program. In order to achieve this outcome, the Program

Coordinator must conduct two secondary activities: Publicizing a request for application to potential contractors and a review of applications received. The request for applications will occur at the end of month three and will be developed based upon the research plan. Likewise the review of applications will assess whether a contractor can meet the goals of the research plan in a timely manner and within the programs budget.

Table III-1 – First Year Performance Measurement Activities

	ACTIVITY/OUTPUT	IN CHARGE
Month 1	Begin Staff Hiring	Deputy Director of Science
Month 2	Literature Review	Assistant Investigators
	Quality Assurance Plan	Principal Investigator Assistant Investigators
	Data Sampling Strategy	Principal Investigator Assistant Investigators
Month 3	Research Plan	Principal Investigator Assistant Investigators
	Publicize Request for Application to Potential Contractors	Program Coordinator
Month 5	Request for Application Window Closed- All Applications due for Review	Principal Investigator
Month 8	Contractor Selected	Principal Investigator Program Coordinator
Month 10	Start Preliminary Data Collection	Contractor
Month 12	Annual Report	Deputy Director of Science Principal Investigator

Quality Assurance Plan

After conducting a literature review, the next seminal step is to draft a Quality Assurance (QA) Plan. It documents the planning, implementation, and assessment procedures for a particular project, in addition to specific quality assurance and quality control activities. The QA plan can be organized into four central components: 1) Project Management, (2) Data Generation and Acquisition, (3) Assessment and Oversight and (4) Data validation and usability.

(1) Program Management

The Principal Investigator in collaboration with the Assistant Investigators will use the findings from the literature review to produce a report that contains a: project description, problem definition and background information on the scientific issue. This information will determine key program objectives and goals that will define the program.

(2) Data Generation and Acquisition

From the literature review and in consultation with the Scientific Advisory Committee, the Principal Investigator and the Assistant Investigators would produce reports that include: contaminants of concern and the measurement techniques used to determine the health effects. These reports will dictate the data generation process and set the terms for the implementation of the health risk assessment.

Consultations with the Board of Scientific Counselors (BSC), a federally chartered advisory committee within the National Toxicology Program (NTP) will be used to ensure that the data collection process is complying with regulatory standards. The BSC is responsible for providing scientific advice to the Director for the NTP and evaluates the scientific merit of the NTP's intramural and collaborative programs. Consultation with the BSC will take place before data collection occurs. These consultations, the Principal Investigator and Assistant Investigators will inform the research plan and set the terms of agreement/procedures for potential contractors.

(3) Assessment and Oversight

Assessments or evaluations are designed to determine whether the QA Plan is being implemented as approved, to increase confidence in the information collected, and determine whether the collected information may be used to meet project outcomes.

The QA Plan will outline seminal activities that will ensure data assessment and oversight. These activities include: scheduling quarterly progress reports to be completed by the principal investigator, and consultations with the scientific advisory committee.

(4) Data validation and Usability

Activities that ensure to that the data obtained meets the program objectives include the reviews of the data by the Principal Investigator. These reviews will be published in internal reports and may examine methods used to obtain data, analytical methods, and

the precision of sampling methods. Ultimately, these activities and outputs are focused on making sure that the collected data meets the program objectives.

Data Sampling Strategy

In conjunction with the Quality Assurance Plan, the Principal Investigator and Assistant Investigators will develop a Data Sampling Plan. The Data Sampling Plan will outline a strategy for the types of data collected and the methods of collection needed in order to produce a comprehensive health impact study. A data sampling plan will need to make determinations in four primary areas if it is going to be considered successful: 1) sample size and target population, 2) frequency of sampling, 3) sampling techniques, 4) scope of sampling area.

IV. Program Budget and Revenue Plan

As previously mentioned, section 6 (part a.) of the ACHE Act calls for a one-time fee to be imposed on each person conducting a mountaintop removal coal mining project in the United States in order to cover the fees and costs incurred by carrying out the health risk assessment and continuous monitoring provisions of the bill. In order to assess the proper fee to impose on a person, or entity, performing mountaintop removal coal mining we must first examine the expected overall budgetary costs associated with the aforementioned sections of the bill. For the purposes of this memo, the subsequent budgetary estimates will focus exclusively on the health risk assessment portion of the legislation outlined in section 3 of H.R. 526.

As a means of producing feasible budgetary estimates for a human health risk study of this size and caliber, previous and ongoing health risk assessments that are similar in scope will be used for comparative purposes. One such study that has been heavily utilized as a frame of reference is the Gulf Long-term Follow-up Study (GuLF study) that was similarly undertaken by the NIEHS in order to study the long-term health impacts of the Deepwater Horizon oil spill that occurred in 2010. There are many parallels that exist between the two studies relating to the scope, estimated time frame, type of study, and agencies involved in implementation. For example, both studies are charged with conducting a health risk assessment spanning four different states, under the direction of the NIEHS, and utilize external contractors as well as in house resources for their program design. Furthermore, the type of data to be collected in both studies are similar with regards to the collection of air, water, and soil samples as well as surveying of biological and epidemiological related human conditions. In addition to the GuLF study, research regarding comparative costs associated with the type of environmental testing needed for our purposes have been examined.

Upon the formulation of the subsequent budgetary estimate for the health risk assessment mandated by the ACHE Act, the next crucial step in the process would be to submit a request for an increase in the formal annual NIEHS budget by means of a Justification of Budget Request. Although the ACHE Act calls for a one time fee to be collected from the mountaintop mining companies as financial means to pay for the study, it is necessary to firstly obtain an increase in funding via a formal budget request by the NIEHS to the House of Representatives Appropriations Committee including our estimated program costs. Once the fees are in fact collected from the mining companies, the funds initially allocated via the NIEHS budget request will be paid back in full to the U.S. government. The reasoning behind the aforementioned sequencing of events is as follow. In order to minimize the timeframe of the study it is essential to make sure there are no impediments to the money being allocated in an efficient and timely manner. If we rely on the fee from the mountaintop mining companies to be collected prior to

beginning the study, we run the risk of pushing back our start date due to the possibility of unforeseen issues with regards to immediate payment from the mining companies. For example, it is not entirely unlikely that perhaps a mechanism such as a grace period would be necessary in order for the mining companies to have a bit more time to raise the funds needed. We can mitigate this potential issue by utilizing existing budgetary pathways via the NIEHS annual budget with a guarantee of payback once the fees are collected from the mining companies. Not only does this sequence of events ensure that the funds are available once the study begins, but it also builds in a mechanism to allow for the companies to have the time to raise the funds if need be.

Lastly, once the total budgetary cost is established we can determine the amount of the fee that each company engaging in mountaintop removal coal mining will be required to pay. This determination will take into account the size of the mountaintop mining company, specifically with regards to the total amount of mining operations they run and their output. As a result, different mining companies may be required to pay varying amounts based upon the total number of mountaintop removal coal mining activities they are engaged in.

a. Program Budget

National Toxicology Program

The NTP is an interagency program headquartered at the NIEHS whose mission is to evaluate agents of public health concern by developing, applying tools of modern toxicology and molecular biology, and testing and evaluating various substances and chemicals found in the environment. NTP will take on the main responsibility for conducting health risk assessment for the adverse health effect from mountaintop removal coal mining.

NTP will conduct In-house, or intramural research with scientists employed by the federal government who have laboratories at the NIEHS. NTP will use one principle investigator and five assistant investigators on the study with the support provided by the contractor.

The budget for NTP is divided into “Personnel” costs and “Other Than Personnel” costs. “Personnel Service” Costs are associated with the salaries for the principle investigators and assistant investigators and are adjusted to the amount of time that investigators will need to allocate for this study (50%). The base salaries for Assistant Investigators have been calculated according to the salary for the GS-11 level as that is for employees with 3 full academic years of progressively higher-level graduate education or Ph.D. or

equivalent doctoral degree. The base salaries for Principle Investigators have been calculated according to the salary for the GS-13 level as Principle Investigators is expected to have more working experience. Fringe benefits, which include health insurance and mileage stipends, have been estimated at a rate of fifteen percent (25%) of the salary allocation (see table following this section). "Other Than Personnel Service" (OTPS) costs include travel cost of site visits and conference, IT cost of employee IT devices, and other costs generated from sample and data analysis

National Toxicology Program				
Personnel Services				
	1 Principle Investigator	(50% of time)		$52,516
	5 Assistant Investigator	(50% of time)		$208,875
			Base Salaries	$261,391
			Fringe Benefits 25%	$65,348
			Total Personnel Services	$326,738
Other Than Personnel Services				
	IT cost of employee IT devices			$8,000
	Travel			$15,000
	Other cost generated from sample and data analysis			$210,000
			Total OTPS	$233,000
			Total Cost	**$559,738**

Figure IV-1 – National Toxicology Program First Year Program Budget

Program Coordination

The Program Coordinator will be hired to work at NIEHS exclusively for this study. The Program Coordinator will compose the tender's contractual terms, and serve as the communication channel between the contractor, the two accountability committees, NIEHS, and especially the investigators at NTP. The Program Coordinator will need to make sure that the contractor provides support to the investigators efficiently. The coordinator will also consult with the Toxicology Branch and the NTP Laboratory of NTPD to monitor the contractor's work. In addition, the coordinator is charged with reporting the research progress to the Deputy Director of Science in NTPD, handling operational and administrative matters with regards to the contractual relationship between NTPD and the contractor, and act concurrently as the permanent secretary to the two advisory committees. Two Program Assistants will be hired assist with the daily work of Program Coordinator.

The budget for NTP is divided into "Personnel" costs and "Other Than Personnel" costs. "Personnel Service" Costs are associated with the salaries for the Program Coordinator and Assistant Coordinator and they will work full-timely for this study (100%). The base salaries for Program Coordinator have been calculated according to the salary for the GS-12 level and the base salaries for Program Assistants have been calculated according to the salary for the GS-7 level as Principal Investigators is expected to have more

working experience. Fringe benefits, which include health insurance and mileage stipends, have been estimated at a rate of fifteen percent (25%) of the salary allocation (see table following this section). "Other Than Personnel Service" (OTPS) costs include cost of monthly meetings for Community Advisory Committee and Scientific Advisory Committee including travel, hotel, catering, and other operational cost, IT cost of employee IT devices, and Office Supply costs.

Program Coordination				
Personnel Services				
	1 Program Coordinator	(100% of time)		$71,616
	2 Program Assistant	(100% of time)		$89,422
			Base Salaries	$161,038
			Fringe Benefits 25%	$40,260
			Total Personnel Services	$201,298
Other Than Personnel Services				
	Meeting Cost (LAC+SAC)			$120,000
	IT cost of employee IT devices			$4,000
	Office & Other Expenses			$20,000
			Total OTPS	$144,000
			Total Cost	**$345,298**

Figure IV-2 –Program Coordination First Year Program Budget

Contractor Activities

The contractor will provide support for this study. It will oversee the day-to- day activities of the study with oversight from the NIEHS investigators. The contractor will be responsible for recruiting and enrolling participants, conducting home visits, collecting samples, providing laboratory-processing services, and statistical support. The contractor can use subcontractors to support their work.

The budget for NTP is divided into "Personnel" costs and "Other Than Personnel" costs. "Personnel Service" Costs are associated with the salaries for the home visit labor, sample collecting labor, regional manager and other contractor labor. "Other Than Personnel Service" (OTPS) costs include supply cost, travel cost, and other cost. Supply cost consists of cost of equipment, expendable supplies, specimen processing & storage supplies, and other supplies. Travel cost consists of home visit and sample collection travel cost, as well as travel cost from training travel. There is other cost associated with contractor such as administrative cost.

Since the contractor is mainly responsible for sample collection and statistical support, the cost from contractor activities will be higher in the first two to three years than year four and year five.

Contractor Activities				
Personnel Services				
	Home Visit Labor	$44,875		
	Regional Field Managers Labor	$5,369		
	Sample Collecting Labor	$44,875		
	Other Contractor Labor	$51,550		
			Base Salaries	$146,669
			Fringe Benefits 25%	$36,667
			Total Personnel Services	$183,337
Other Than Personnel Services				
	Supplies	$557,000		
	Travel	$18,750		
	Office&Other Expenses	$15,000		
			Total OTPS	$590,750
			Total Cost	$774,087

Figure IV-3 – Contractor Activities First Year Program Budget

b. Line-Item Budget

Detailed first-year ad five-year total line-item budgets are as outlined below (see Figure IV-4 and Figure IV-5). During the first year, personnel services costs (base salaries, fringe benefits) amount to approximately 42% of the total budget during that year, while other than personnel services costs (supplies, travel, office & other expenses) constitute the remaining 58%. This ratio increases over the total five-year period, with personnel services costs making up 32%, and other than personnel services costs 68% of the total operation cost.

Line-item Budget				
Personnel Services				
		Base Salaries		$569,098
		Fringe Benefits 25%		$142,274
		Total Personnel Services		**$711,372**
Other Than Personnel Services				
	Supplies			$569,000
	Travel			$153,750
	Office & Other Expenses			$245,000
		Total OTPS		**$967,750**
			Total Operation Cost	**$1,679,122**

Figure IV-4 – First-year Line-item Budget

Line-item Budget		
Personnel Services		
	Base Salaries	4,286,987
	Fringe Benefits 25%	1,071,747
	Total Personnel Services	$ 5,358,733
Other Than Personnel Services		
Supplies		8,944,000
Travel		975,000
Office & Other Expenses		1,300,000
	Total OTPS	$11,219,000
	Total Operation Cost	$16,577,733

Figure IV-5 – Five-year Line-item Budget

c. Budget Analysis

The total budget for the health risk assessment is estimated to be around 16.6 million dollars for the duration of five year. The pie chart below shows the distribution of operational costs of the health risk study. 17% of the total cost is generated from the investigation conducted by National Toxicology Program. 10% of the total cost is generated by the program coordination. 73% of total cost is generated by the contractor activities. A large part of the expenditure of program coordination comes from arranging the meetings for Scientific Advisory Committee and Local Advisory Committee. It is important to note the monetary and staff emphasis that has been put on contractor activities. It is very important that the contractor has the adequate staff and funding to conduct enough home visits and collect sufficient amount of samples of air, water, and soil, in order for the samples to be representative and to ensure the quality and accuracy of the health risk assessment.

We assume that the expenditure will be lower in the first half of the first year when there is more administrative activities before the scientific research could start. Since the samples are mainly collected during the beginning period of the study, we assume that the expenditure by the contractor as well as total expenditure will be higher in the first two to three years and will be lower in year four and year five, when more emphasis will be put on toxicological assessment and risk characterization.

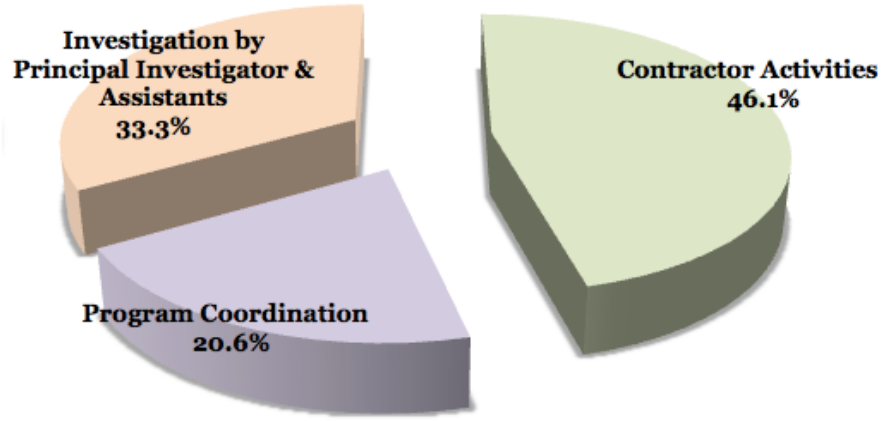


Figure IV-5 – First Year Program Budget Breakdown

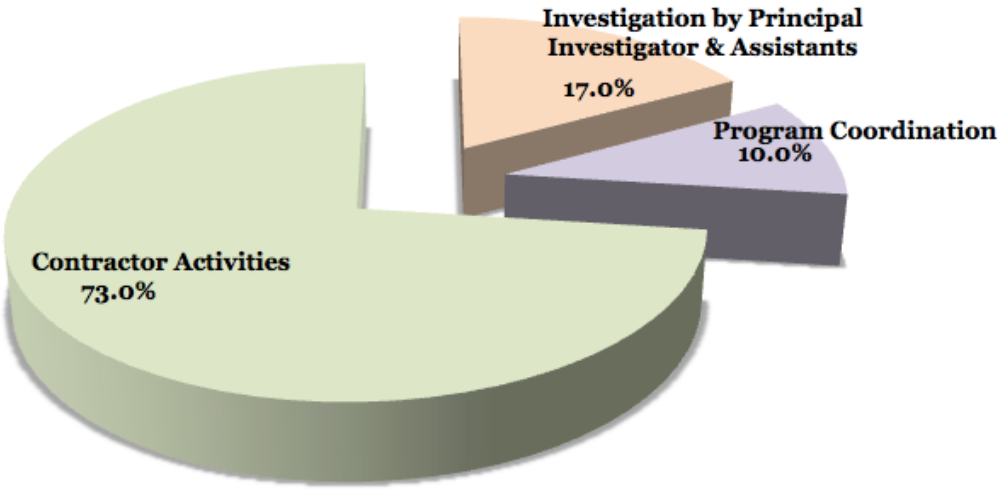


Figure IV-6 – Five-year Program Budget Breakdown

V. Conclusion

Mountaintop removal coal mining is a cost-efficient extractive practice common to the area of the Appalachian states of Kentucky, Tennessee, Virginia, and West Virginia. The extraction process potentially poses negative impacts on the environment and human health in local communities. This provides impetus for the Appalachian Communities Health Emergency Act. The primary solutions are an indefinite moratorium on the issuance of permits for new and the undertaking of comprehensive health impact studies during the moratorium period.

The primary solution of a comprehensive health impact assessment is crucial for the Act, due to limitations in existing scientific studies that require additional research. The proposed five-year program design hopes to developed a comprehensive academic research understanding and build a robust database, to determine whether there is a causal relationship between mountaintop mining and potential health impacts. This requires consistent labor and financial support over the program period. Key stakeholders for these supports include the National Institute of Environmental Health Sciences (NIEHS), the National Toxicology Program Division housed within NIEHS, potential contractors and subcontractors, as well as coal mining companies in the Appalachia region. Additionally, implementation of the program in local areas will require strong community engagement throughout the entire research process. Whether the study could reach a definite conclusion at the end of the five-year period on the causal relationship between mountaintop removal coal mining and adverse health impacts, the ACHE Act raises an important question and seeks to provide scientific evidence and prospective policy implications for researchers, mining companies, local residents and regulators.

VI. Appendix

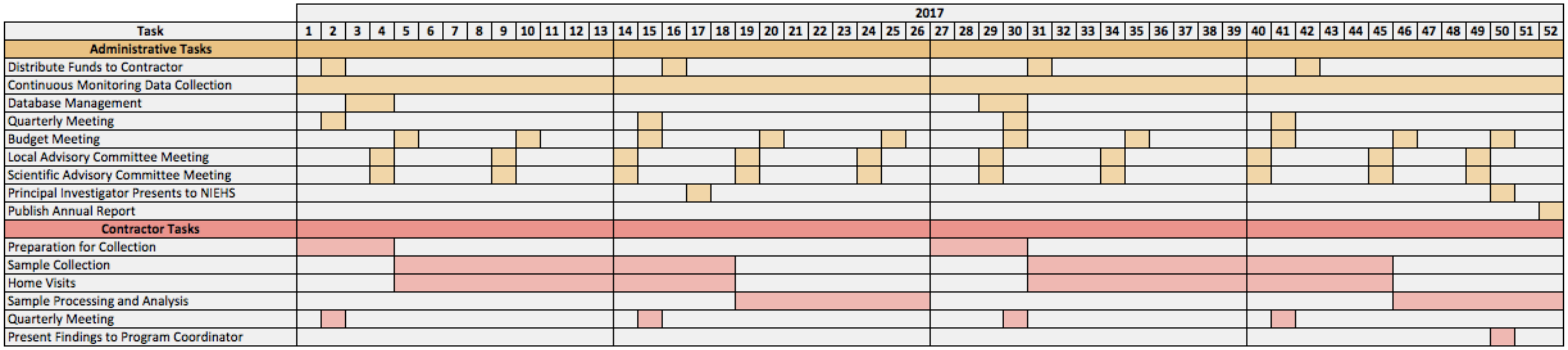
Table VI-1 – First-year Master Calendar by week

	2015																																																			
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Administrative Tasks																																																				
Arrange Office of Program Coordinator	■	■	■	■																																																
Secure Funding from NIEHS	■	■												■	■	■	■																																			
Contract Formulation														■	■	■	■																																			
IRB Review														■	■	■	■																																			
Contract Application Period																		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■										
Contract Bidder Review and Award																																											■	■	■	■						
Distribute Funds to Contractor																																															|■|				
Advertise for Local Advisory Committee			■	■																																																
Decide Scientific Advisory Committee					■	■	■	■																																												
Decide Local Advisory Committee					■	■	■	■																																												
Local Advisory Committee Meeting									■																																											
Scientific Advisory Committee Meeting									■																																											
Budget Review with Principal Investigator																																																		|■|	
Principal Investigator Presents to NIEHS																																																			|■|
Publish Annual Report																																																				|■
Research Planning																																																				
Literature Review					■	■	■																																													
Develop Research Plan								■	■	■	■	■	■																																							
Data Sampling Strategy										■	■	■	■																																							
Quality Assurance Plan										■	■	■	■																																							
Create Database for Continuous Monitoring Data																																					■	■	■	■													
Contractor Tasks																																																				
Create Research Database																																																	■	■	■		
Acquire and Assemble all necessary equipment																																																	■	■	■	■	■

Table VI-2 – Second-year Master Calendar by week

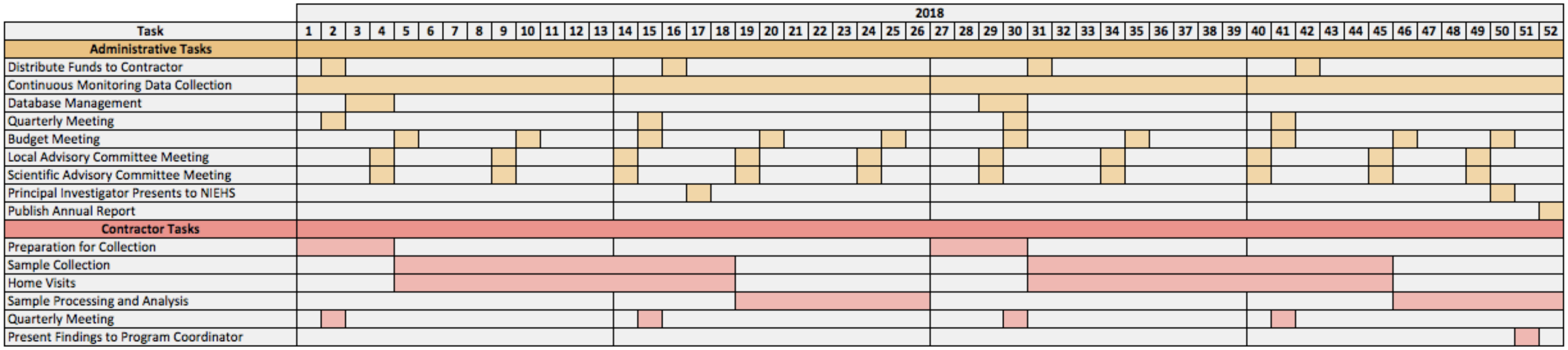
	2016																																																			
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Administrative Tasks																																																				
Dristibute Funds to Contractor		■														■															■											■										
Continuous Monitoring Data Collection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Database Management			■	■																									■	■																						
Quarterly Meeting		■													■															■											■											
Budget Review with Principal Investigator					■					■					■						■				■					■					■						■					■				■		
Principal Investigator Presents to NIEHS																	■																																	■		
Local Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Scientific Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Publish Annual Report																																																				■
Contractor Tasks																																																				
Preparation for Collection	■	■	■	■																							■	■	■	■																						
Sample Collection					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Home Visits					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Sample Processing and Analysis																			■	■	■	■	■	■	■	■																			■	■	■	■	■	■	■	■
Quarterly Meeting		■													■															■											■											
Present Findings to Program Coordinator																																																	■			

Table VI-3 – Third-year Master Calendar by week



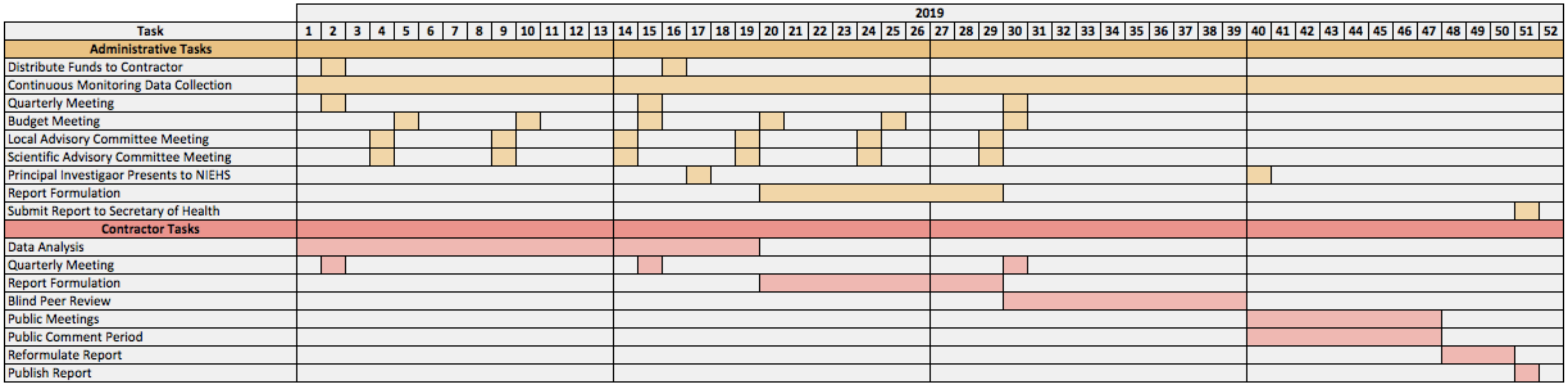
	2017																																																			
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Administrative Tasks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Distribute Funds to Contractor		■														■															■											■										
Continuous Monitoring Data Collection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Database Management			■	■																									■	■																						
Quarterly Meeting		■													■															■											■											
Budget Meeting					■					■					■					■					■					■					■						■					■				■		
Local Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Scientific Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Principal Investigator Presents to NIEHS																	■																																	■		
Publish Annual Report																																																				■
Contractor Tasks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Preparation for Collection	■	■	■	■																							■	■	■	■																						
Sample Collection					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Home Visits					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Sample Processing and Analysis																			■	■	■	■	■	■	■	■																				■	■	■	■	■	■	■
Quarterly Meeting		■													■															■											■											
Present Findings to Program Coordinator																																																		■		

Table VI-4 – Fourth-year Master Calendar by week



	2018																																																			
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Administrative Tasks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Distribute Funds to Contractor		■														■															■											■										
Continuous Monitoring Data Collection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Database Management			■	■																									■	■																						
Quarterly Meeting		■													■															■											■											
Budget Meeting					■					■					■					■					■					■					■						■					■				■		
Local Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Scientific Advisory Committee Meeting				■					■					■					■					■					■					■						■					■				■			
Principal Investigator Presents to NIEHS																	■																																	■		
Publish Annual Report																																																				■
Contractor Tasks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Preparation for Collection	■	■	■	■																							■	■	■	■																						
Sample Collection					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Home Visits					■	■	■	■	■	■	■	■	■	■	■	■	■	■													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Sample Processing and Analysis																			■	■	■	■	■	■	■	■																				■	■	■	■	■	■	■
Quarterly Meeting		■													■															■											■											
Present Findings to Program Coordinator																																																			■	

Table VI-5 – Fifth-year Master Calendar by week



	2019																																																		
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Administrative Tasks																																																				
Distribute Funds to Contractor		■														■																																				
Continuous Monitoring Data Collection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Quarterly Meeting		■													■															■																						
Budget Meeting					■					■					■					■					■					■																						
Local Advisory Committee Meeting				■					■					■					■					■					■																							
Scientific Advisory Committee Meeting				■					■					■					■					■					■																							
Principal Investigaor Presents to NIEHS																	■																							■												
Report Formulation																				■	■	■	■	■	■	■	■	■	■																							
Submit Report to Secretary of Health																																																			■	
Contractor Tasks																																																				
Data Analysis	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																																	
Quarterly Meeting		■													■															■																						
Report Formulation																				■	■	■	■	■	■	■	■	■	■																							
Blind Peer Review																														■	■	■	■	■	■	■	■	■	■													
Public Meetings																																								■	■	■	■	■	■	■	■					
Public Comment Period																																								■	■	■	■	■	■	■	■					
Reformulate Report																																																■	■	■		
Publish Report																																																			■	

VII. References

Adler, Jonathan H. (2007). When is Two a Crowd? The Impact of Federal Action on State Environmental Regulation. Harvard Environmental Law Review. Volume 31. Page 67-114. http://www.law.harvard.edu/students/orgs/elr/vol31_1/adler.pdf

Appalachian Voices. (2013). Protecting the Central & Southern Appalachian Mountain Region. Community Impacts of Mountaintop Removal. http://appvoices.org/end-mountaintop-removal/community/

Appalachian Voices. (2013). Economic Impacts of Mountaintop Removal. http://appvoices.org/end-mountaintop-removal/economy/

Biggers, Jeff. (2012). Historic Appalachian Communities Health Emergency Act Introduced in Congress for Mountaintop Removal Moratorium. The Huffington Post. http://www.huffingtonpost.com/jeff-biggers/ache-act_b_1609958.html

Cohen, S., Eimicke, W., & Heikkila, T. (2011). The effective public manager: Achieving success in a changing government. John Wiley & Sons.

Domberger, S., & Jensen, P. (1997). Contracting out by the public sector: theory, evidence, prospects. Oxford review of economic policy, 13(4), 67-78.

Evans, S. (2010). Voices from the Desecrated Places: A Journey To End Mountaintop Removal Mining. *Harvard Environmental Law Review*, 34:2 521-576.
House, S. & Howard, J. (2009). Something's Rising: Appalachians Fighting Mountaintop Removal, *The University Press of Kentucky*.

FedBizOpps.Gov. (2014). SUPPORT CONTRACT FOR THE NATIONAL TOXICOLOGY PROGREM INTERAGENCY CENTER FOR THE EVALUATION OF ALTERNATIVE TOXICOLOGICAL METHODS (NICEATM). National Institute of Environmental Health Sciences. Retrieved September 30, 2014, from:
https://www.fbo.gov/index?s=opportunity&mode=form&id=7a0abf28ec48c800c2e56fb4c3c9df48&tab=core&_cview=1

H.R. 526 - ACHE Act. Congress.gov Legislation - 113th Congress. https://beta.congress.gov/bill/113th-congress/house-bill/526/cosponsors

Keating, Janet. (2005). The Real Friends of Coal.

Kenney, R. (2007). Surface Mining Control and Reclamation Act of 1977, United States. Retrieved from http://www.eoearth.org/view/article/156351

Kitts, Gene. Why Surface Mine? National Mining Association. Retrieved from: http://www.nma.org/pdf/fact_sheets/why_surface_mine.pdf

Legislation Proposes Moratorium on Mountaintop Removal Permits Until Health Consequences Are Investigated. Environmental Health. http://wordpress.vermontlaw.edu/environmentalhealth/2013/02/20/legislation-proposes-moratorium-on-mountaintop-removal-permits-until-health-consequences-are-invesitgated/

Manchin Senate. (2011). Manchin Champions for Coal. Retrieved from: http://www.manchin.senate.gov/public/index.cfm/files/serve?File_id=25ccaf0c-bb78-4dc3-82a1-4f93329a8883

NTP. (2014a). About the NTP. National Toxicology Program. Retrieved October 2, 2014, from: http://ntp.niehs.nih.gov/about/index.html

NTP. (2014b). Nominations to the testing program. National Toxicology Program. Retrieved September 30, 2014, from: http://ntp.niehs.nih.gov/testing/noms/index.html

Quinones, Manuel & Schorse, Elana. (2011). Manchin Maintains Lucrative Ties to Family-Owned Coal Company. (2011). New York Times.

Raby, John. (2012). EPA Coal Mine Water Rules Struck Down By Federal Judge. The Huffington Post. July 31, 2012. http://www.huffingtonpost.com/2012/07/31/epa-coal-mine-water-rules_n_1725316.html

Resnick, David B. (2011). What is Ethics in Research & Why is it Important? NIEHS. May 1, 2011. http://www.niehs.nih.gov/research/resources/bioethics/whatis/

Vollers, Maryanne. (1999). Razing Appalachia. Mother Jones. http://www.motherjones.com/politics/1999/07/razing-appalachia

Ward, Ken Jr. (2010). Coal industry sues EPA, Corps of Engineers over permit crackdown. The Charleston Gazette. July 20, 2010. http://www.wvgazette.com/News/201007200779?page=1&build=cache