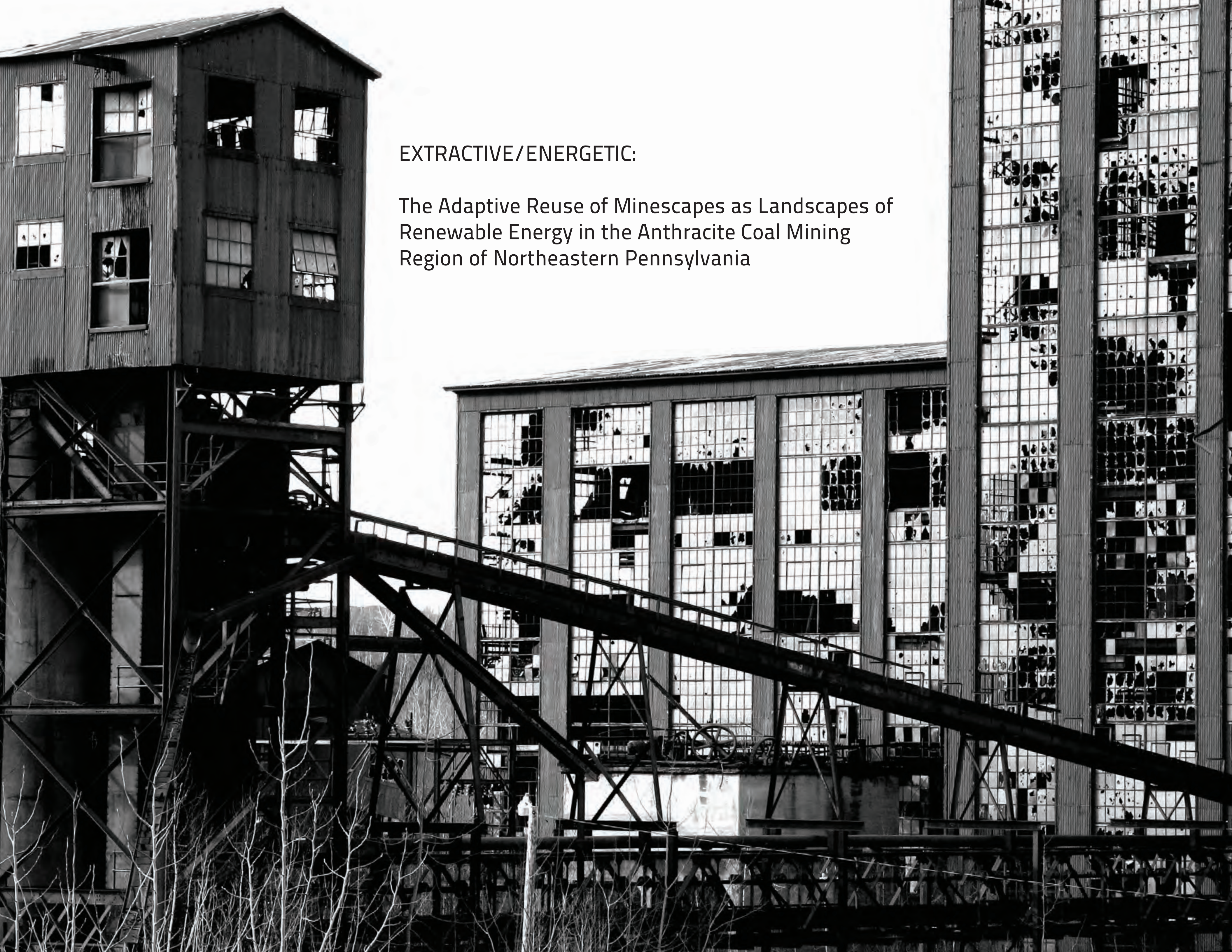
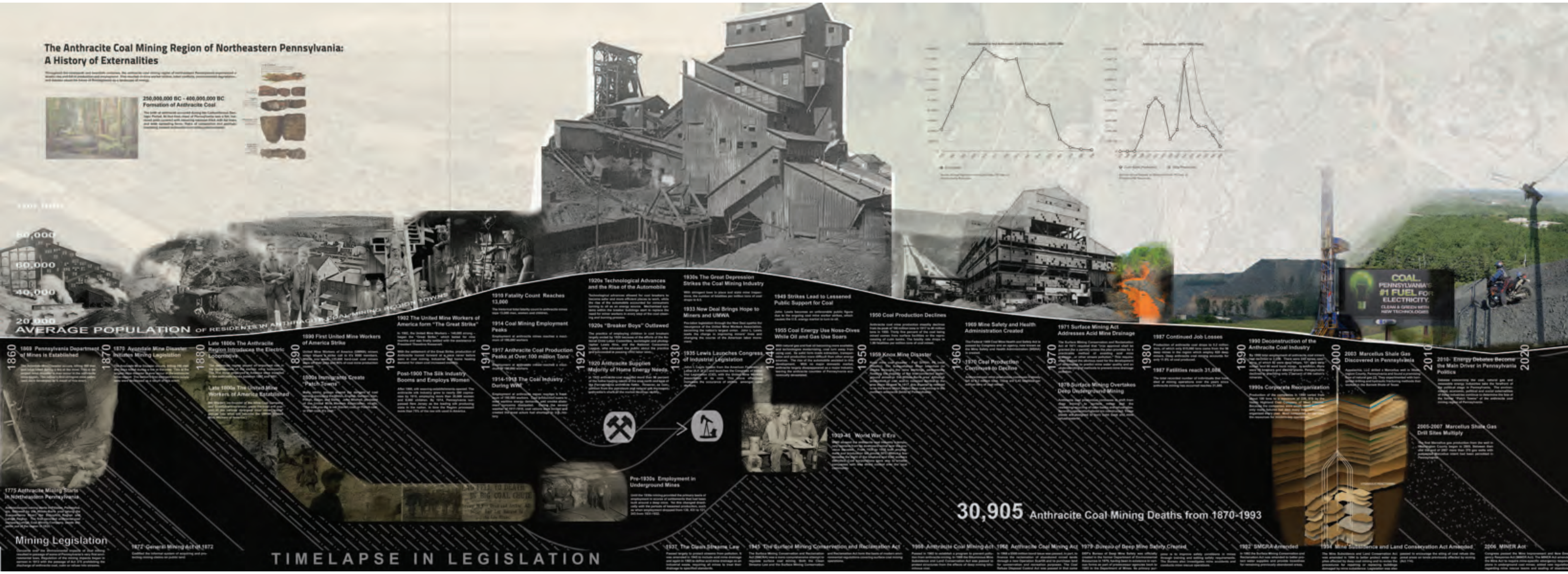
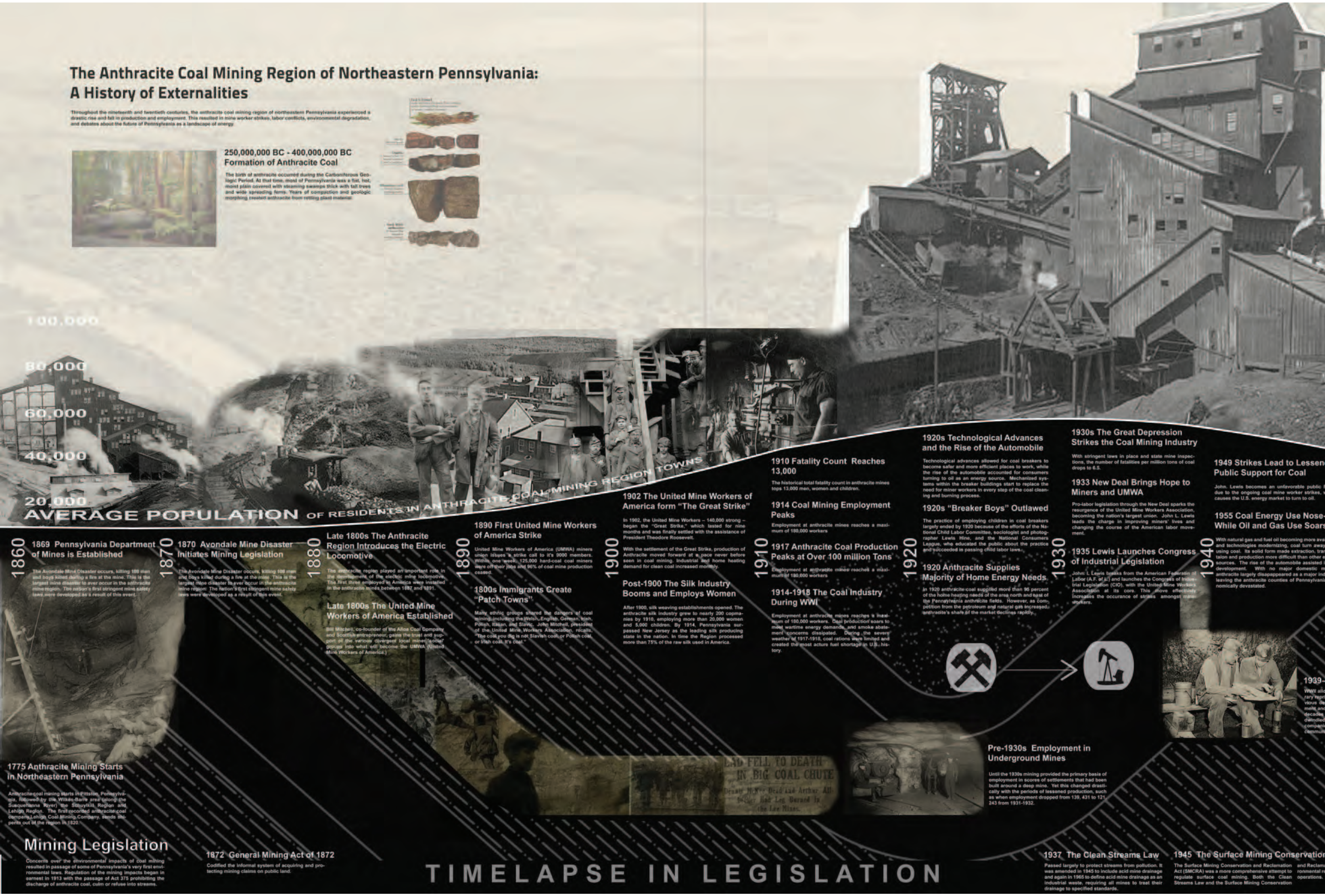


EXTRACTIVE/ENERGETIC:

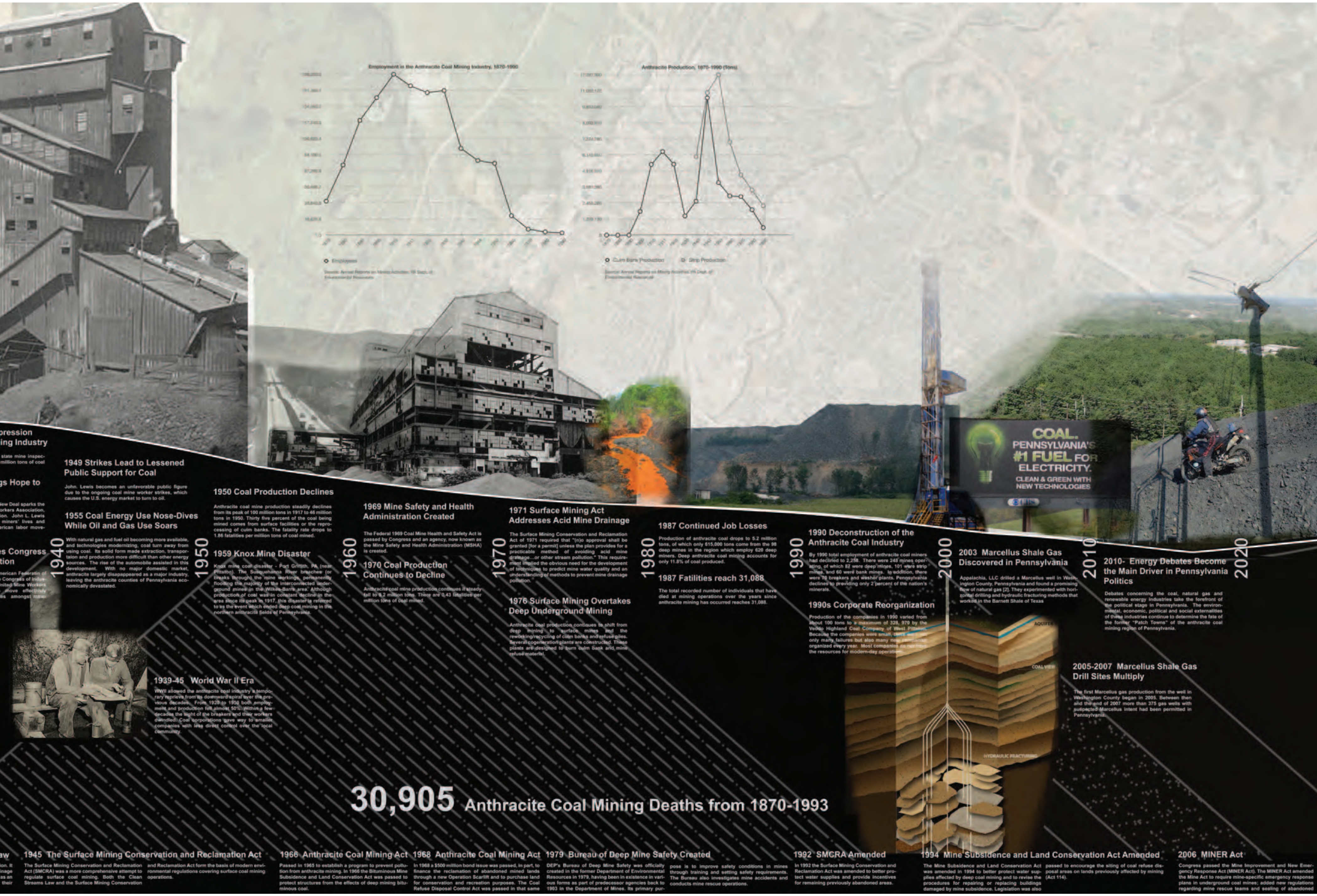
The Adaptive Reuse of Minescapes as Landscapes of Renewable Energy in the Anthracite Coal Mining Region of Northeastern Pennsylvania



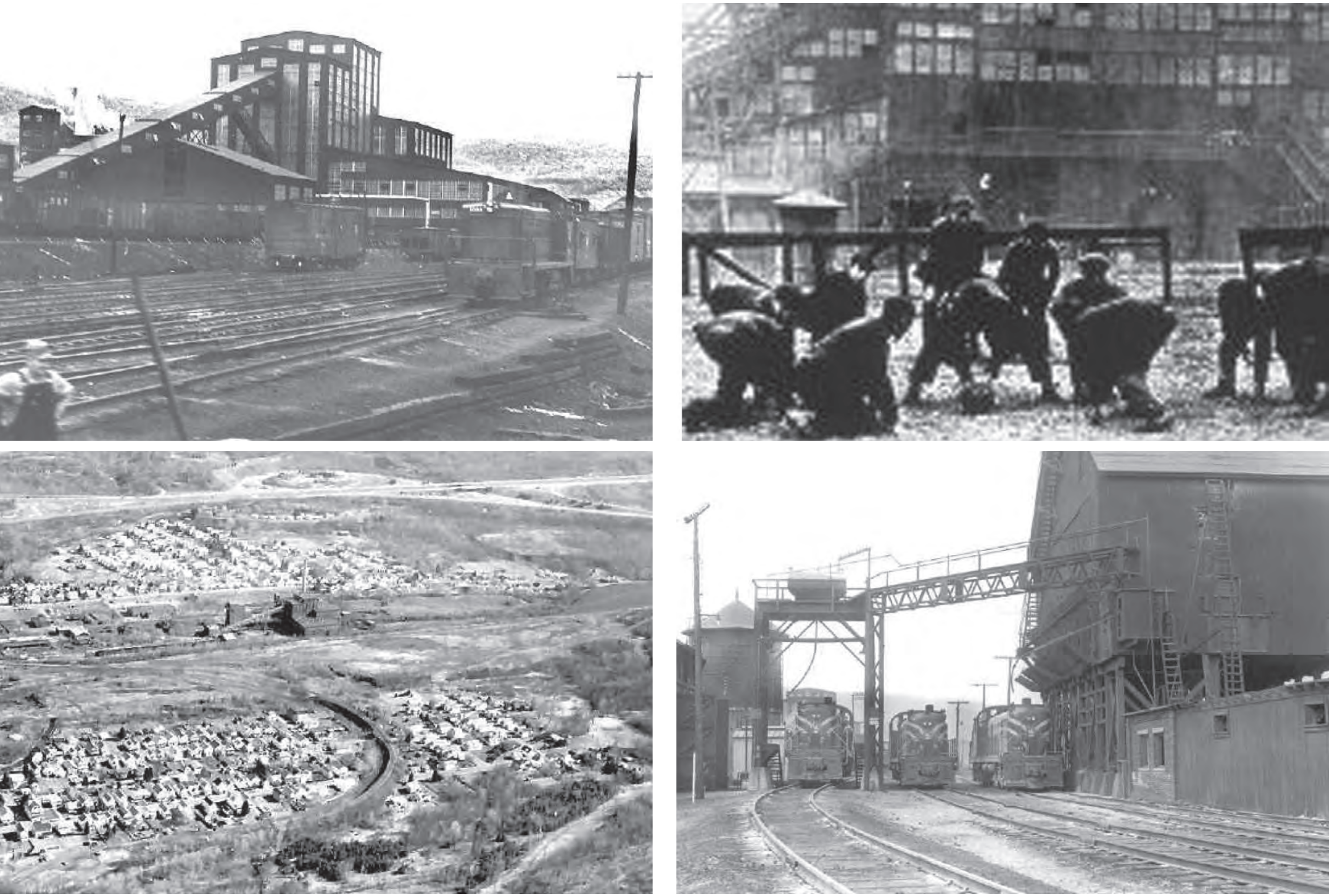
THE ANTHRACITE REGION OF NORTHEASTERN PENNSYLVANIA:
A HISTORY OF EXTERNALITIES



THE ANTHRACITE REGION OF NORTHEASTERN PENNSYLVANIA:
A HISTORY OF EXTERNALITIES

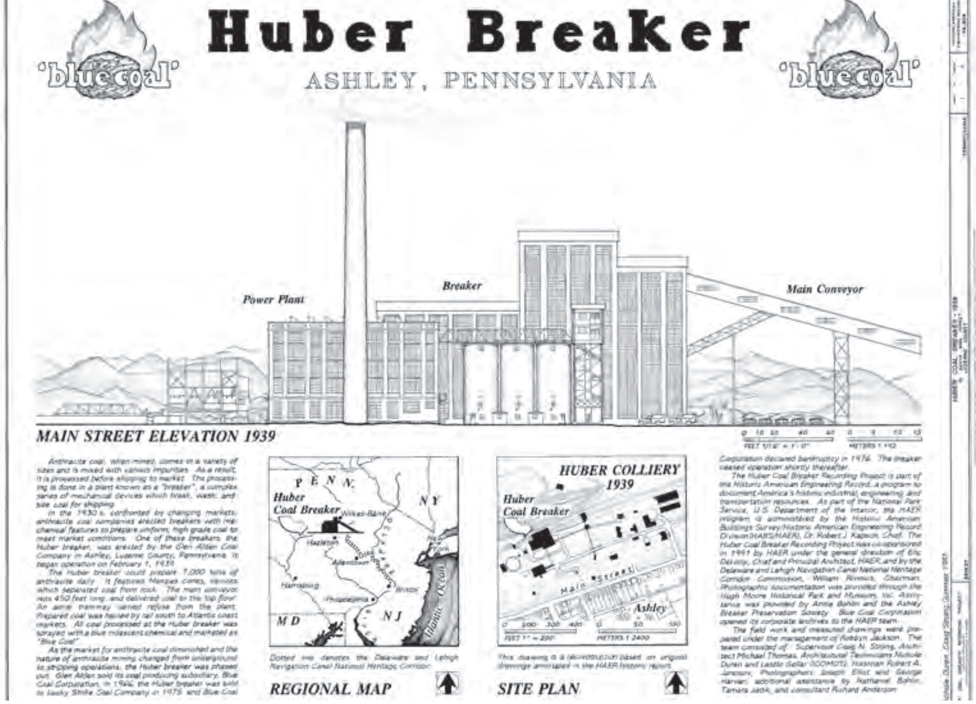


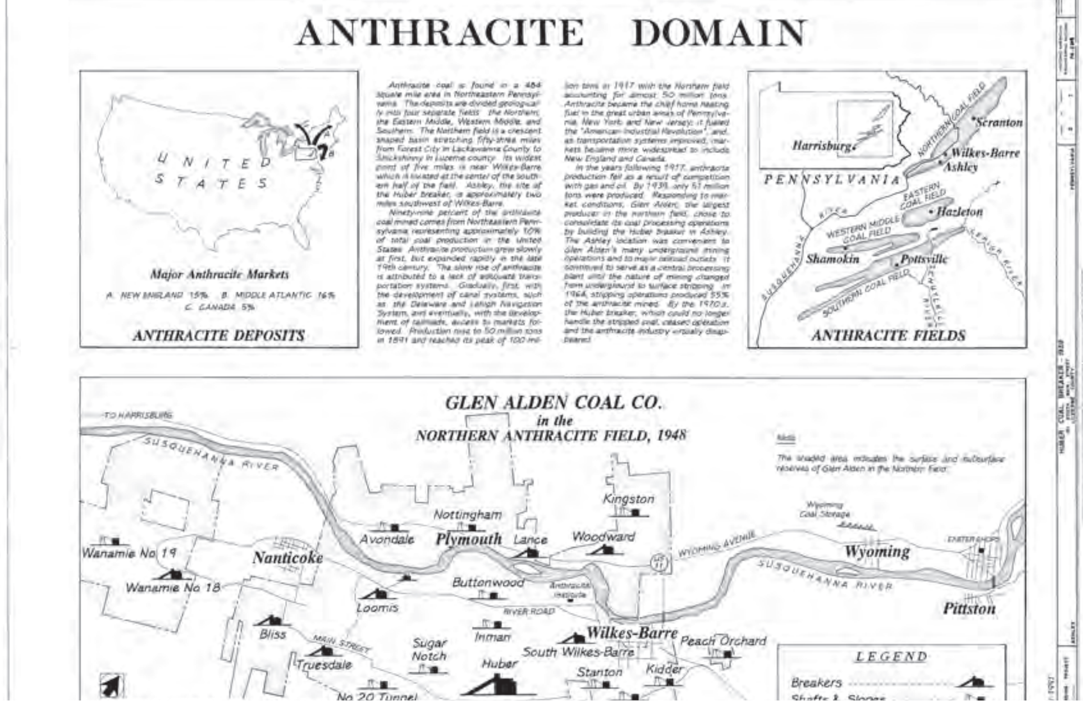
THE ANTHRACITE REGION OF NORTHEASTERN PENNSYLVANIA:
A HISTORY OF EXTERNALITIES

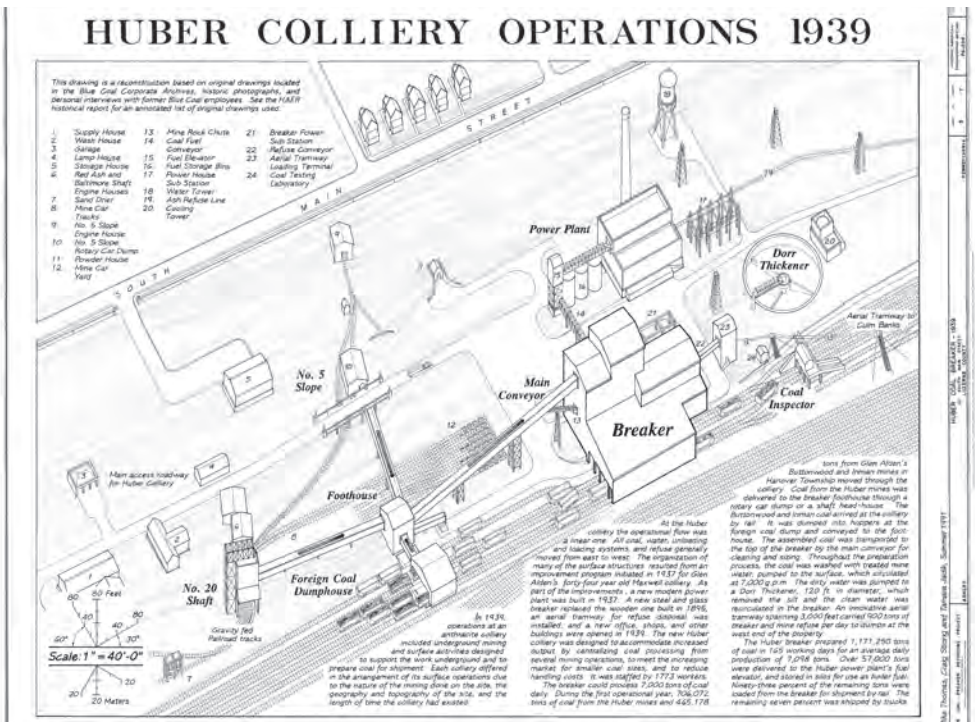


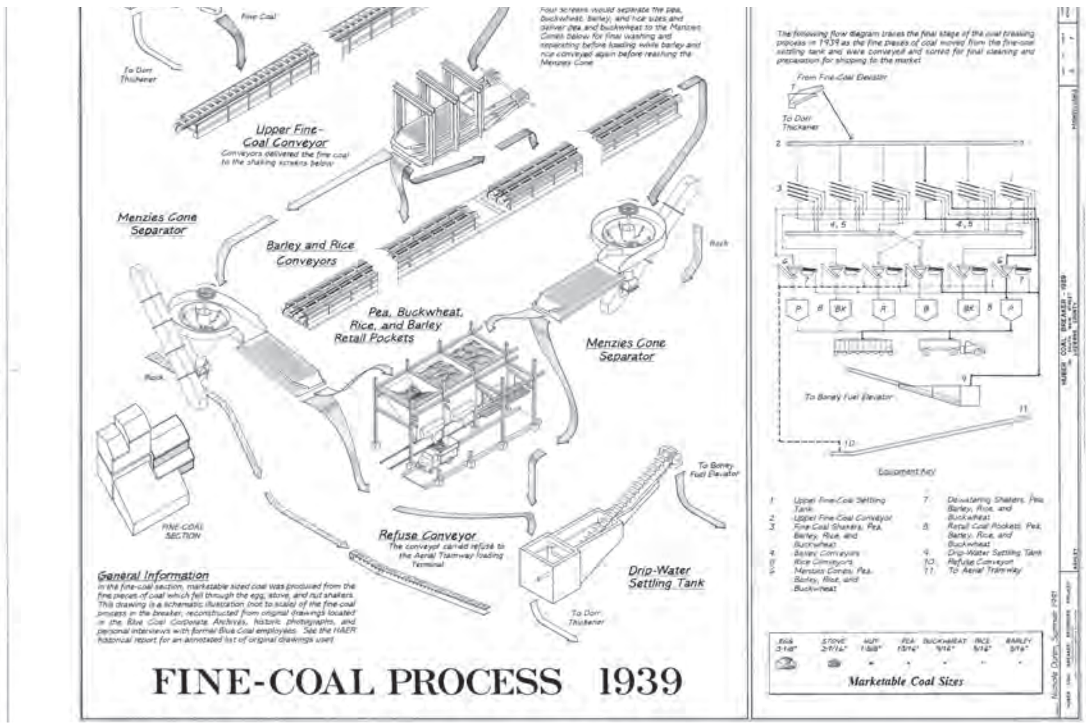
THESIS SITE: HUBER BREAKER, ASHLEY PENNSYLVANIA

THESIS SITE: HUBER BREAKER, ASHLEY PENNSYLVANIA

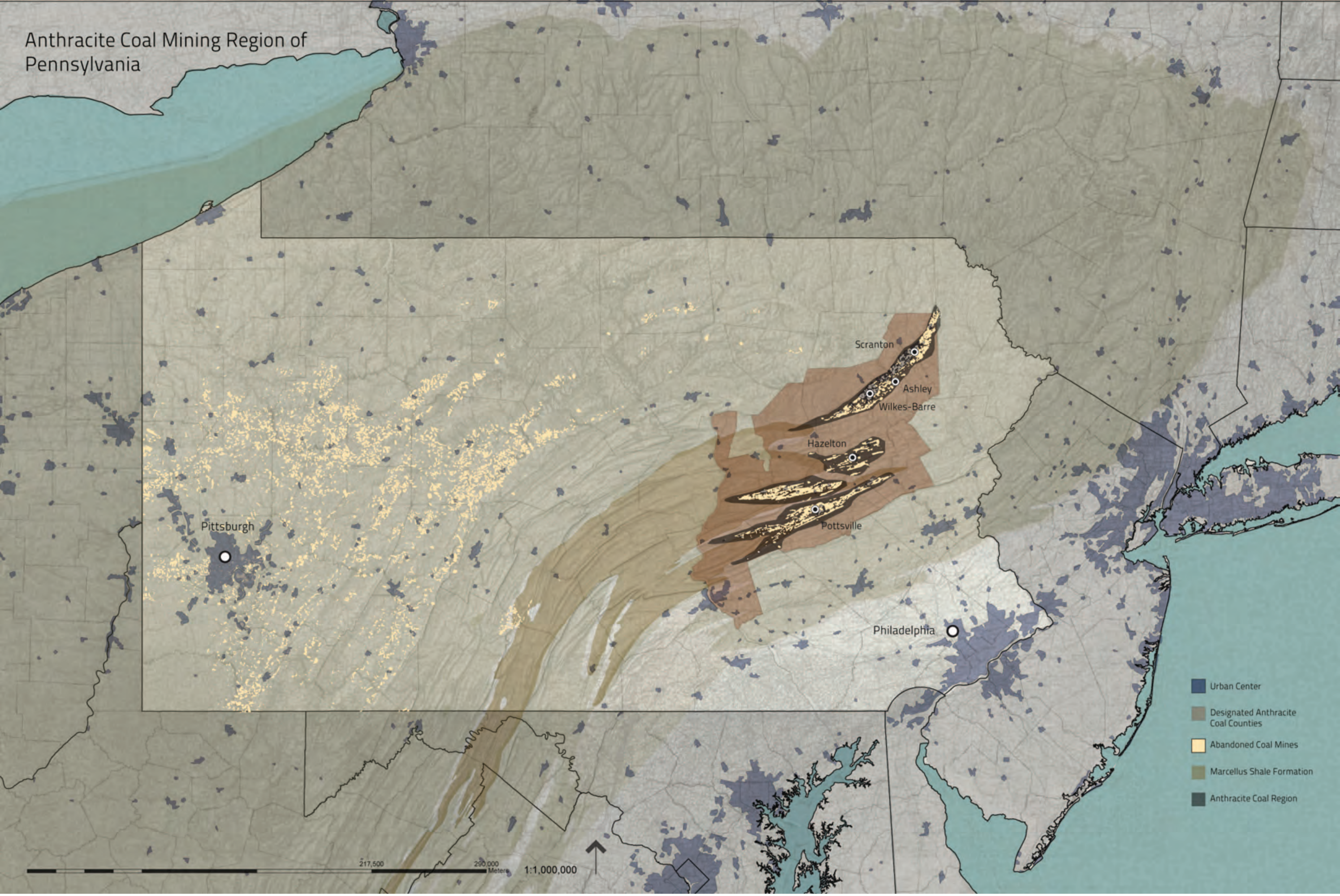






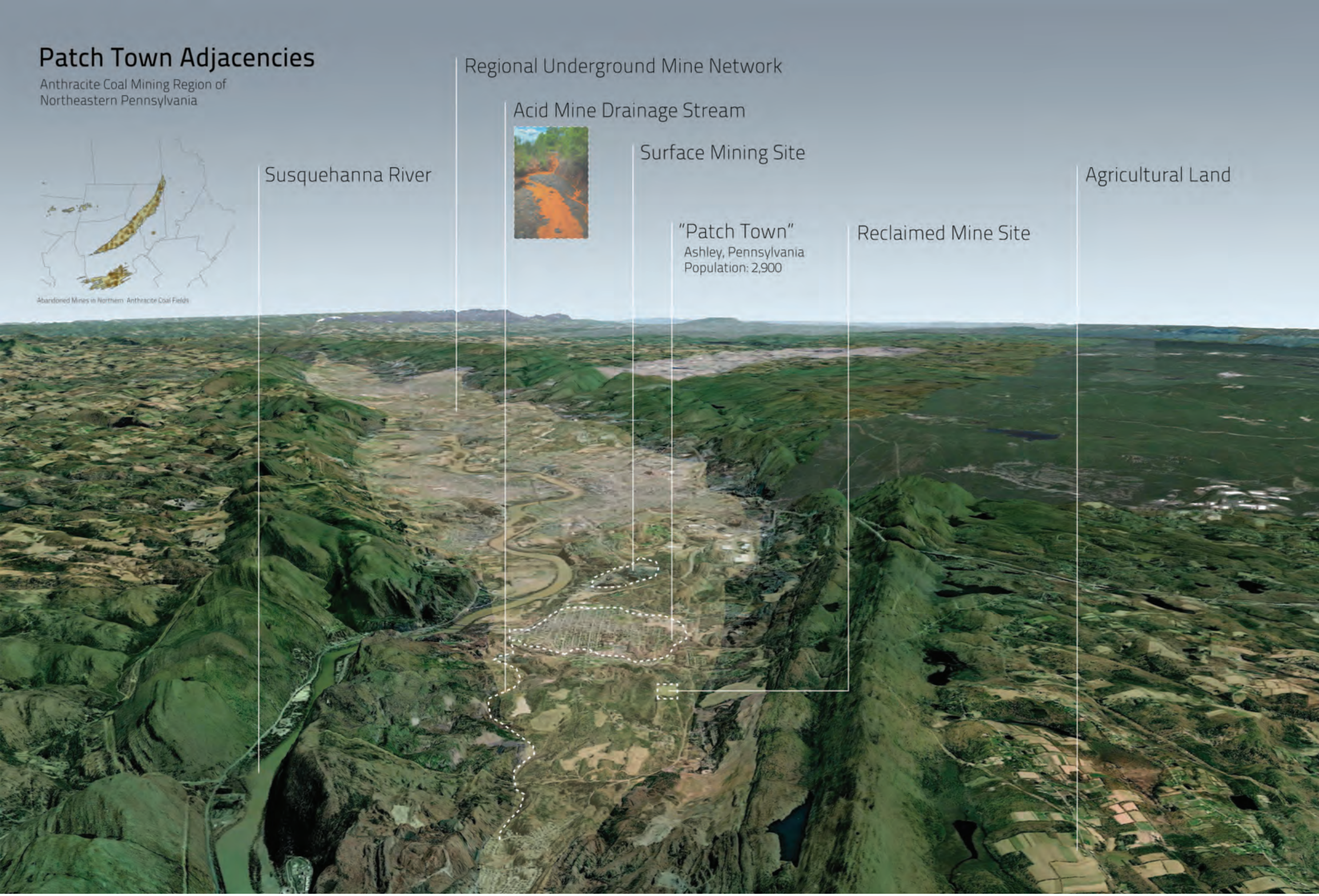


SITE ANALYSIS



INTRODUCTION

ENVIRONMENTAL EXTERNALITIES


Patch Town Adjacencies
Anthracite Coal Mining Region of
Northeastern Pennsylvania
Abandoned Mines in Northern Anthracite Coal Fields
Regional Underground Mine Network
Acid Mine Drainage Stream
Surface Mining Site
Susquehanna River
Agricultural Land
"Patch Town"
Ashley, Pennsylvania
Population: 2,900
Reclaimed Mine Site

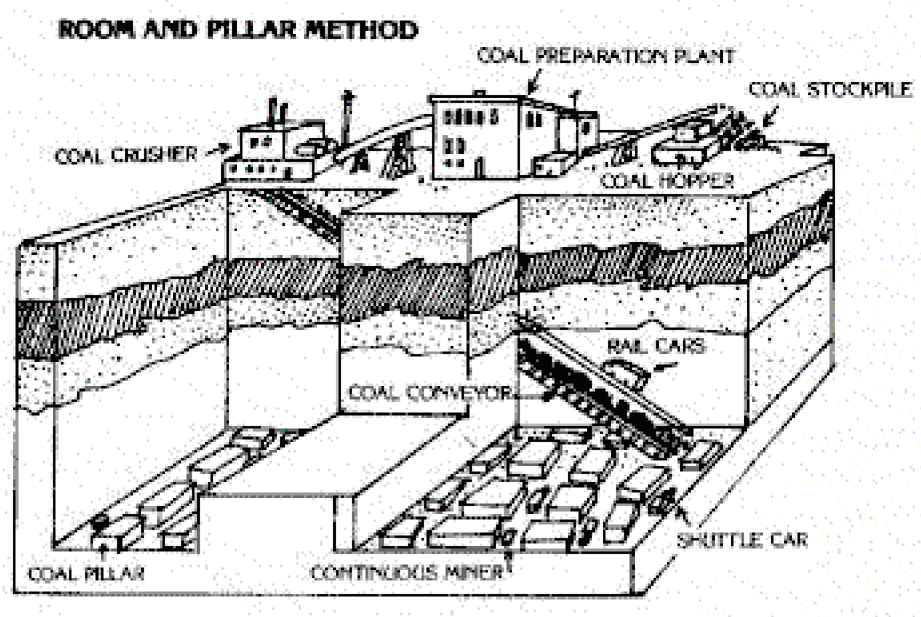
Minescapes:

Landscapes which exhibit 4 different conditions resulting from mining practices.

*As identified in the northeastern Pennsylvania anthracite coal region

Minescape Type 1:

Deep Underground Mine (aka “Room and Pillar”)




FRENCH
AVONDALE
NOTTINGHAM
COLLIER
CHAUNCEY REYNOLDS
ELLEN W. RYDE ET AL No 2
F. TURNER
J. B. SMITH
L W WILLIAMS
No 2
Bott Ross
H. C. TOWNSEND R—W
Water
GEORGE KOCHER.
ARIO PARDEE.
C.V.ROBBINS.
A.MINICH.
CHARLES GARRINGER
LIERY
COLLIERY


SLATE BANK

Source: Underground Miner's Website

ENVIRONMENTAL DEEP UNDERGROUND MINE

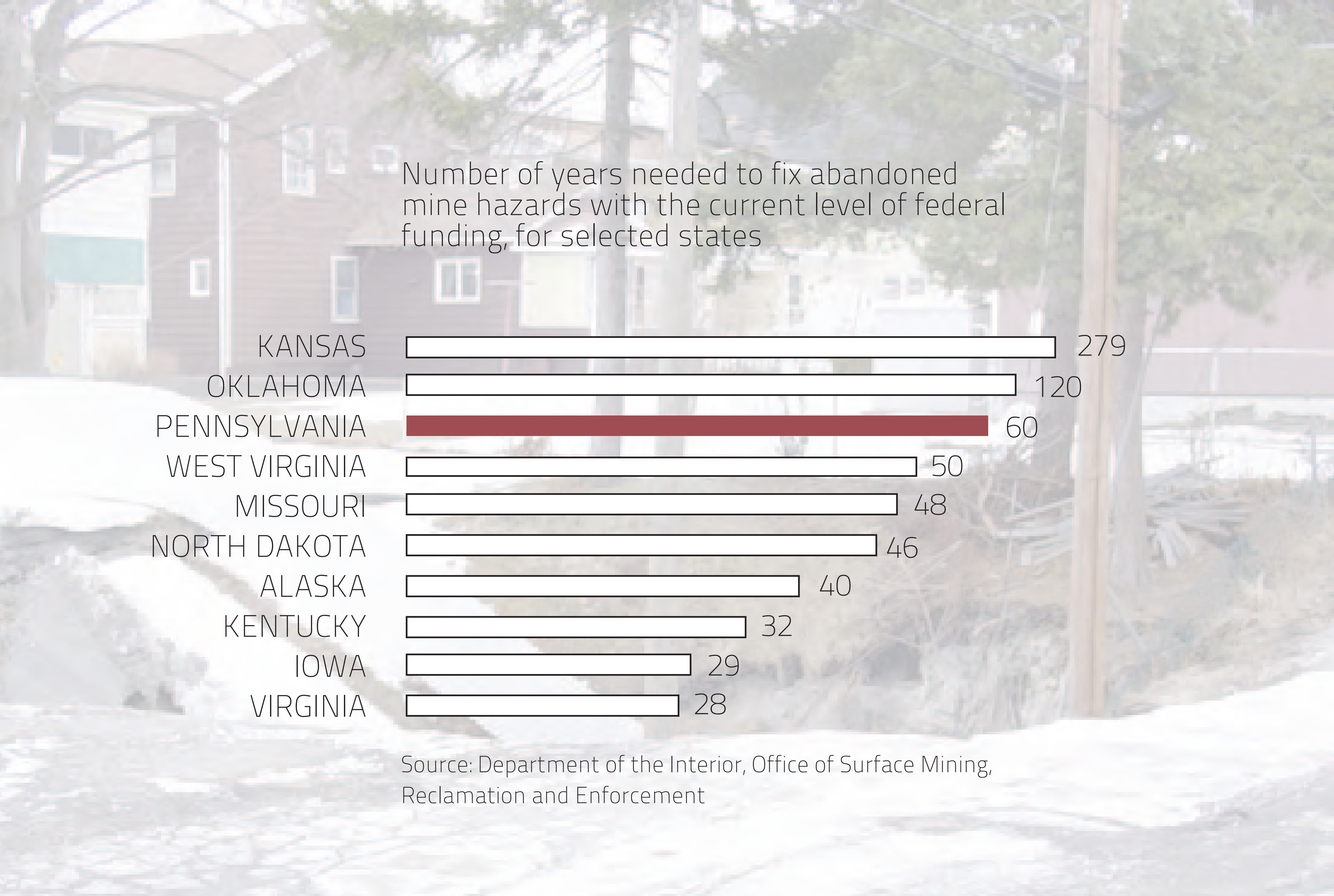
ENVIRONMENTAL DEEP UNDERGROUND MINE

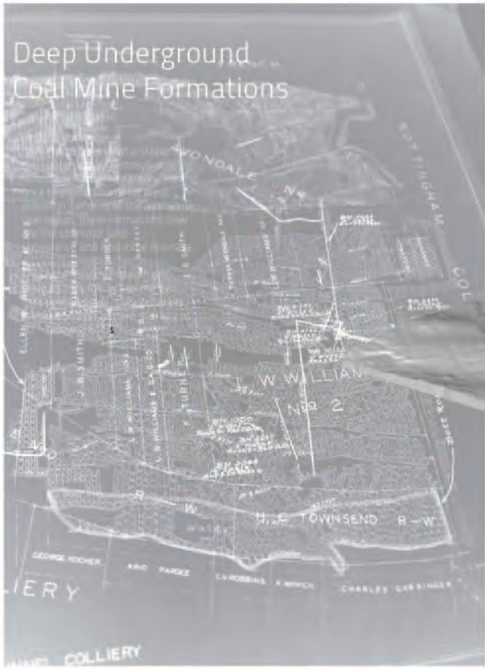
SUBSIDENCE

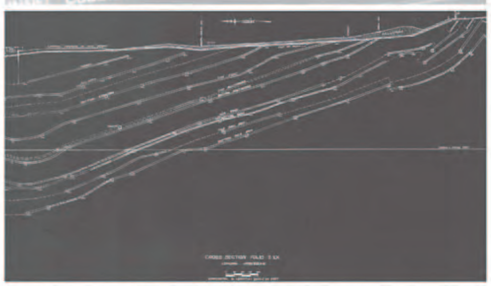
Source: Underground Miner's Website

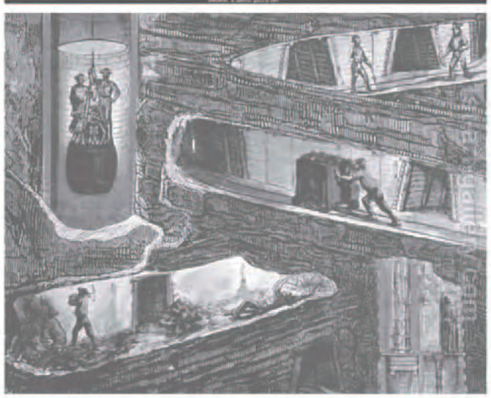
Source: Underground Miner's Website

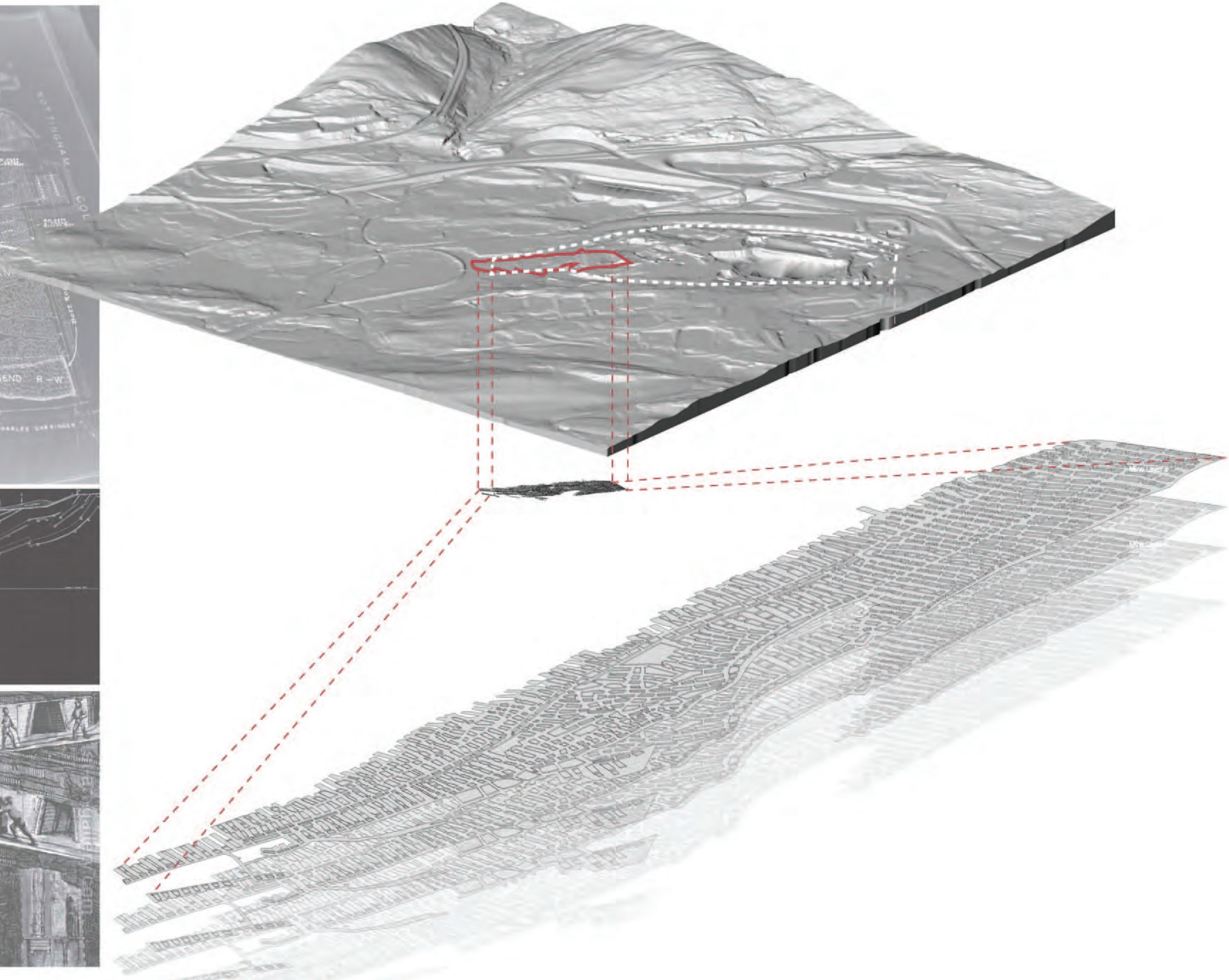
ACID MINE DRAINAGE


Number of years needed to fix abandoned mine hazards with the current level of federal funding, for selected states
KANSAS
279
OKLAHOMA
120
PENNSYLVANIA
60
WEST VIRGINIA
50
MISSOURI
48
NORTH DAKOTA
46
ALASKA
40
KENTUCKY
32
IOWA
29
VIRGINIA
28
Source: Department of the Interior, Office of Surface Mining, Reclamation and Enforcement

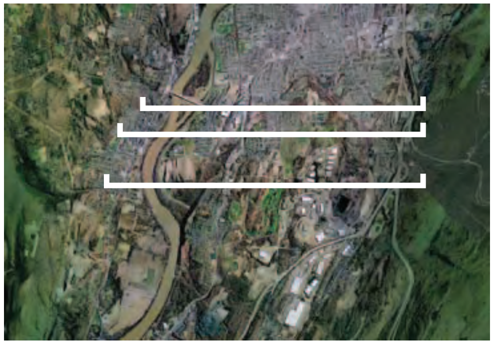




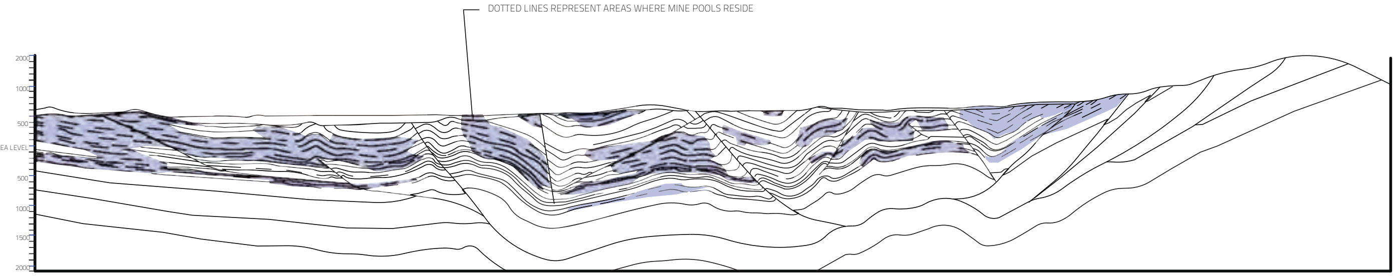


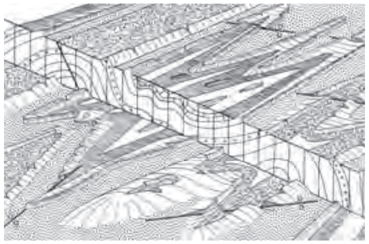


ENVIRONMENTAL UNDERGROUND MINE NETWORK AT HUBER BREAKER SITE

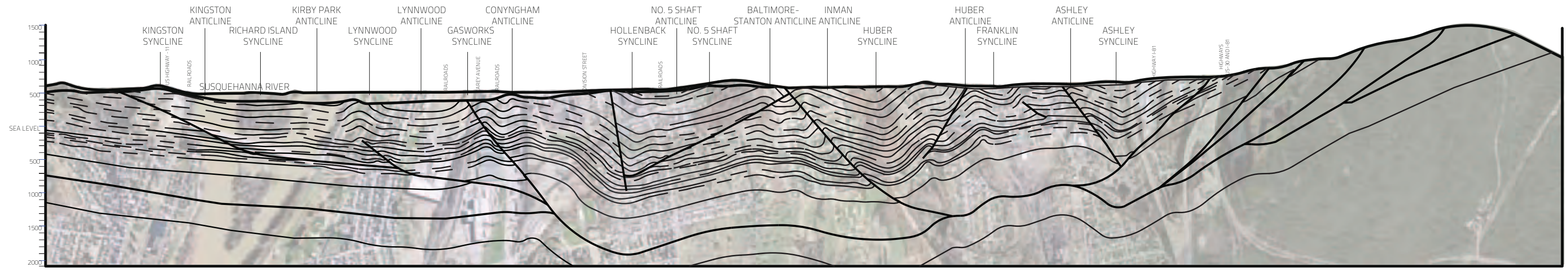


KEY PLAN OF THE TOWNS OF ASHLEY AND WILKES-BARRE PENNSYLVANIA

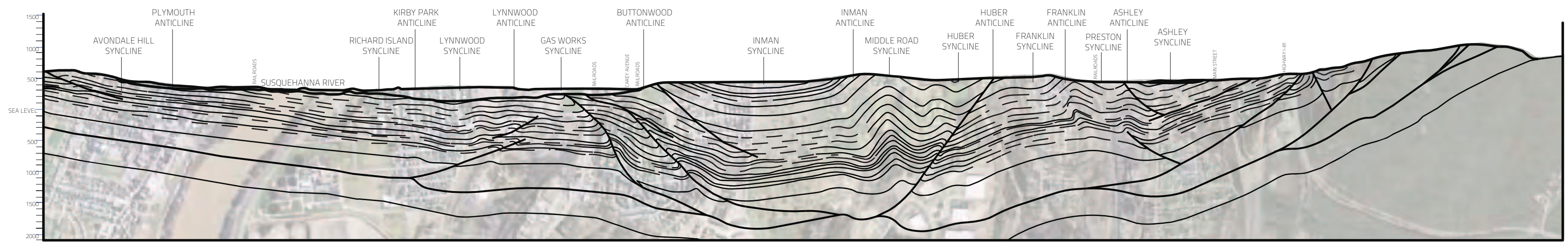




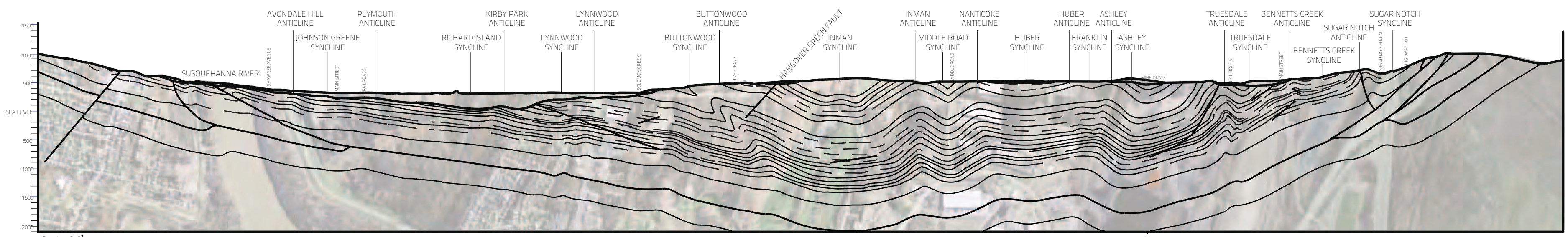
ANTICLINES AND SYNCLINES OF THE ANTHRACITE COAL REGION



Section A-A[1]



Section B-B[1]



Section C-C[1]

FAULT LINES

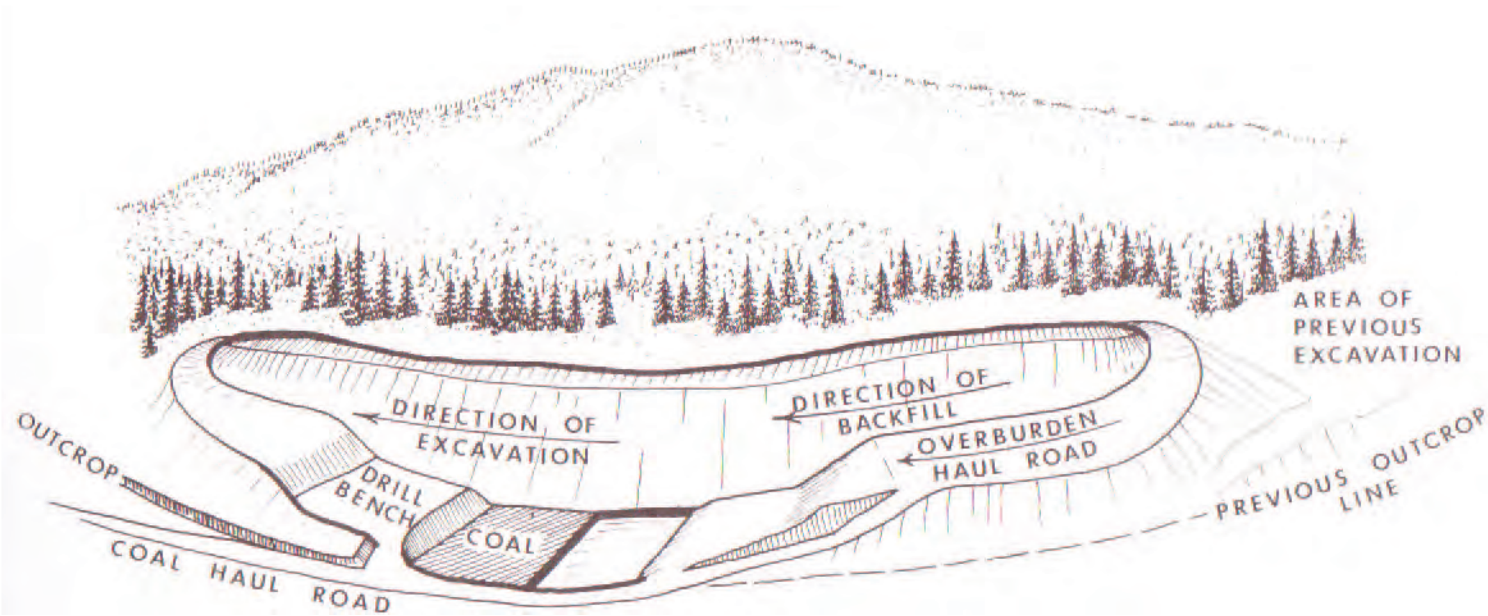
UNMINED COAL SEAM

MINED COAL SEAM

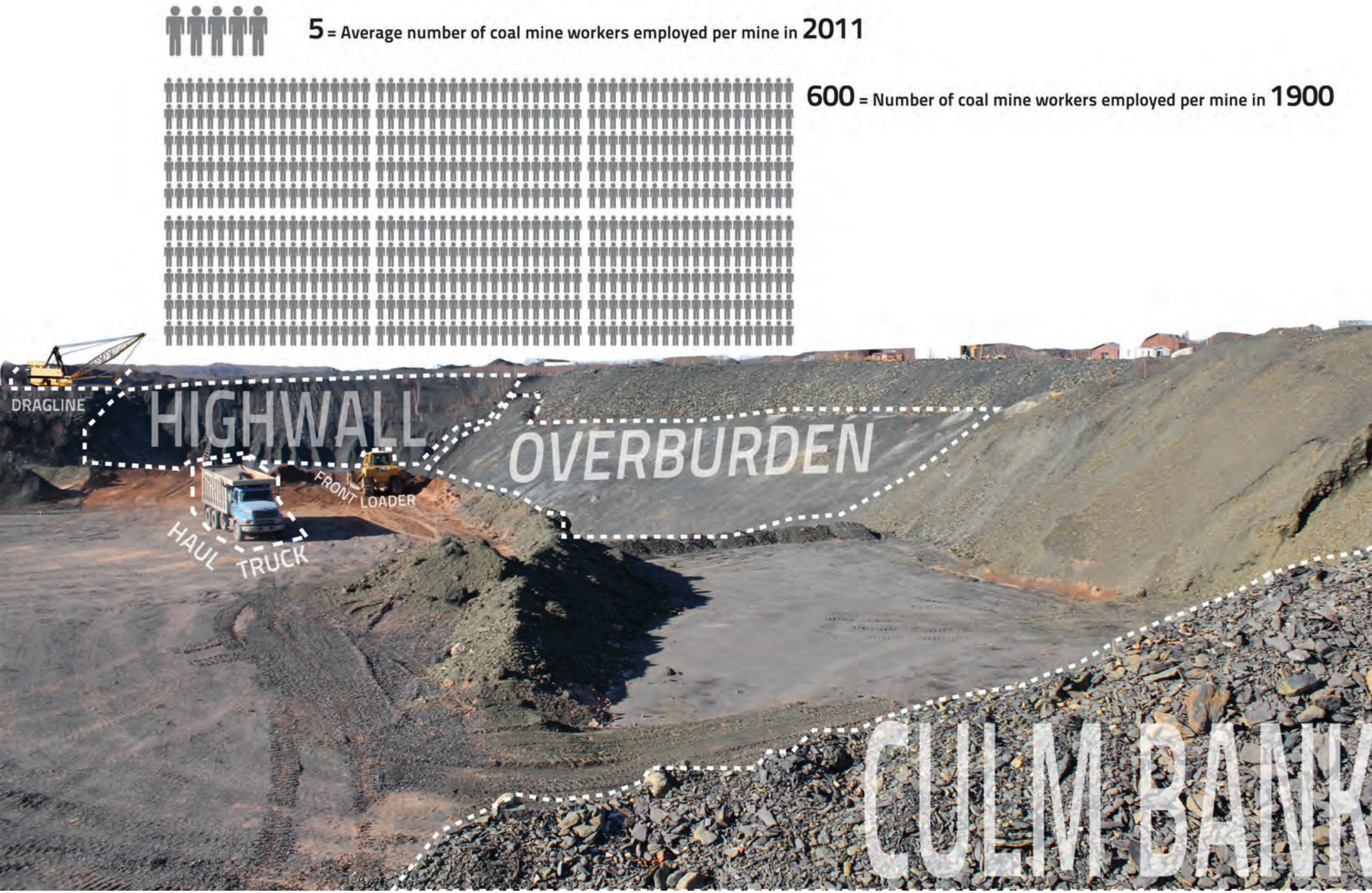
ENVIRONMENTAL GEOLOGIC SECTIONS OF COAL SEAMS, ANTICLINES & SYNCLINES, AND UNDERGROUND MINE POOLS

Minescape Type 2:

Open Pit Mine (aka “Surface Mine”)

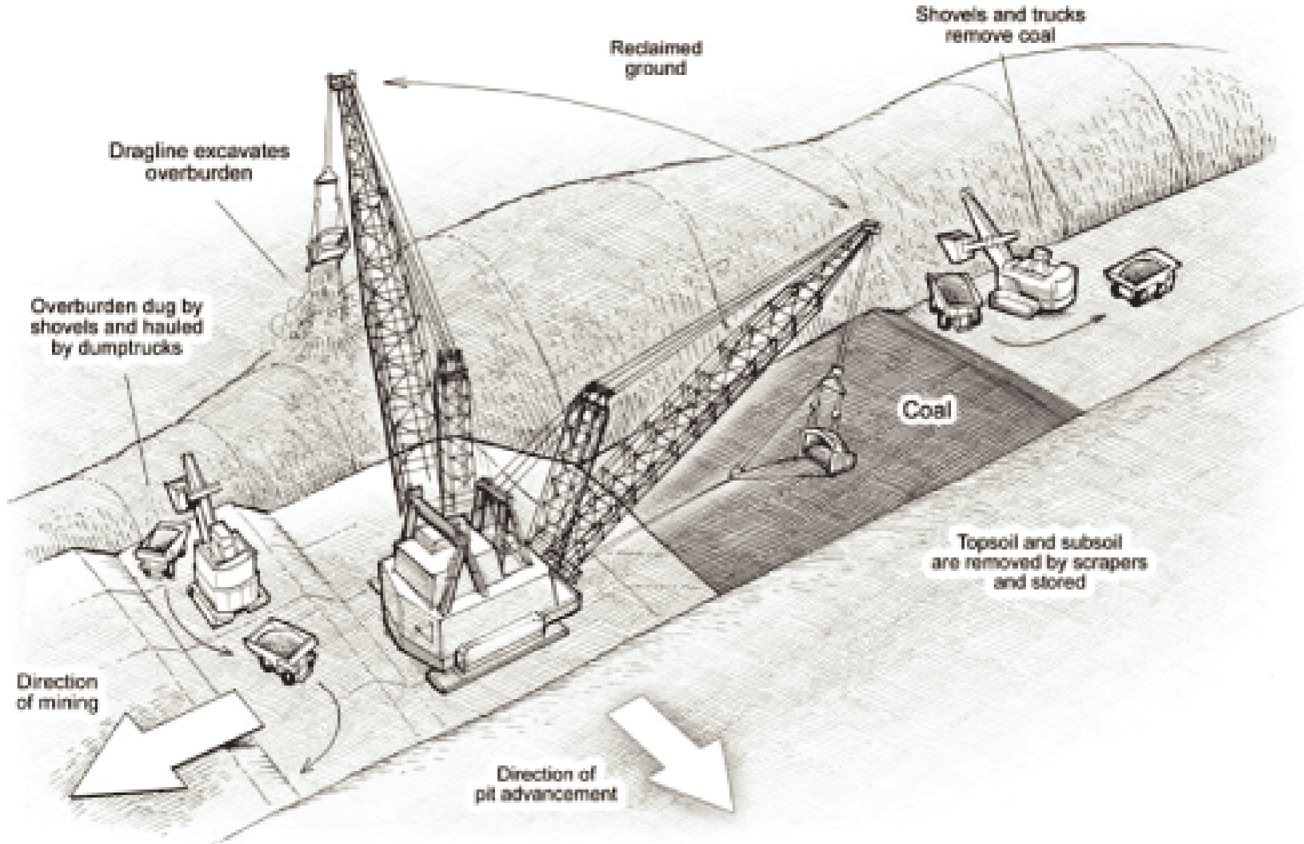


ENVIRONMENTAL OPEN PIT MINE


5 = Average number of coal mine workers employed per mine in 2011
600 = Number of coal mine workers employed per mine in 1900
DRAGLINE
HIGHWALL
OVERBURDEN
FRONT LOADER
HAUL TRUCK
CULM BANK

Minescape Type 3:

Reclaimed Mine

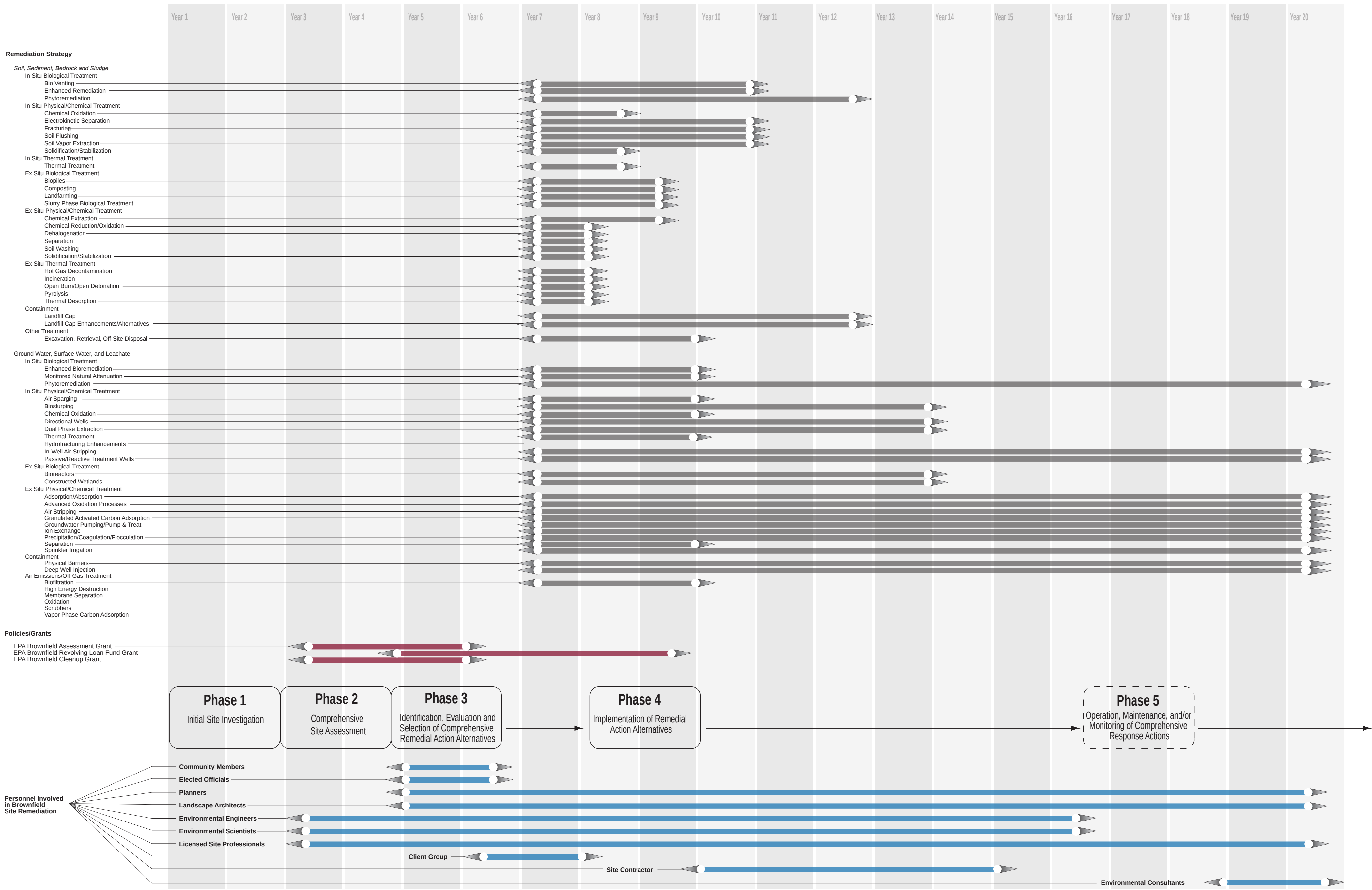


Reclaimed open pit mine sites near Pottsville, PA

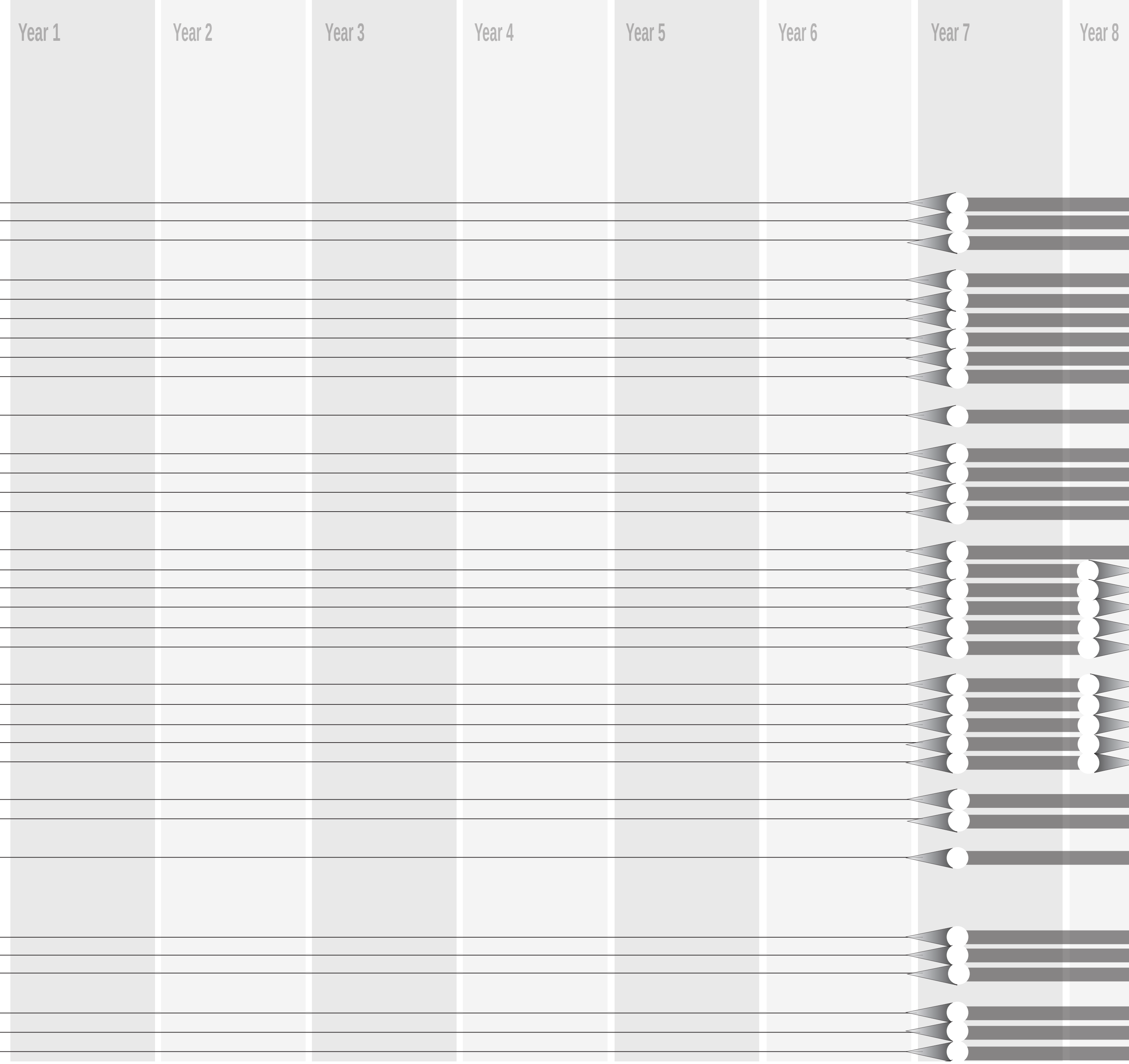
WalMart adjacent to coal mine site in Pottsville, PA as part of Acres for America Program


Former mine site, now a soccer field in Ashley, Pennsylvania

ENVIRONMENTAL RECLAIMED MINE



ENVIRONMENTAL



Remediation Strategy

Soil, Sediment, Bedrock and Sludge

In Situ Biological Treatment
- Bio Venting
- Enhanced Remediation
- Phytoremediation

In Situ Physical/Chemical Treatment
- Chemical Oxidation
- Electrokinetic Separation
- Fracturing
- Soil Flushing
- Soil Vapor Extraction
- Solidification/Stabilization

In Situ Thermal Treatment
- Thermal Treatment

Ex Situ Biological Treatment
- Biopiles
- Composting
- Landfarming
- Slurry Phase Biological Treatment

Ex Situ Physical/Chemical Treatment
- Chemical Extraction
- Chemical Reduction/Oxidation
- Dehalogenation
- Separation
- Soil Washing
- Solidification/Stabilization

Ex Situ Thermal Treatment
- Hot Gas Decontamination
- Incineration
- Open Burn/Open Detonation
- Pyrolysis
- Thermal Desorption

Containment
- Landfill Cap
- Landfill Cap Enhancements/Alternatives

Other Treatment
- Excavation, Retrieval, Off-Site Disposal

Ground Water, Surface Water, and Leachate

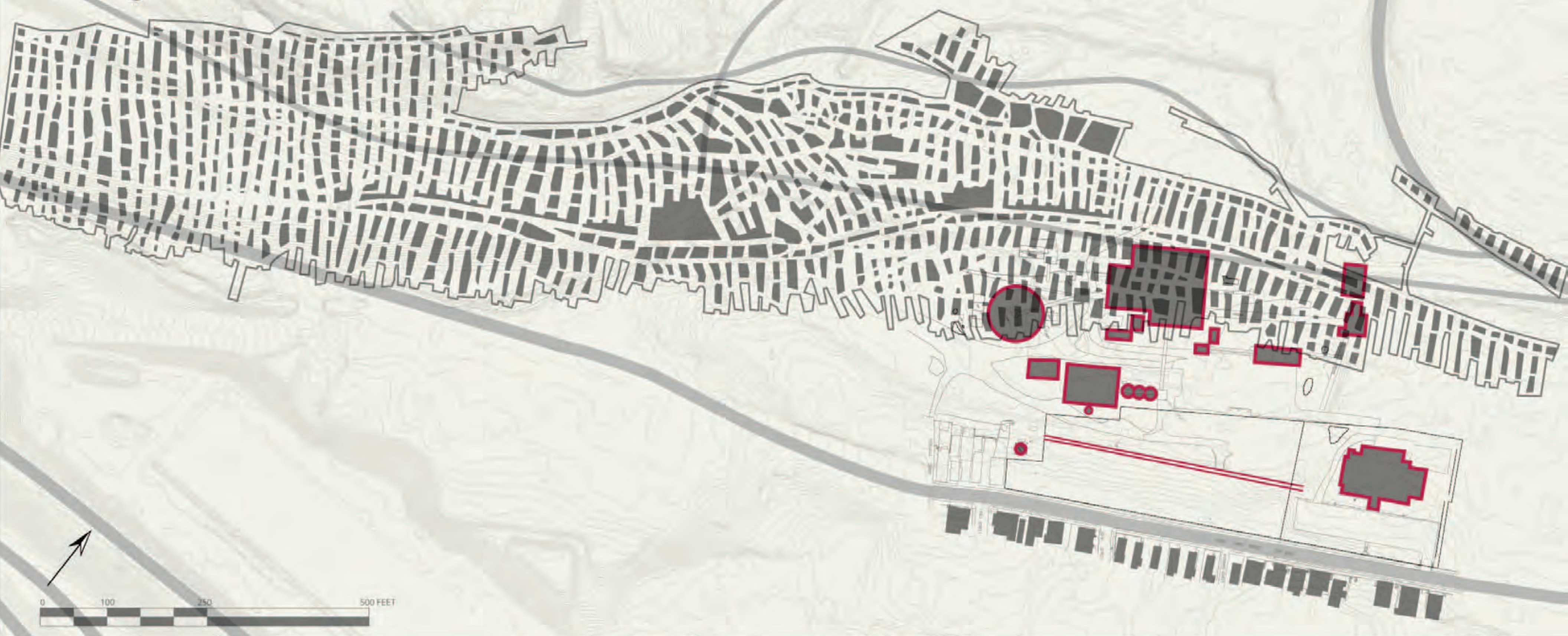
In Situ Biological Treatment
- Enhanced Bioremediation
- Monitored Natural Attenuation
- Phytoremediation

In Situ Physical/Chemical Treatment
- Air Sparging
- Bioslurping
- Chemical Oxidation

Minescape Type 4:

Supporting Infrastructure

Supporting Infrastructure and Underground Mine Newtork at Huber Breaker Site



Underground Mine Network

Above is a plan of a mine network underneath the Huber Breaker site which starts at 70 ' below surface grade. There are five levels of mines still intact, however each level is filled with water and slurry. The white in the above plan are the coal pillars still standing, and the black indicates the "rooms " where coal was extracted.

Huber Breaker

Opened in 1939, is now the last standing colliery breaker in the northern anthracite coal region.

Power House

Retail Coal Pocket

Foreign Coal Dump

Storage Tanks

Smoke Stacks and Coal Silos

EPCAMR Office

Sewer Easement

ENVIRONMENTAL

POLITICAL EXTERNALITIES

Concerns over the environmental impacts of coal mining resulted in passage of some of Pennsylvania's very first environmental laws. Regulation of the mining impacts began in earnest in 1913 with the passage of Act 375 prohibiting the discharge of anthracite coal, culm or refuse into streams.

1872 The General Mining Act of 1872

Codified the informal system of acquiring and protecting mining claims on public land.

1937 The Clean Streams Law

Attempt to regulate surface coal mining. Formed the basis of modern environmental regulations covering surface coal mining operations.

1945 The Surface Mining Conservation and Reclamation Act

Largely protects streams from pollution. It was amended in 1945 to include acid mine drainage and again in 1965 to define acid mine drainage as an industrial waste, requiring all mines to treat their drainage to specified standards.

1968 Anthracite Coal Mining Act

In 1968 a $500 million bond issue was passed, in part, to finance the reclamation of abandoned mined lands through a new Operation Scarlift and to purchase land for conservation and recreation purposes. The Coal Refuse Disposal Control Act was passed in that same year to help control pollution from coal refuse piles.

1979 Borough of Deep Mine Safety Created

DEP's Bureau of Deep Mine Safety was officially created in the former Department of Environmental Resources in 1979, having been in existence in various forms as part of predecessor agencies back to 1903 in the Department of Mines. Its primary purpose is to improve safety conditions in mines through training and setting safety requirements. The Bureau also investigates mine accidents and conducts mine rescue operations.

1980 CERCLA (Superfund) Act Created

The Comprehensive Environmental Respose, Compensation and Recovery Act created a tax on chemical and petroleum industries, established requirements concerning closed and abandoned hazardous waste sites. The act also provided liability for persons responsible for releases of hazardous waste sites.

1992 SMCRA Amended

In 1992 the Surface Mining Conservation and Reclamation Act was amended to better protect water supplies and provide incentives for remaining previously abandoned areas.

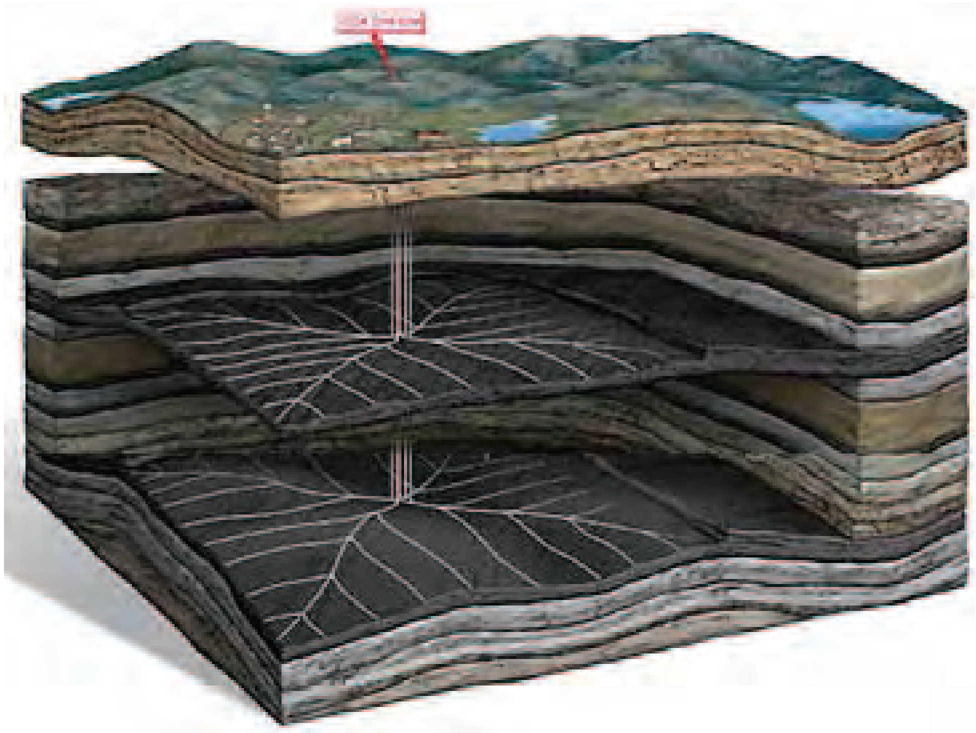
1994 Mine Subsidence and Land Conservation Act Amended

The Mine Subsidence and Land Conservation Act was amended in 1994 to better protect water supplies affected by deep coal mining and to revise the procedures for repairing or replacing buildings damaged by mine subsidence. Legislation was also passed to encourage the siting of coal refuse disposal areas on lands previously affected by mining (Act 114).

Mineral vs. Surface Rights

"Mineral Rights" entitle a person or organization to explore and produce the rocks, minerals, oil and gas found at or below the surface of a tract of land. The owner of mineral rights can sell, lease, gift or bequest them to others individually or entirely. For example, it is possible to sell or lease rights to all mineral commodities beneath a property and retain rights to the surface. It is also possible to sell the rights to a specific rock unit (such as the Pittsburgh Coal Seam) or sell the rights to a specific mineral commodity (such as limestone). In the United States and a few other countries, ownership of mineral resources was originally granted to the individuals or organizations that owned the surface. These property owners had both "surface rights" and "mineral rights". This complete private ownership is known as a "fee simple estate".

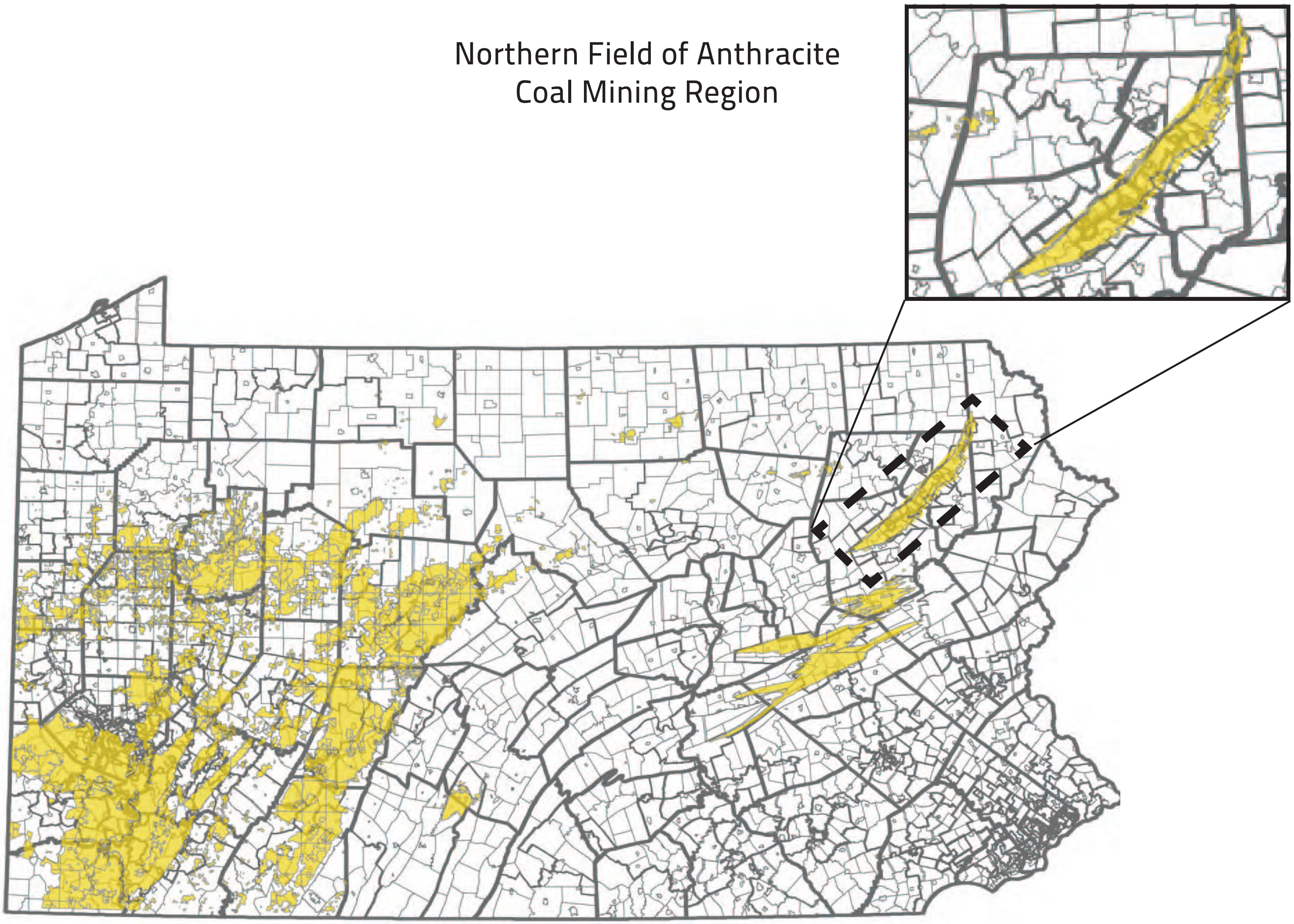
Fee simple is the most basic type of ownership. The owner controls the surface, the subsurface and the air above a property. The owner also has the freedom to sell, lease, gift or bequest these rights individually or entirely to others.



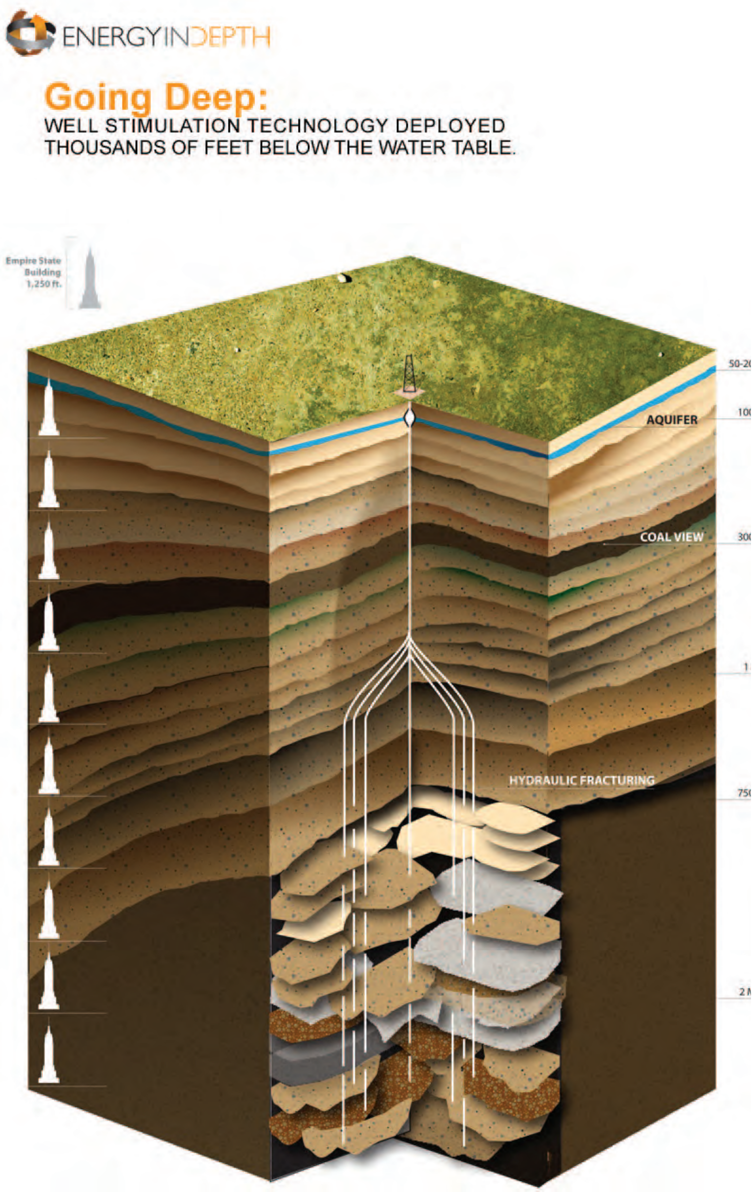
Source: Rock Creek Energy LLC Website

The General Mining Act of 1872 ESTABLISHED SURFACE AND MINERAL RIGHTS REGULATIONS THAT ARE STILL TODAY'S STANDARD

Northern Field of Anthracite
Coal Mining Region



POLITICAL COAL FORMATIONS AND POLITICAL BOUNDARIES IN PENNSYLVANIA:
COUNTIES, MUNICIPALITIES, TOWNSHIPS, BOROUGHS AND CONGRESSIONAL DISTRICTS



Source: Energy In Depth Website

Source: Carbon Tax Center Website

Source: Swarthmore College Environmental Studies Website Article “Natural Gas Drilling in the Marcellus Shale”

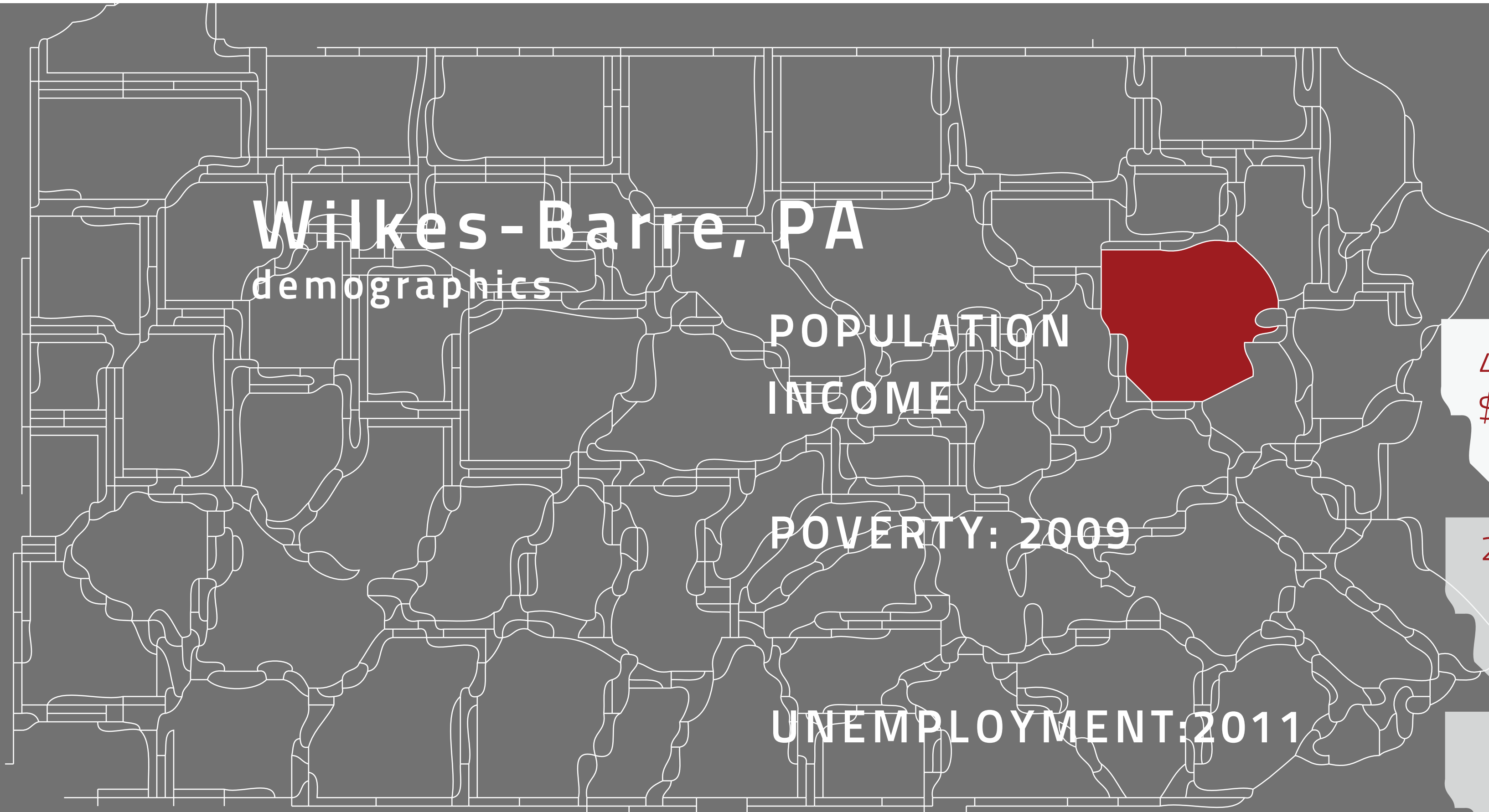
POLITICAL MARCELLUS SHALE DRILLING THROUGH “FRACKING”

SOCIAL EXTERNALITIES




SOCIAL

ECONOMIC EXTERNALITIES



Wilkes-Barre, PA
demographics

POPULATION

INCOME

40,964

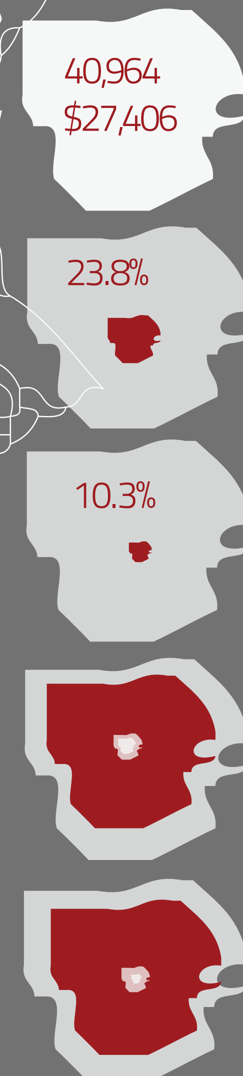
$27,406

POVERTY: 2009

23.8%

UNEMPLOYMENT:2011

10.3%



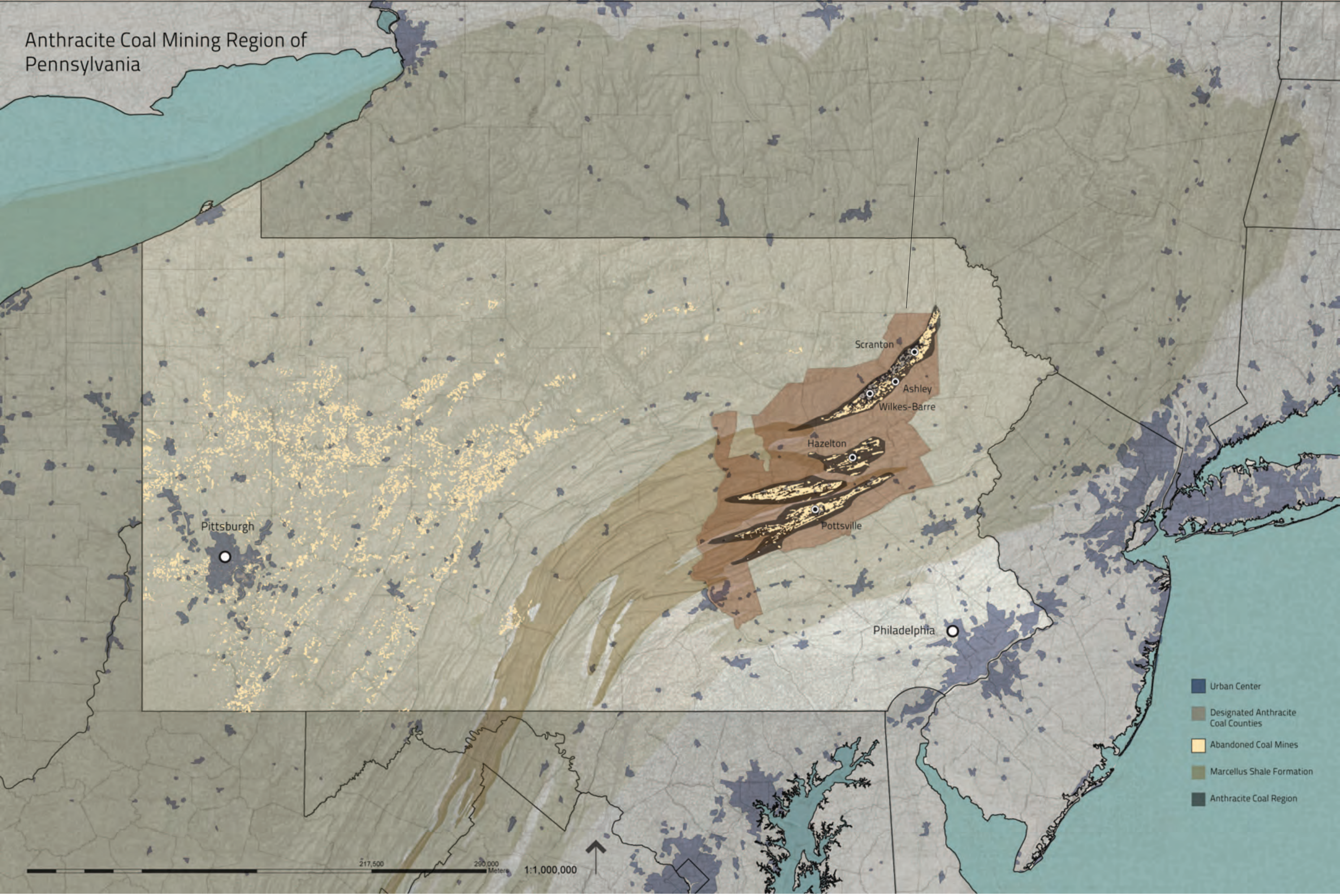
ENERGY

UTILITY GAS 76%
ELECTICITY 13%
FUEL OIL, KEROSENE 8%
BOTTLED, TANK, LP GAS 1%
COAL 1%

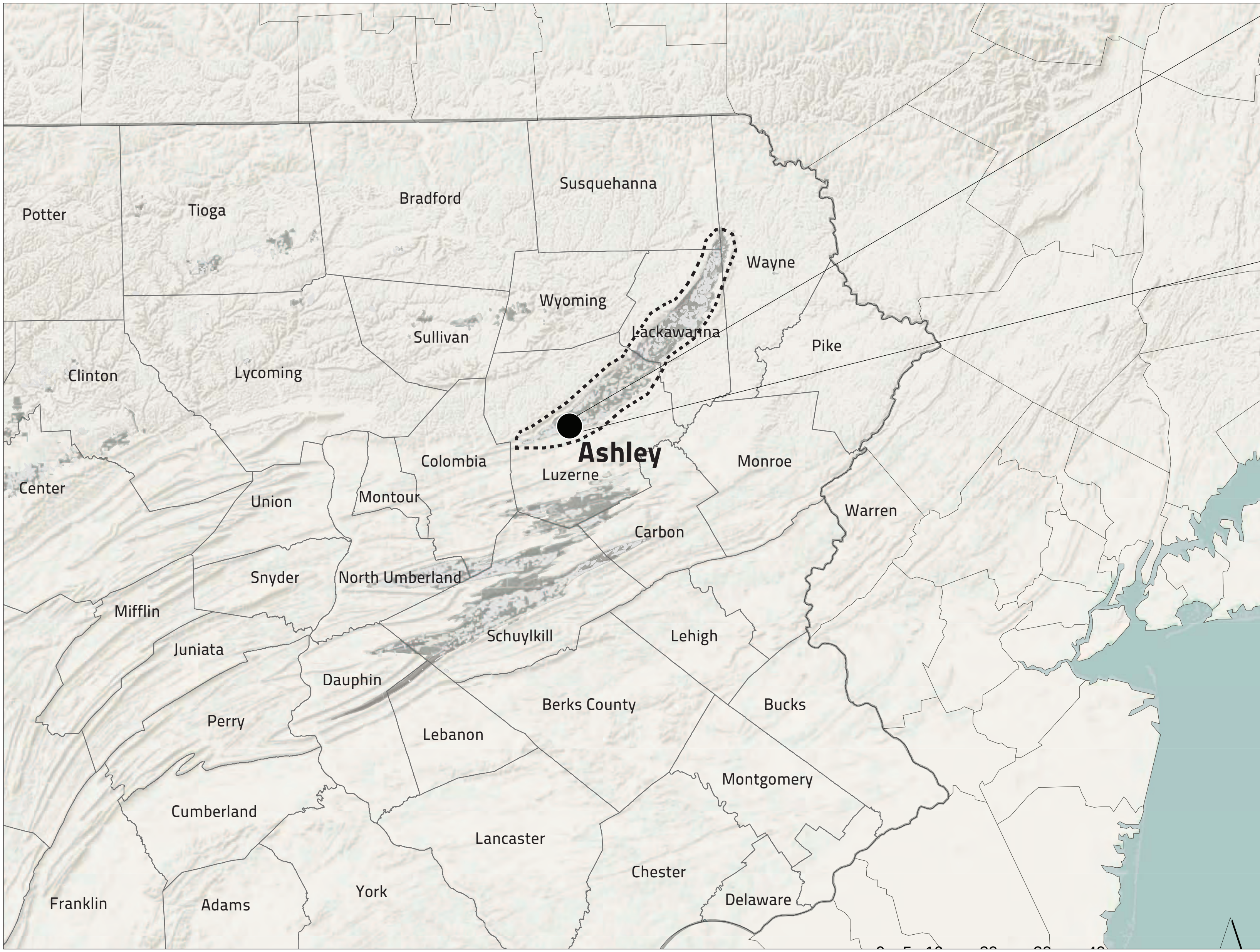
EDUCATION

HIGH SCHOOL 76.8%
BACHELOR'S DEGREE 12.8%
GRADUATE OR
PROFESSIONAL DEGREE 4.7%

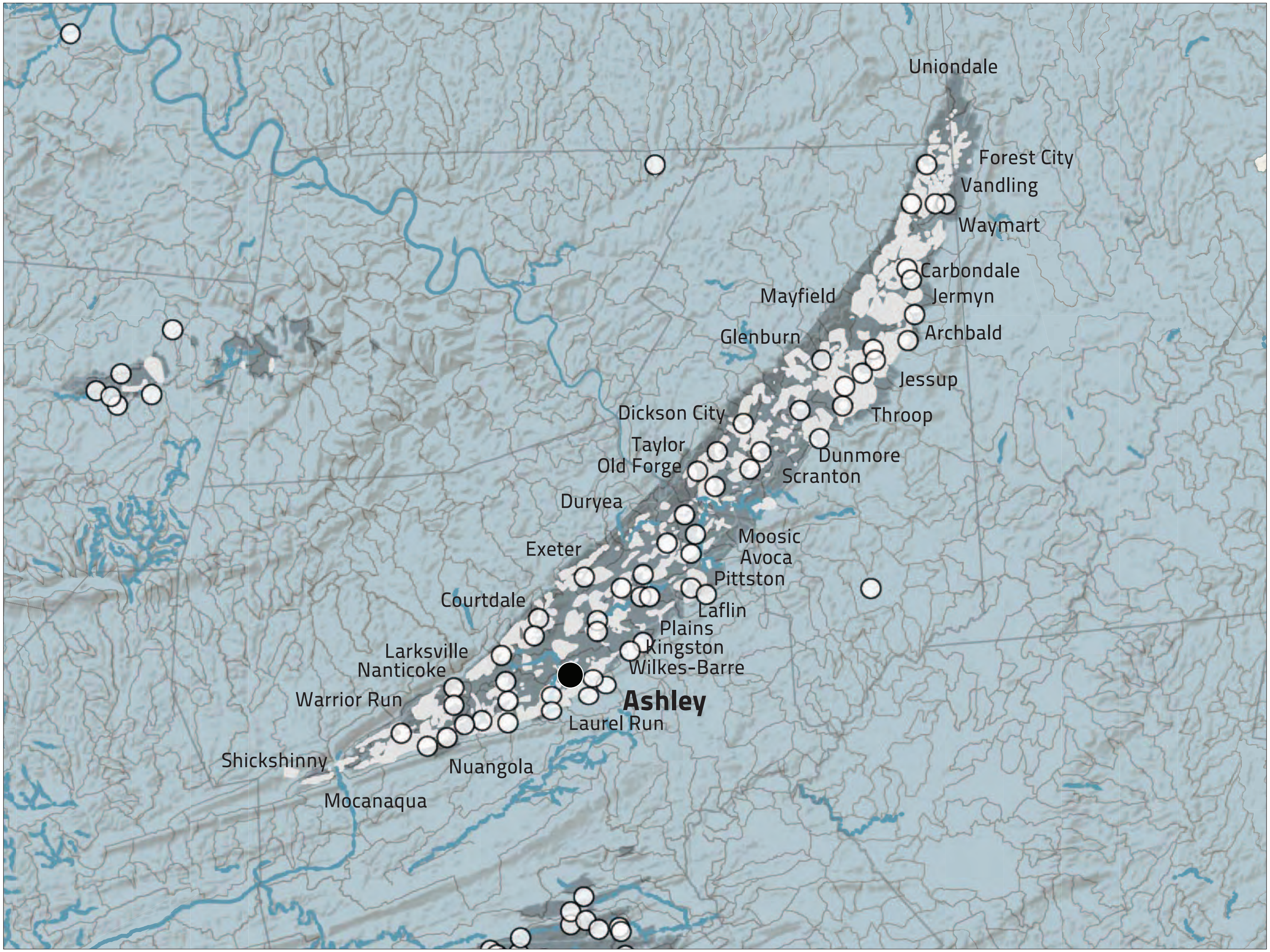
ECONOMIC



SITE ANALYSIS



SITE ANALYSIS COAL FIELDS AND COUNTIES IN THE ANTHRACITE REGION



WATERSHED

COAL FIELD

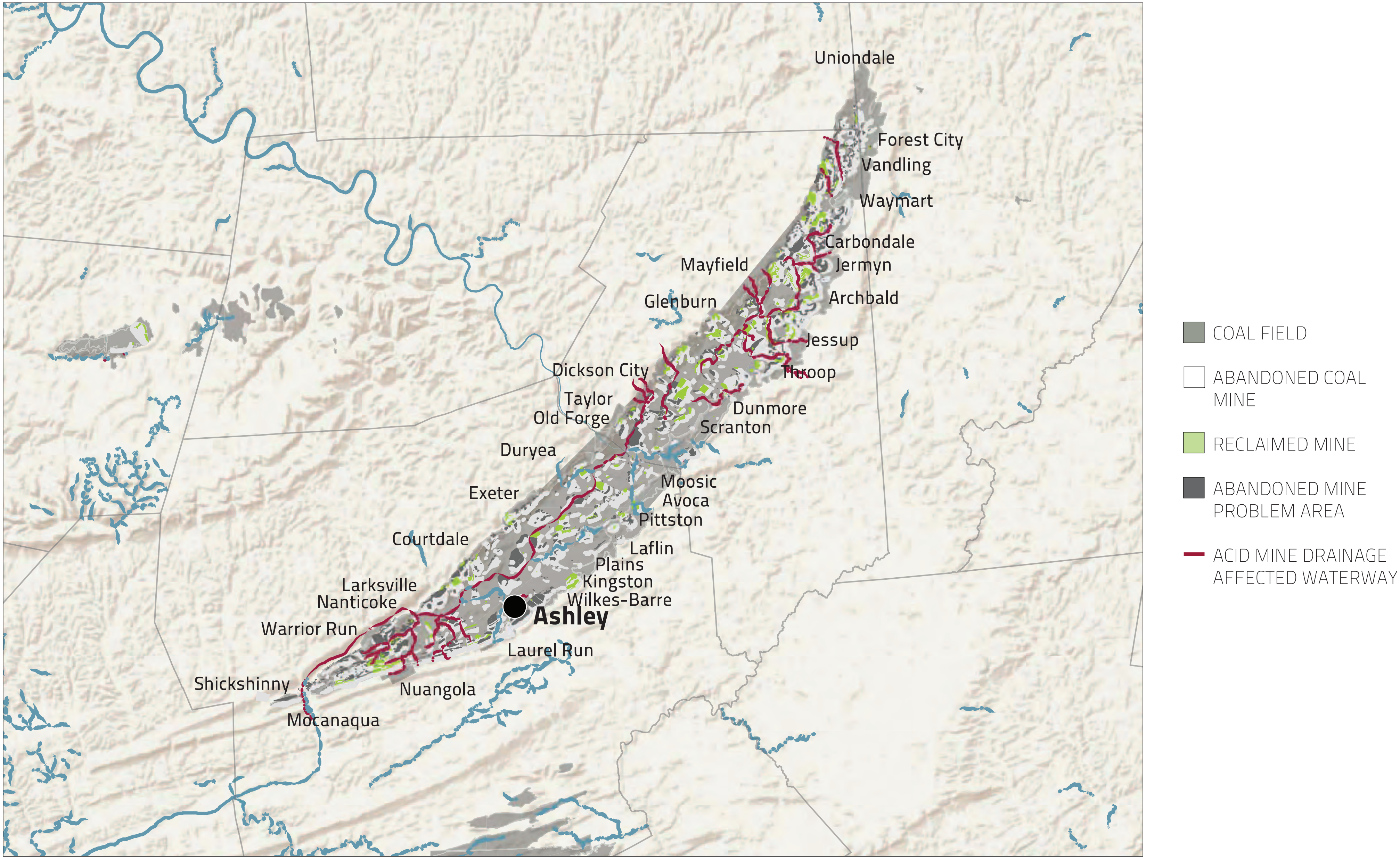
ABANDONED COAL MINE

COUNTY LINE

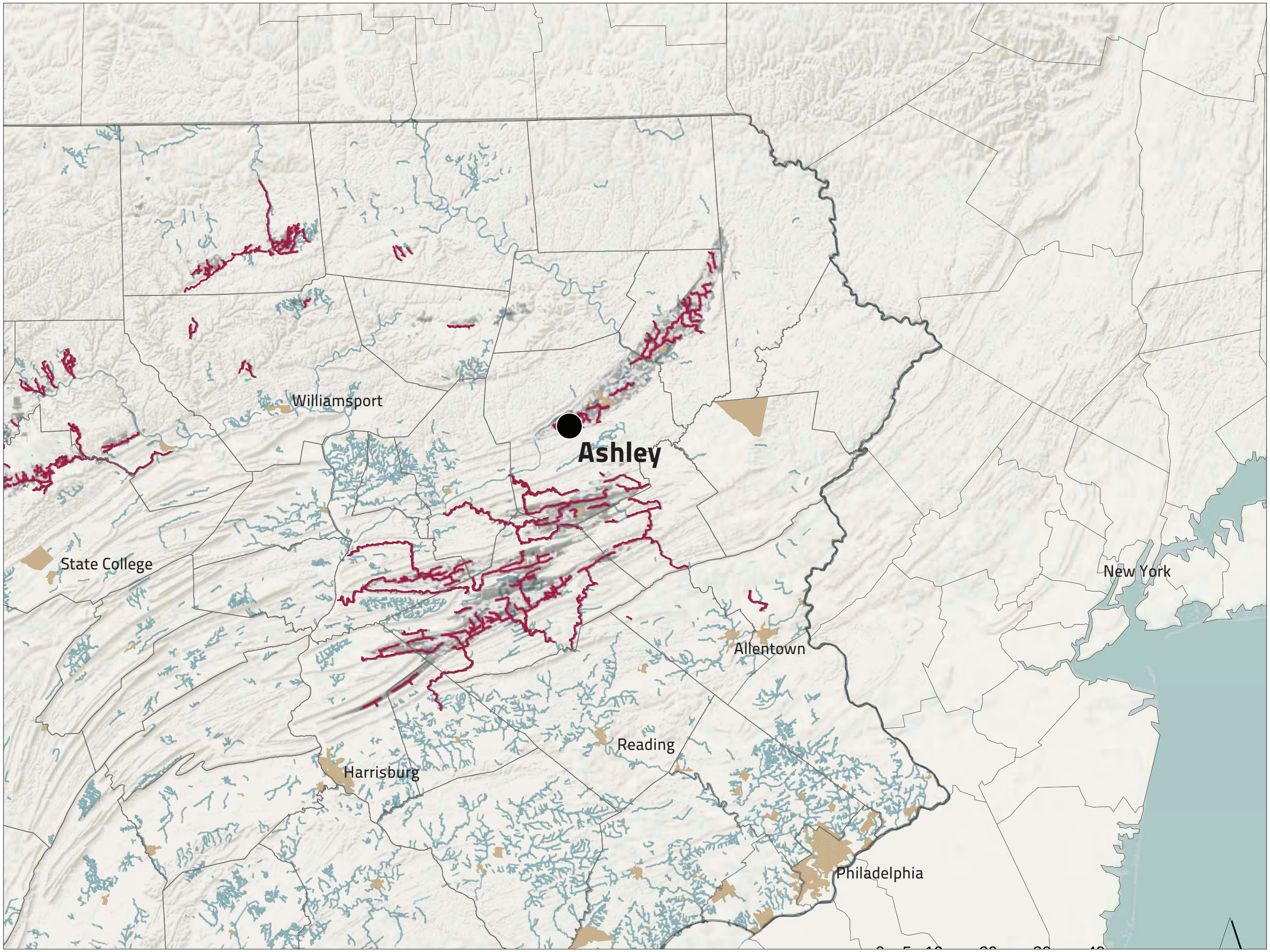
COAL MINING OPERATION

ACID MINE DRAINAGE AFFECTED WATERWAY

SITE ANALYSIS WATERSHEDS AND MINING AREAS IN THE NORTHERN ANHRACITE COAL FIELD



SITE ANALYSIS ABANDONED MINE LANDS, ACID MINE DRAINAGE AND RECLAIMED MINE SITES IN THE NORTHERN ANHRACITE COAL FIELD



COAL FIELD

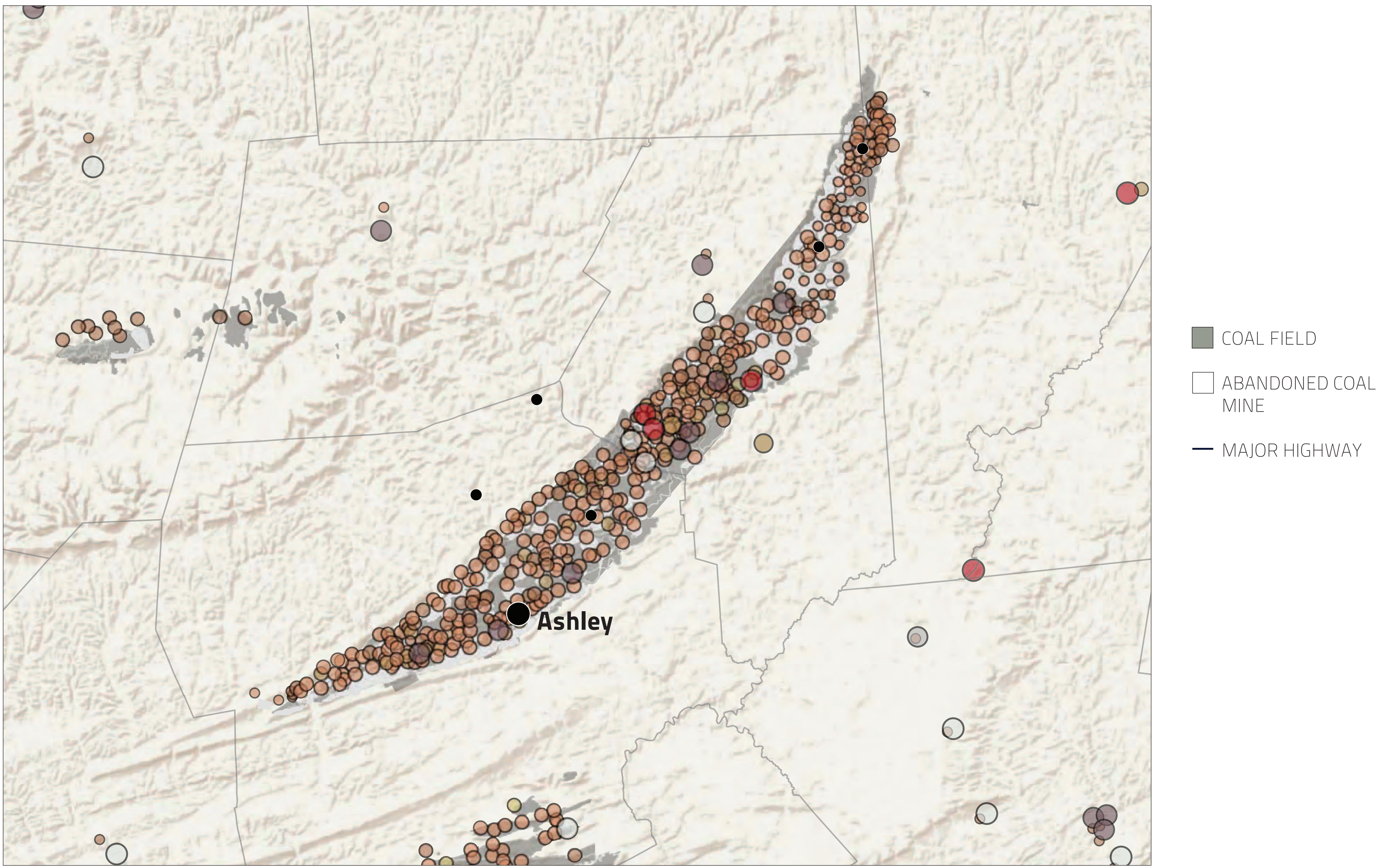
ABANDONED COAL MINE

ENVIRONMENTAL JUSTICE AREAS

ABANDONED MINE PROBLEM AREA

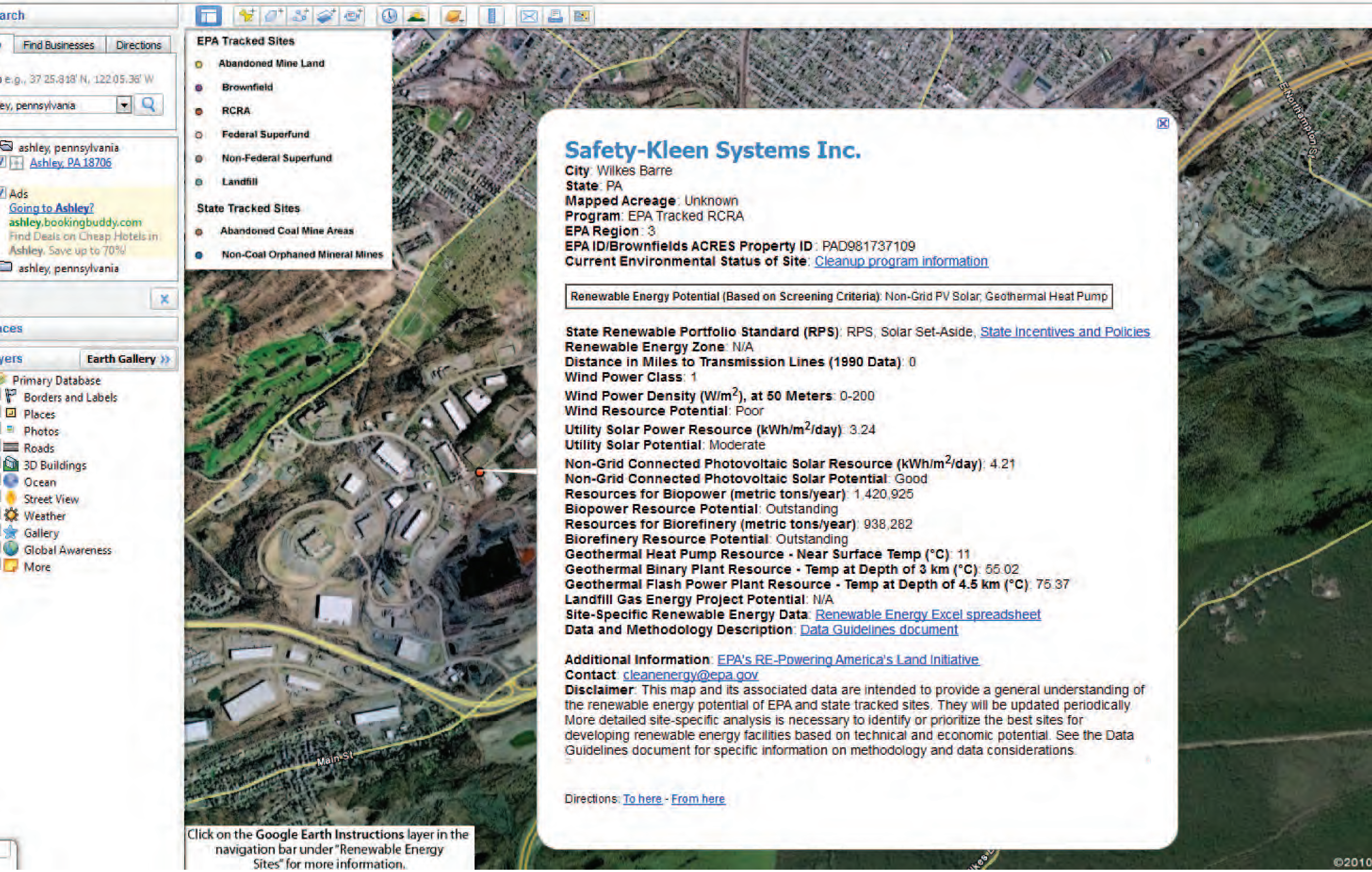
ACID MINE DRAINAGE AFFECTED WATERWAY

SITE ANALYSIS COAL FIELDS AND ACID MINE DRAINAGE IN THE ANTHRACITE REGION



SITE ANALYSIS

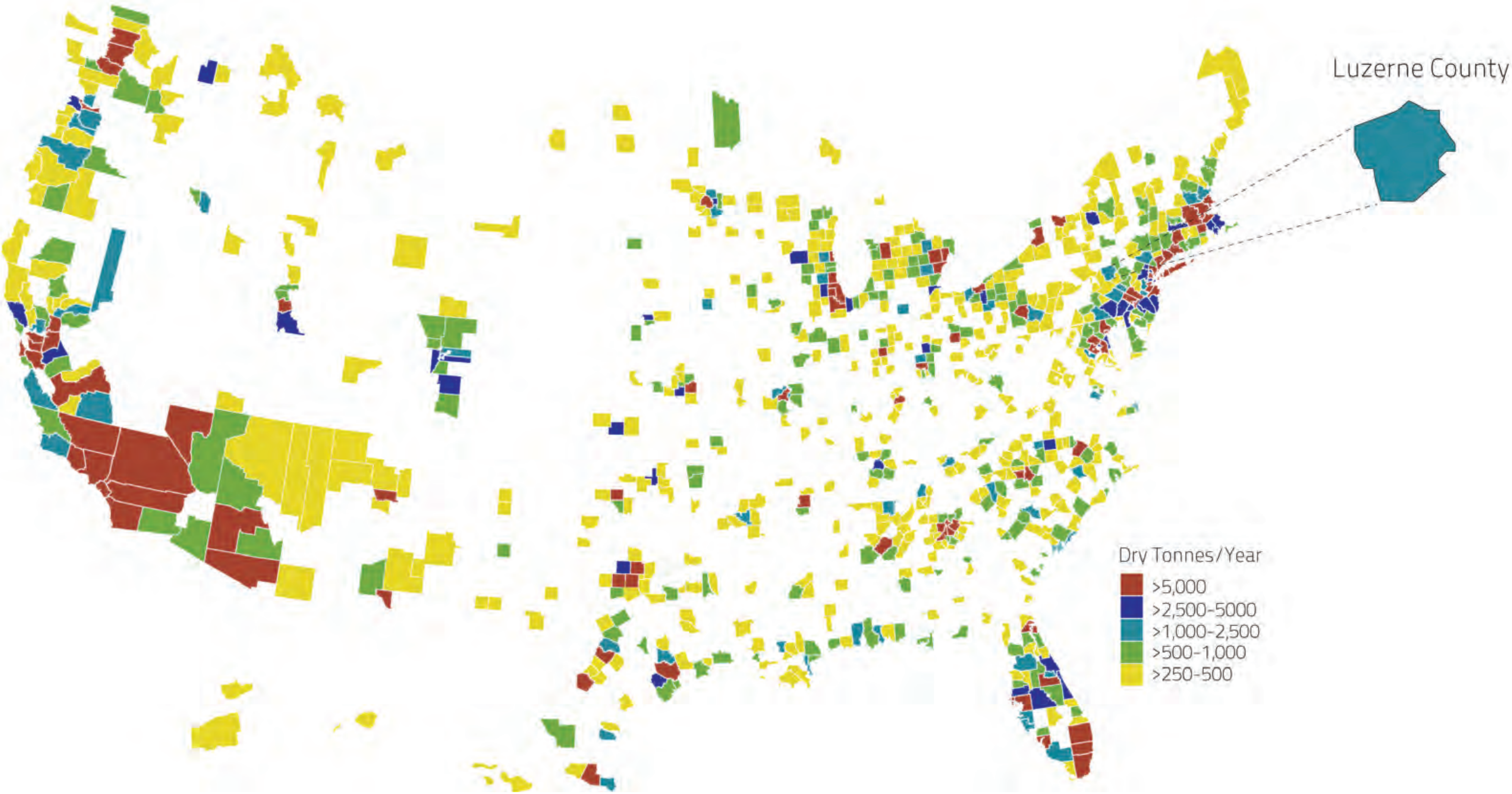
RENEWABLE ENERGY POTENTIAL, BROWNFIELD AND SUPERFUND SITES IN THE NORTHERN ANHRACITE COAL FIELD

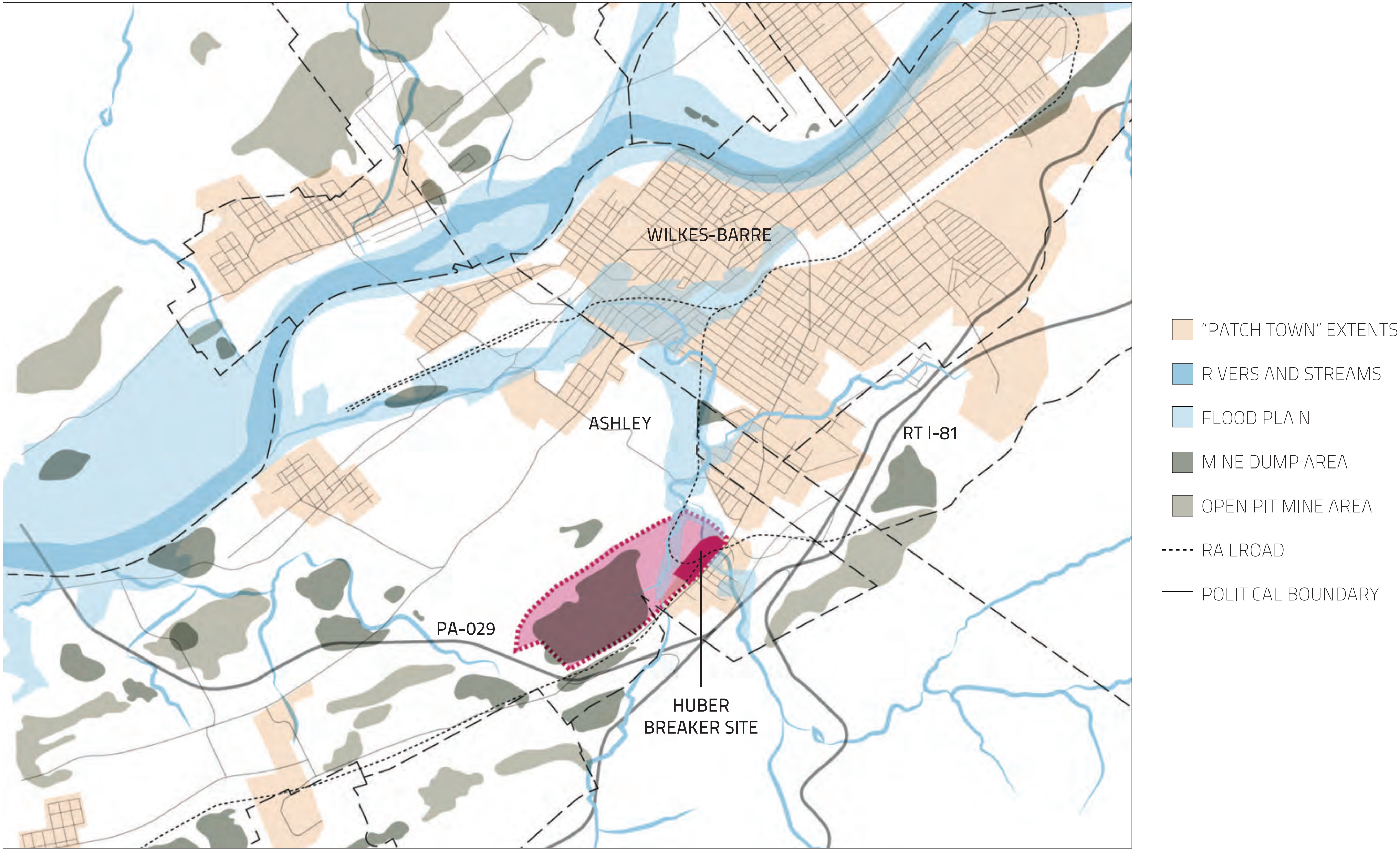


SITE ANALYSIS RENEWABLE ENERGY NREL MAPPING

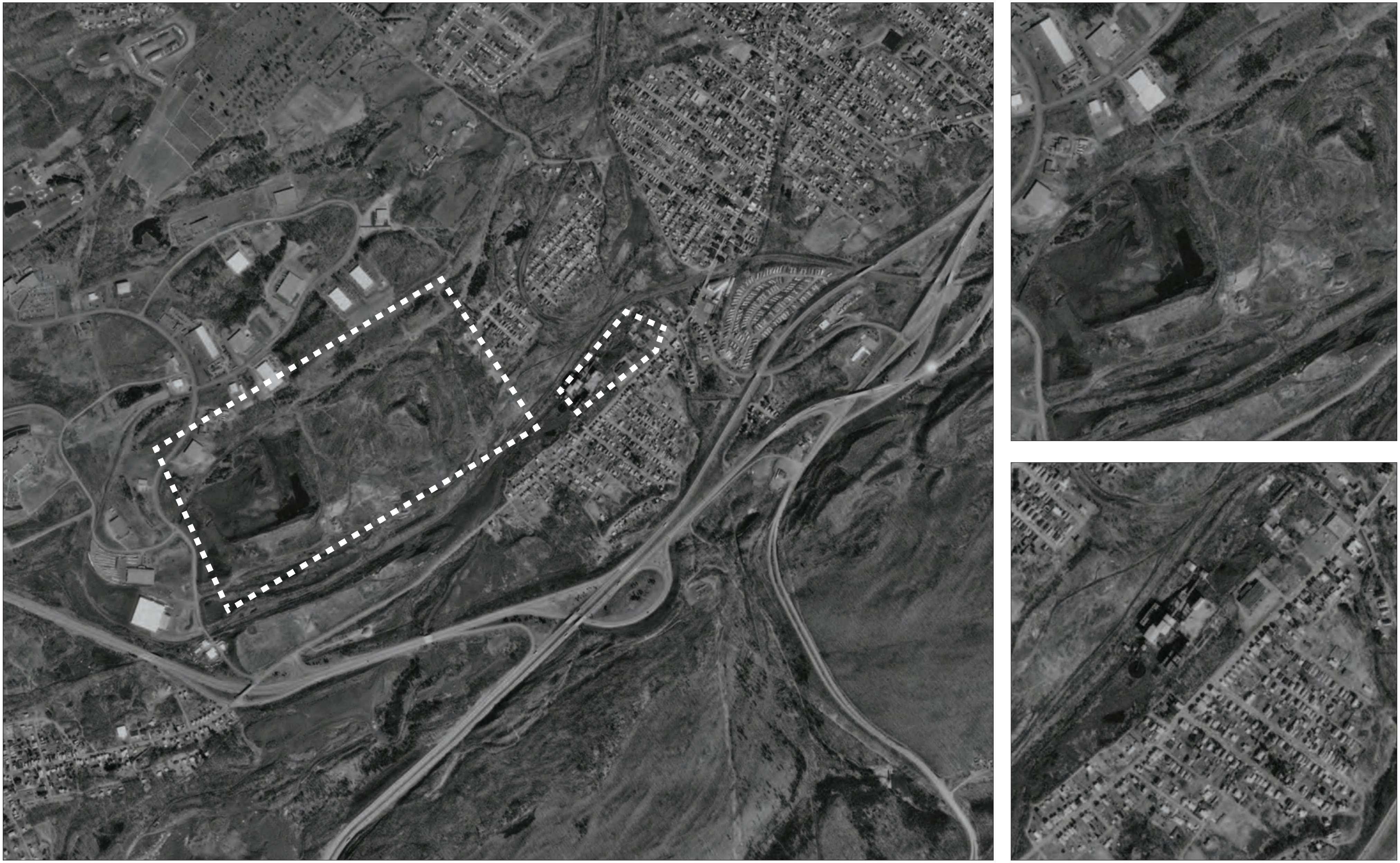
Biomass Resources of the United States by County: Methane Emissions from Domestic Wastewater Treatment

*Source: National Renewable Energy Laboratory





SITE ANALYSIS ASHLEY AND WILKES-BARRE, PENNSYLVANIA ANALYSIS: MINE LANDS AND WATER BODIES



SITE ANALYSIS ASHLEY, PENNSYLVANIA AERIAL: 1992

SITE ANALYSIS ASHLEY, PENNSYLVANIA AERIAL: 1999



SITE ANALYSIS ASHLEY, PENNSYLVANIA AERIAL: 2005

SITE ANALYSIS ASHLEY, PENNSYLVANIA AERIAL: 2010

SITE ANALYSIS ASHLEY, PENNSYLVANIA AERIAL: MINE DUMP AREAS

Design Intervention:

ADAPTIVE REUSE OF MINESCAPES

Use Huber Breaker Site as testing ground for energetic landscape prototypes infused with remediation...

...thus spawning a new chapter in energy landscapes for the anthracite coal region.

Address externalities through program dictated by remediation status:

Environmental

-Site and design energy prototypes based on cyclical energy of former coal mine sites through geothermal and biomass

Political/Legislative

-Private companies purchasing mine lands
-Develop private interest groups that work with local government to spearhead legislation

Economic

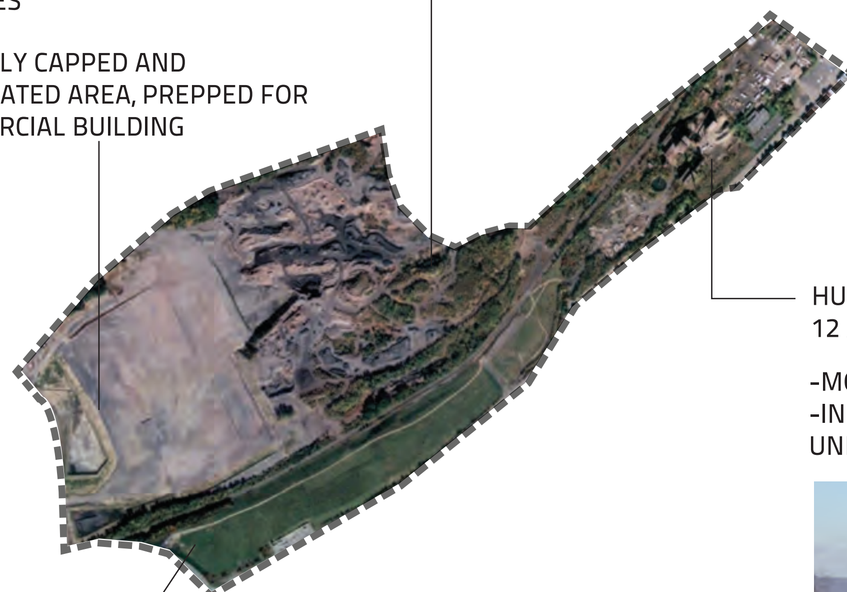
-Provide funding for renewables researchers through federal/state grants
-Provide "green jobs" for those working at prototypes at Research and Development

Social
-Industrial heritage tour as educational tool

FORMER MINE DUMP SITE
75 ACRES

RECENTLY CAPPED AND
REMEDIATED AREA, PREPPED FOR
COMMERCIAL BUILDING

CULM PILES SET IN FLOOD PLAIN,
FILLED WITH ACID MINE DRAINAGE



HUBER BREAKER SITE
12 ACRES

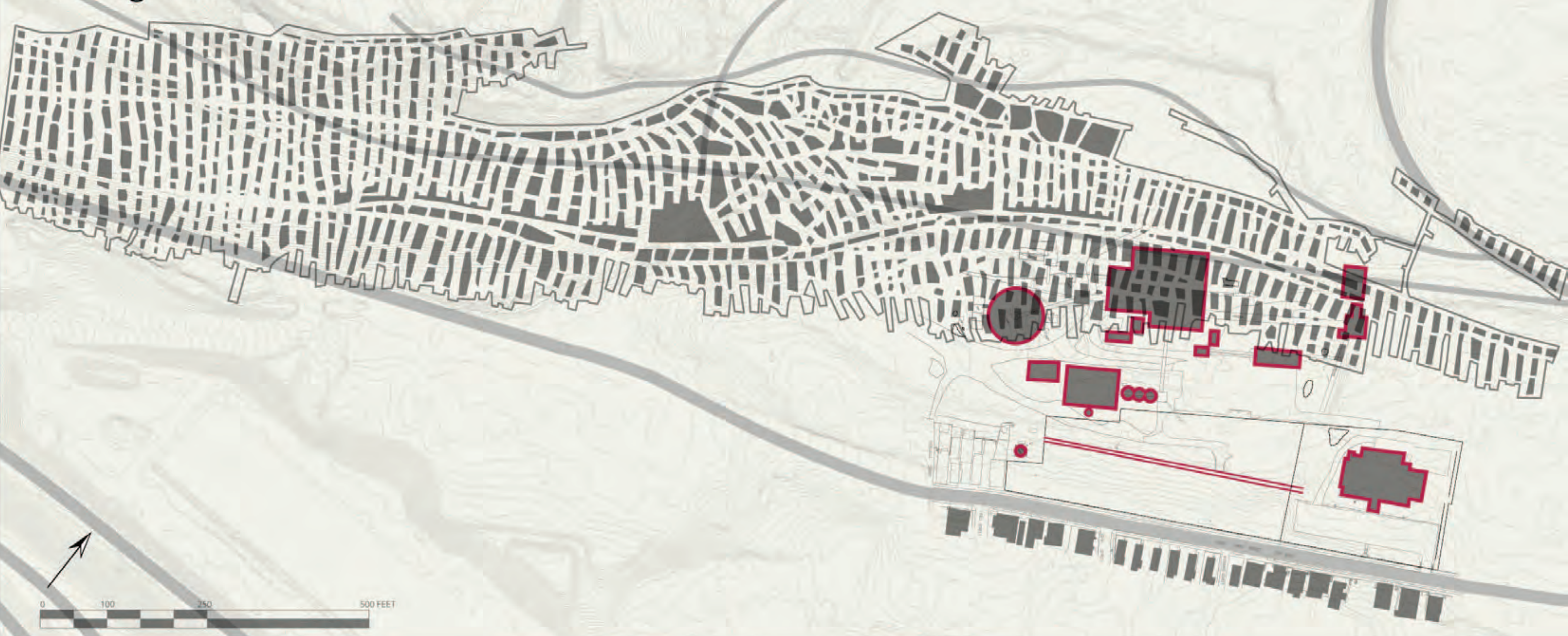
-MOST TOXIC
-INCLUDES HUBER BREAKER AND
UNDERGROUND MINE NETWORK

DEVELOPABLE SITE 1
17 ACRES

-RECENTLY REMEDIATED
THROUGH CAPPING USING COAL
REFUSE MATERIAL
-PREPPED FOR BULIDINGS


FUTURE BUILDOUT FOR BIOMASS PLANT FACILITIES TREATEMENT
GEOTHERMAL FROM UNDERGROUND MINE WATER
ATV PARK ON CULM PILES
WETLAND S AND ACID MINE DRAINAGE TREATEMENT
BIOMASS CROP AREA
PHYTOREMEDIATION PLOTS
BIOMASS WASTE DEPOSIT AREA
BUFFER AND BIOMASS FOREST
RESEARCH AND DEVELOPMENT FACILITIES AND CLASS ROOMS

Supporting Infrastructure and Underground Mine Newtork at Huber Breaker Site



Underground Mine Network

Above is a plan of a mine network underneath the Huber Breaker site which starts at 70 ' below surface grade. There are five levels of mines still intact, however each level is filled with water and slurry. The white in the above plan are the coal pillars still standing, and the black indicates the "rooms" where coal was extracted.

Huber Breaker

Opened in 1939, is now the last standing colliery breaker in the northern anthracite coal region.

Power House

Retail Coal Pocket

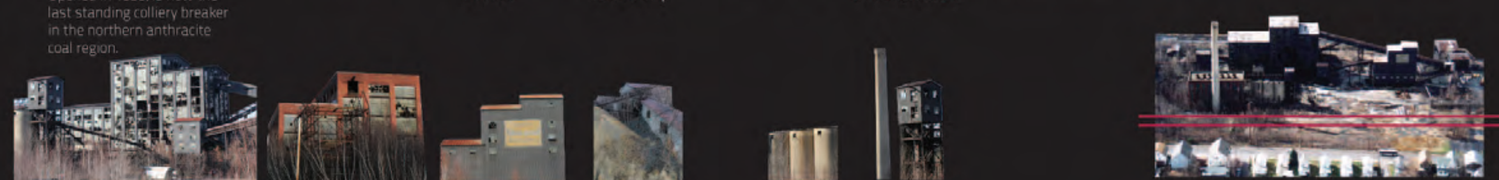
Foreign Coal Dump

Storage Tanks

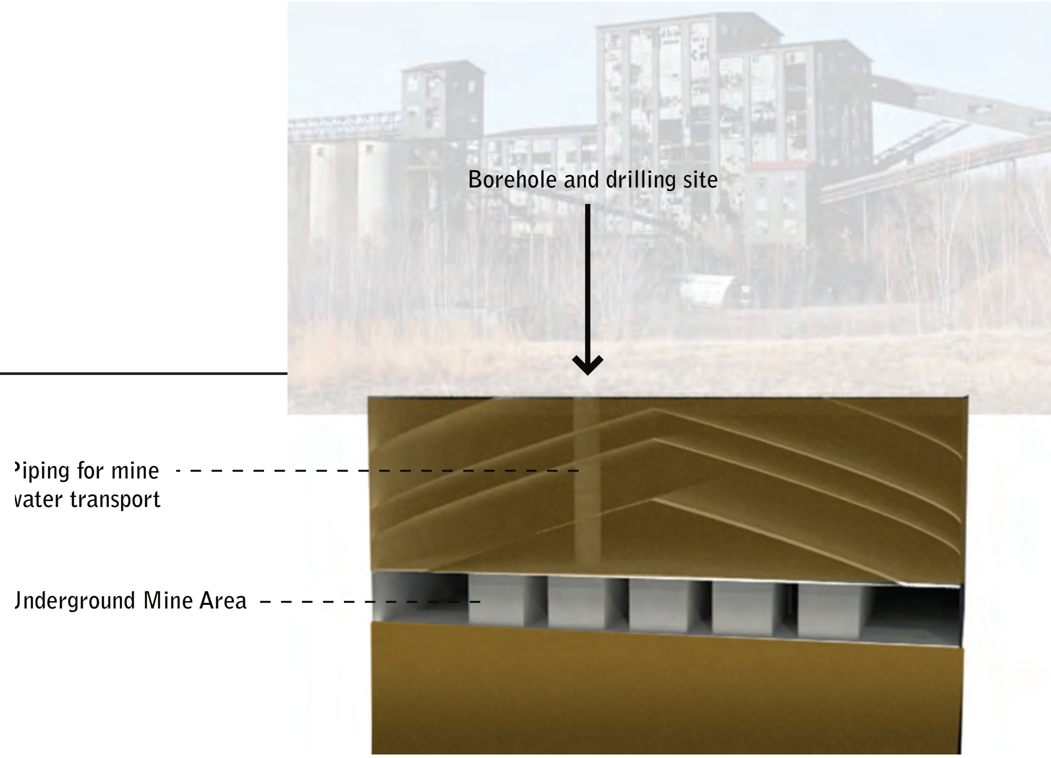
Smoke Stacks and Coal Silos

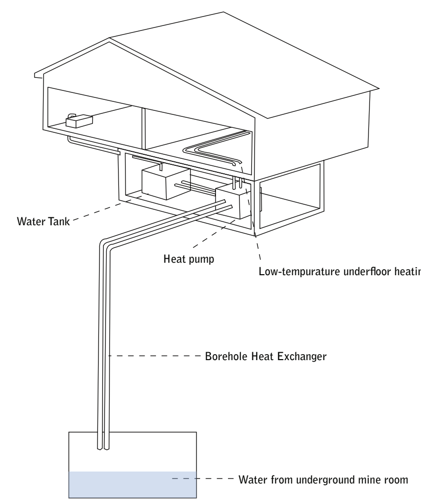
EPCAMR Office

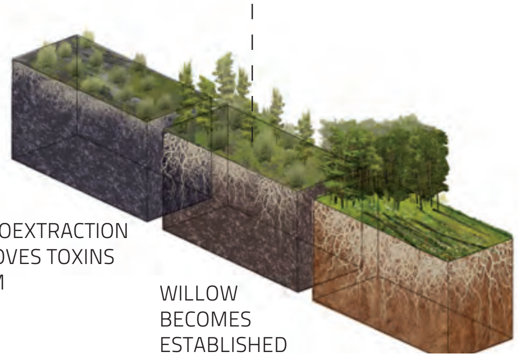
Sewer Easement

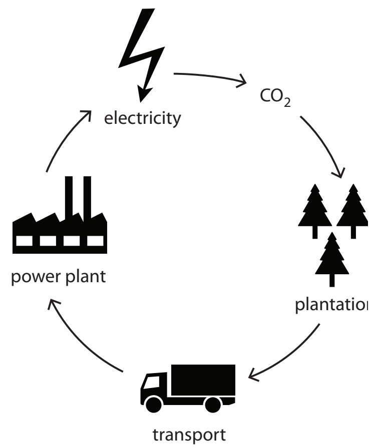


PROPOSAL REPURPOSE BUILDINGS AT HUBER BREAKER SITE FOR BIOMASS


Borehole and drilling site
iping for mine
ater transport
nderground Mine Area

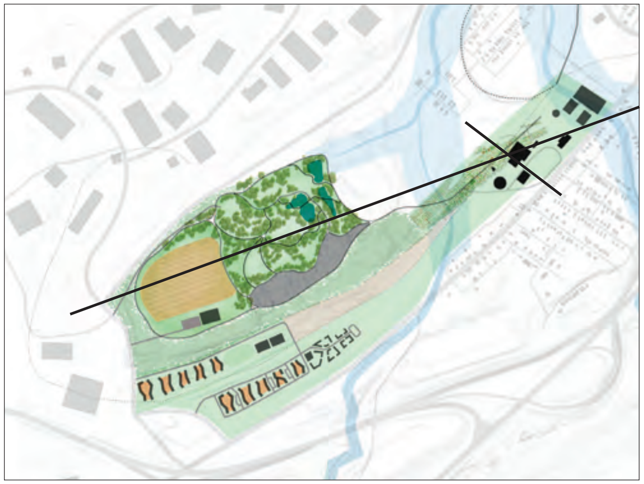

Water Tank
Heat pump
Low-tempurature underfloor heating
Borehole Heat Exchanger
Water from underground mine room



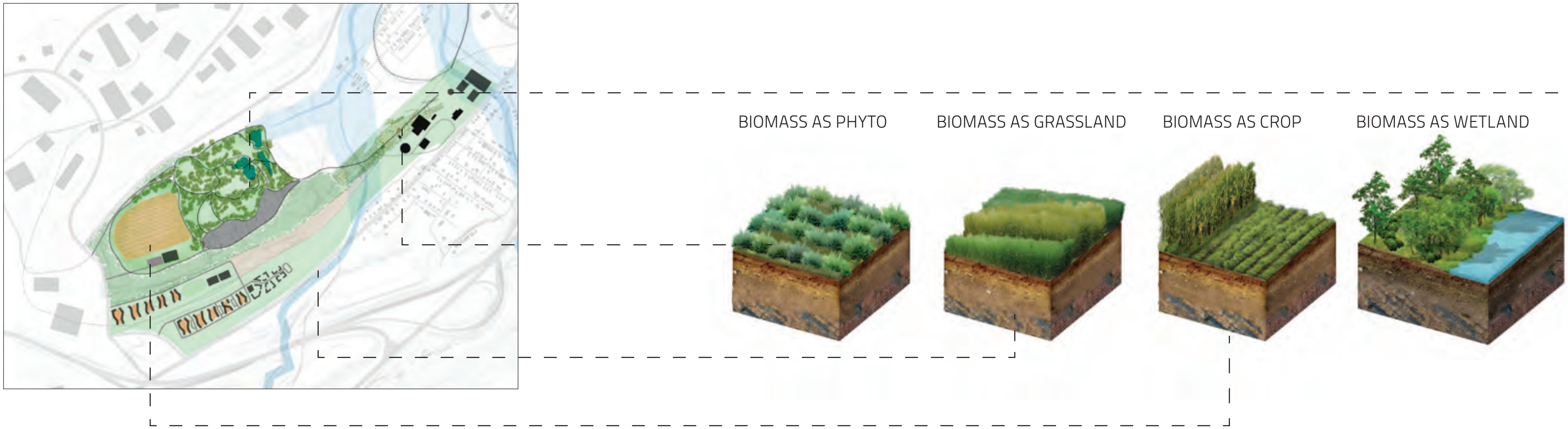


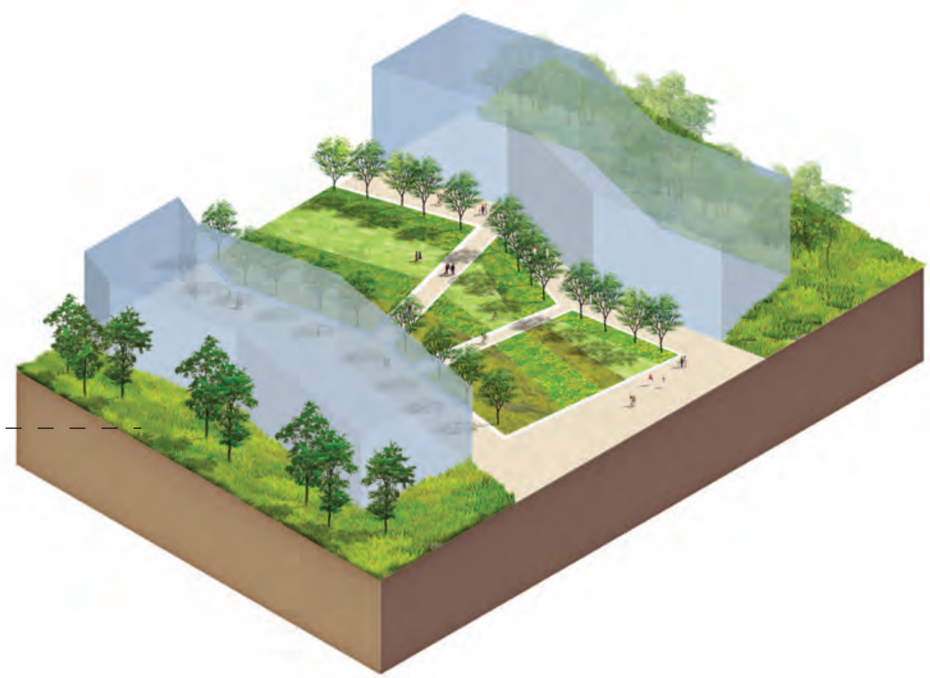
PROPOSAL

PHYTOREMEDIATION PLOTS CONVERTED TO BIOMASS



POLITICAL

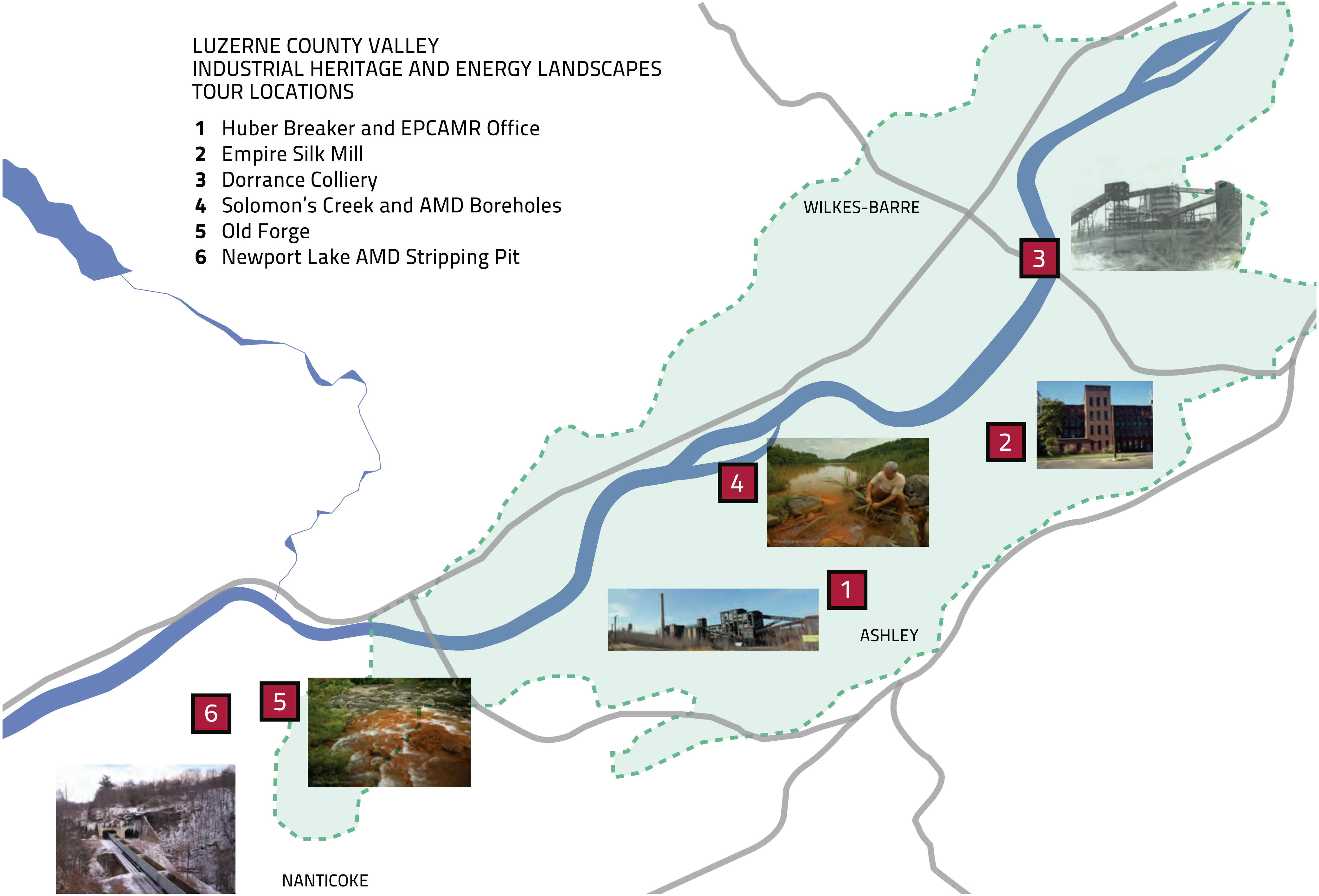

BIOMASS AS PHYTO
BIOMASS AS GRASSLAND
BIOMASS AS CROP
BIOMASS AS WETLAND



PROPOSAL RESEARCH AND DEVELOPMENT CENTER

PROPOSAL LUSATIA SEE 2010 PROJECT - LIGNITE MINING REGION OF LUSATIA, GERMANY

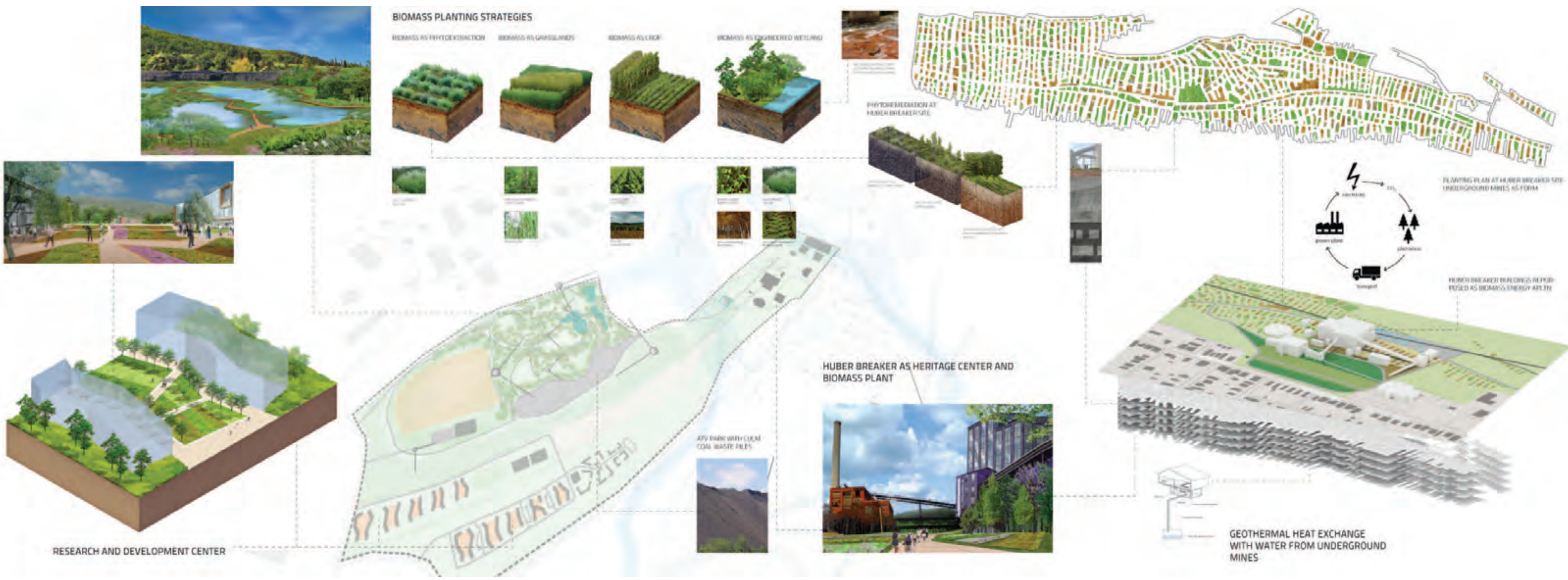
PROPOSAL LUSATIA SEE 2010 PROJECT - LIGNITE MINING REGION OF LUSATIA, GERMANY


LUZERNE COUNTY VALLEY
INDUSTRIAL HERITAGE AND ENERGY LANDSCAPES
TOUR LOCATIONS
1 Huber Breaker and EPCAMR Office
2 Empire Silk Mill
3 Dorrance Colliery
4 Solomon's Creek and AMD Boreholes
5 Old Forge
6 Newport Lake AMD Stripping Pit
WILKES-BARRE
3
2
4
1
ASHLEY
5
6
NANTICOKE

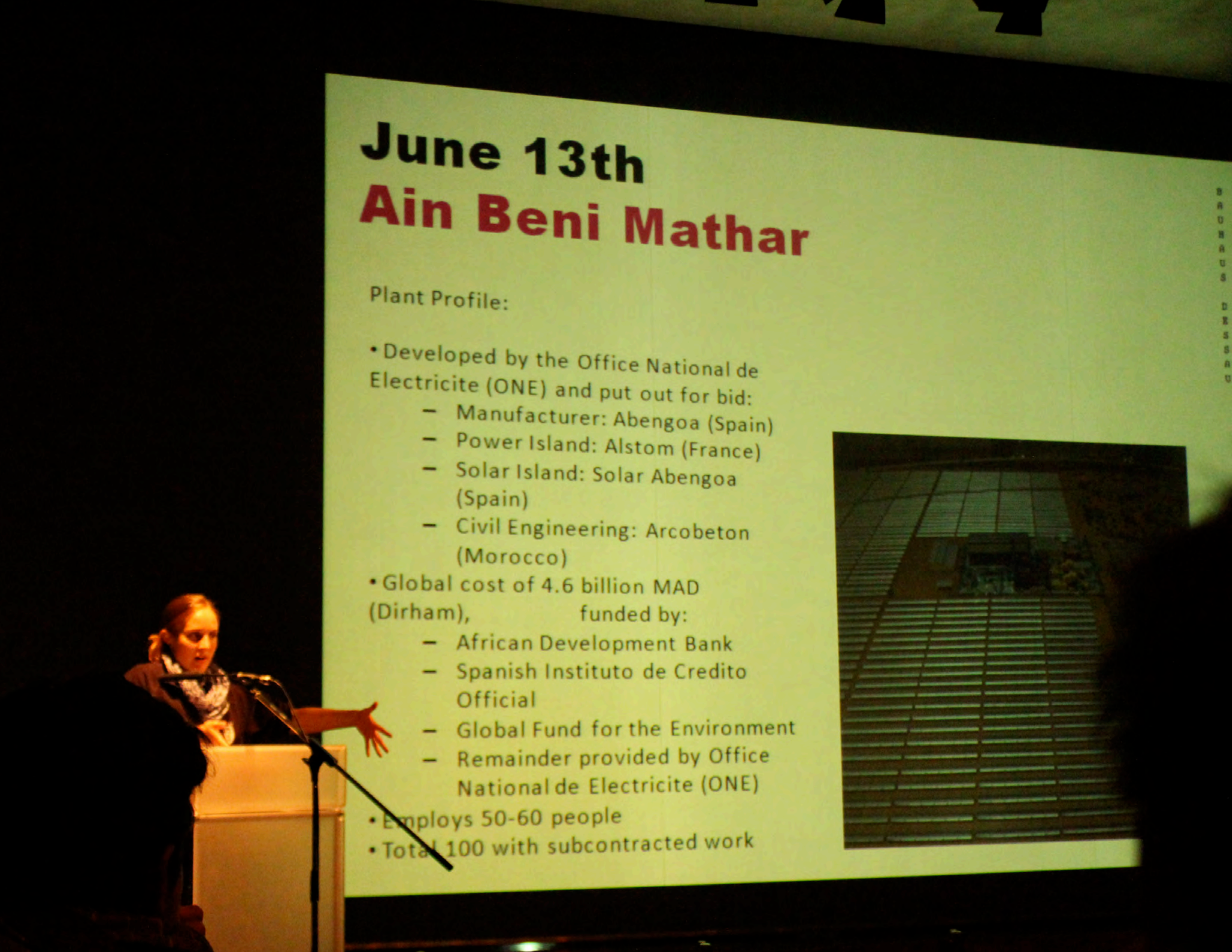
PROPOSAL


FUTURE BUILDOUT FOR
BIOMASS PLANT FACILITIES
TREATEMENT
GEOTHERMAL FROM
UNDERGROUND MINE WATER
ATV PARK ON
CULM PILES
WETLAND S AND ACID
MINE DRAINAGE
TREATEMENT
BIOMASS CROP AREA
PHYTOREMEDIATION PLOTS
BIOMASS WASTE DEPOSIT AREA
BUFFER AND BIOMASS
FOREST
RESEARCH AND
DEVELOPMENT FACILITIES
AND CLASS ROOMS

PROPOSAL


BIOMASS PLANTING STRATEGIES
BIOMASS AS PHYTOEXTRACTION
BIOMASS AS GRASSLANDS
BIOMASS AS CROP
BIOMASS AS ENGINEERED WETLAND
PHYTOREMEDIATION AT HUBER BREAKER SITE
PLANTING PLAN AT HUBER BREAKER SITE
UNDERGROUND MINES AS FORM
HUBER BREAKER BUILDINGS REPURPOSED AS BIOMASS ENERGY ARENA
HUBER BREAKER AS HERITAGE CENTER AND BIOMASS PLANT
ATV PARK WITH CULM COAL WASTE PILES
GEOTHERMAL HEAT EXCHANGE WITH WATER FROM UNDERGROUND MINES
RESEARCH AND DEVELOPMENT CENTER


BAUHAUS DESSAU
22nd – 31st
july 2011
international
summer school
energy landscapes 3.0
bauhaus dessau
Advisors: Charles Waldheim (Cambridge), Anuradha Mathur / Dilip da Cunha (Philadelphia and Bangalore), Stefan Tischer (Alghero), Theo Deutinger (Rotterdam) and Gunnar Hartmann (Dessau-Roßlau/Chur)
The objective of the summer school "Energy Landscapes 3.0" is to analyse potential network geographies and concepts in the post-fossil fuel era and their impacts on settlement structures in Europe. We will thereby explicitly refer to a chronicle of utopian thought on a large scale – visionary ideas for new Energy Landscapes promulgated decades ago by Herman Sörgel in 1928 with Atlantropa and Richard Buckminster Fuller in 1972 with World Game. The findings of these analyses should result in a development project for the design of new, "ideal" Energy Landscapes from the perspective of landscape architecture and urban development. — The interdisciplinary summer school is open for all students and post-graduate students of architecture, spatial planning, urban planning, art, design, environmental technology, the environmental sciences, the social sciences, philosophy etc. — **apply now! www.bauhaus-dessau.de/energylandscapes**


June 13th
Ain Beni Mathar
Plant Profile:
• Developed by the Office National de Electricite (ONE) and put out for bid:
– Manufacturer: Abengoa (Spain)
– Power Island: Alstom (France)
– Solar Island: Solar Abengoa (Spain)
– Civil Engineering: Arcobeton (Morocco)
• Global cost of 4.6 billion MAD (Dirham), funded by:
– African Development Bank
– Spanish Instituto de Credito Official
– Global Fund for the Environment
– Remainder provided by Office National de Electricite (ONE)
• Employs 50-60 people
• Total 100 with subcontracted work


% of renewable electrical energy in Europe
99% IS
99% N
37% FI
55% SE
62% LV
EE
12% IE
30% DK
16% RUS
6% UK
LT
10% NL
BY
6% BE
15% D
4% PL
13% LU
5% CZ
6% UA
13% F
59% CH
71% A
16% SK
6% H
MD
27% SI
27% RO
33% P
44% HR
27% RS
35% BiH
20% ES
20% IT
ME
7% BG
MK
18% TR
the ecological footprint incre-
ased above the size of the
planet
black line highlighted!!!!!


WASTE HEAT
BIOMASS
O_2
CO_2

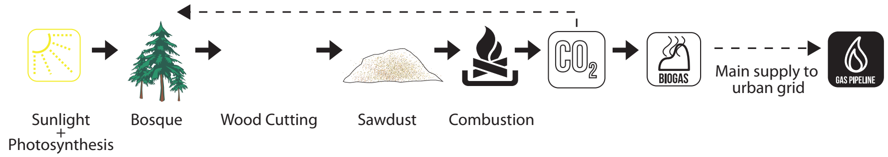

EURO

Fermentation Plant for Turning Biomass Into Biogas: Rural

prosumer

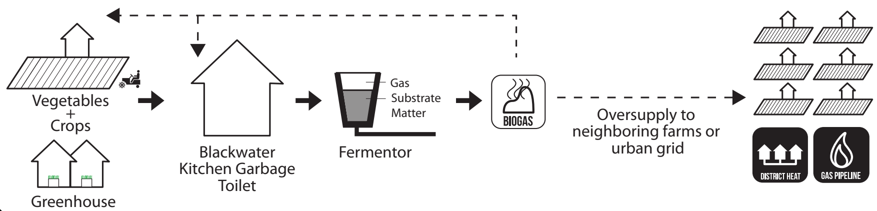
business concept

Forest Biomass



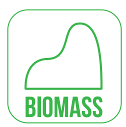
Forest Biomass and Agricultural Biomass are grown and produced. Forest Biomass goes to the urban grid directly through a biogas pipeline.

Agricultural Biomass



Agricultural Biomass is both centralized and decentralized. Fermented biogas goes back to the farm as biogas energy, with excess going to the neighboring farms or urban biogas pipeline.

consumption



Forest or Agricultural Biomass

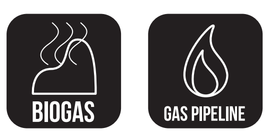
production

(1)

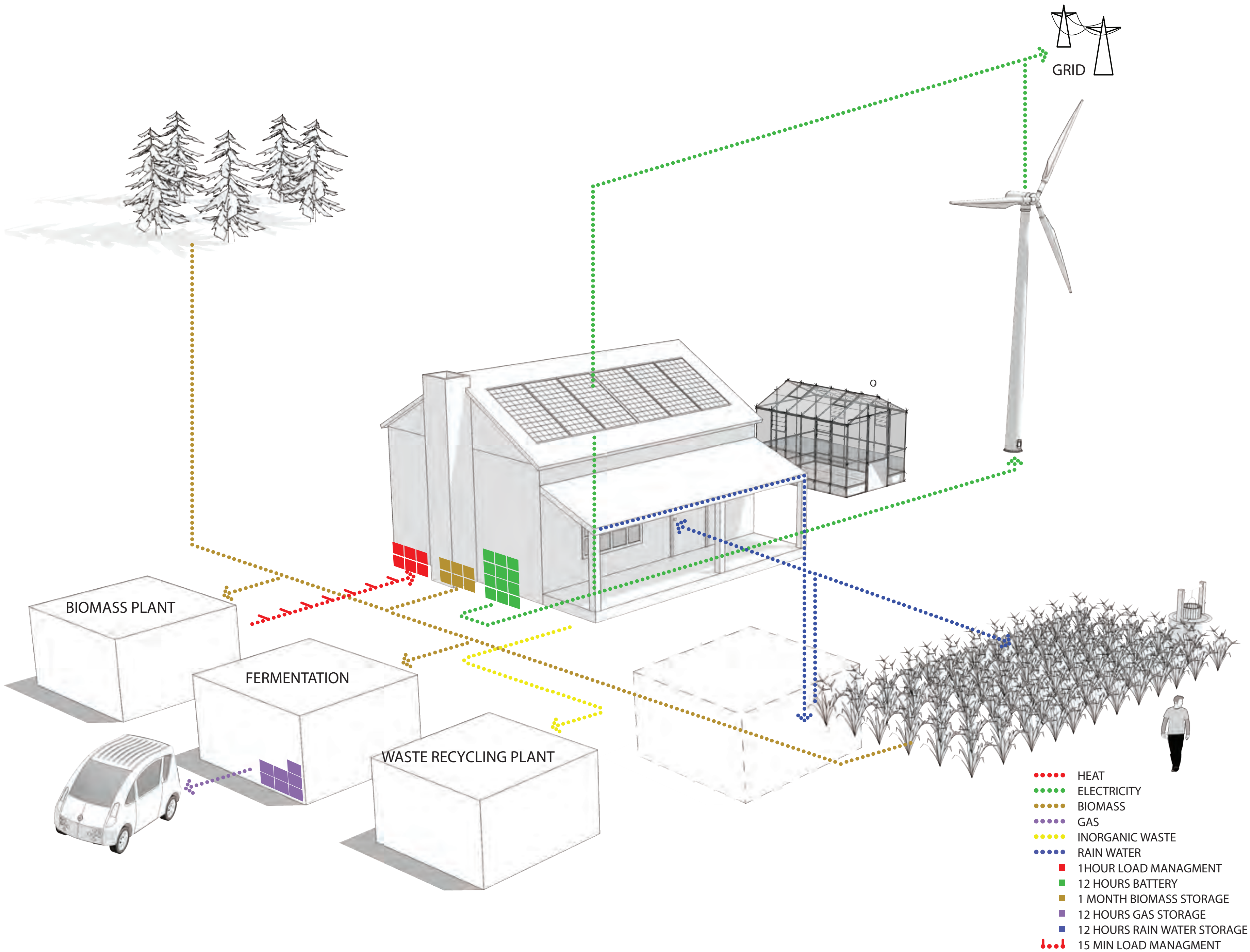
(2)

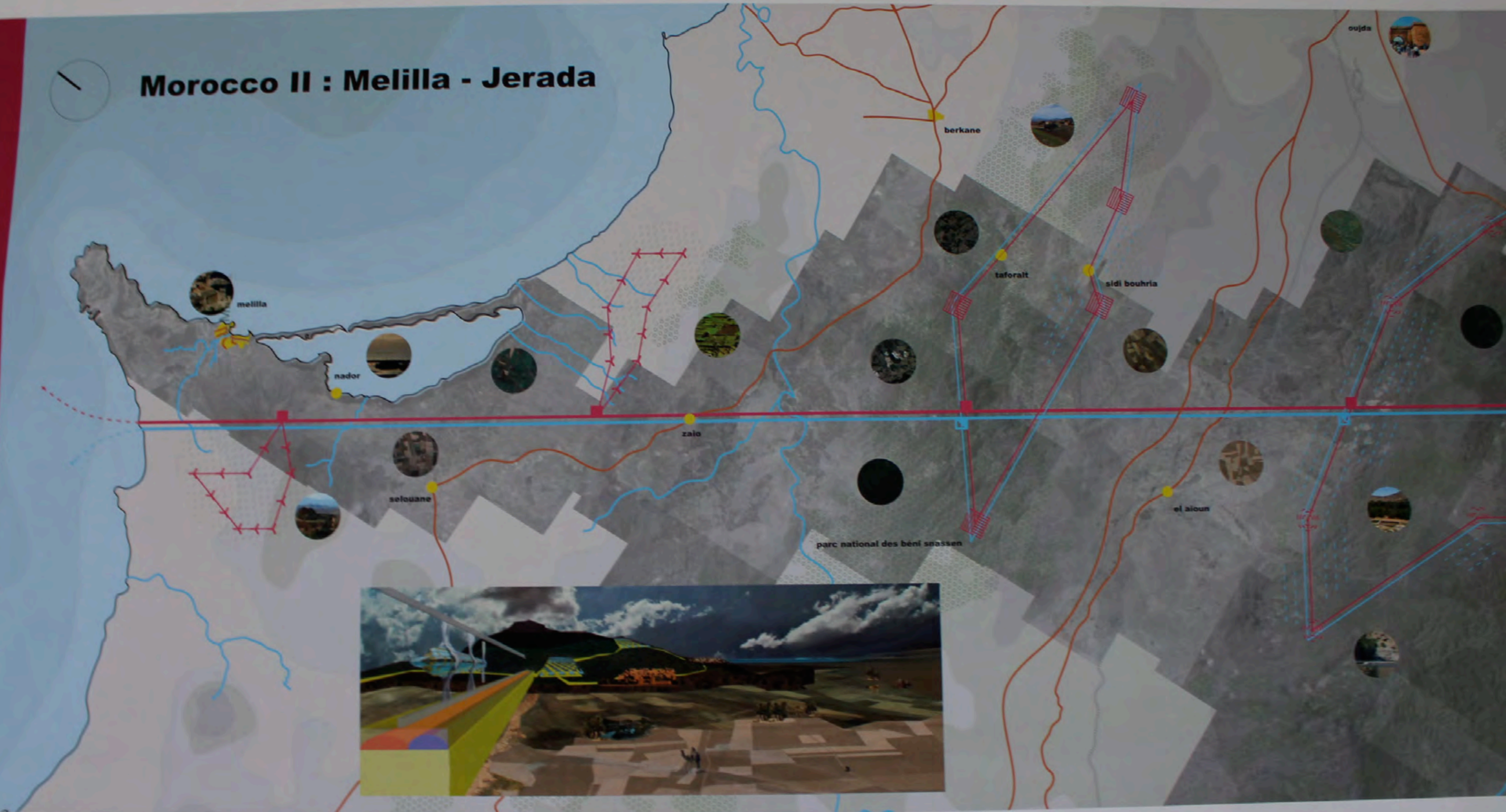
storage

(1)



(2)


GRID
BIOMASS PLANT
FERMENTATION
WASTE RECYCLING PLANT
HEAT
ELECTRICITY
BIOMASS
GAS
INORGANIC WASTE
RAIN WATER
1HOUR LOAD MANAGMENT
12 HOURS BATTERY
1 MONTH BIOMASS STORAGE
12 HOURS GAS STORAGE
12 HOURS RAIN WATER STORAGE
15 MIN LOAD MANAGMENT


Morocco II : Melilla - Jerada
melilla
nador
selouane
zaio
berkane
taforalt
sidi bouhria
parc national des béni snassen
el aioun
oujda

Summary of Project Research and Design Observations:

- Consider alternatives to energy production and consumption

- Consider the short- and long- term initiatives and funding for remediation, reclamation and design

- Consider the wide possibilities for research and development in the region with the partnership of local universities...

- Is is possible to change the Pennsylvania energy grid? Can energy landscapes of Pennsylvania become more localized and decentralized as a regional infrastructure?