COAL MINING AND RECLAMATION PERMIT

Issued To: AMERICAN ENERGY CORP
43521 Mayhugh Hill Rd.
Beallsville, OH 43716

Telephone: (740) 926-9152

Permit Number: D-425
Application Number: D-0425-4
Acreage: 0
Underground Acreage 849.4

Effective: 11/27/2002
Expires: 10/21/2004

Type of Operation: Underground (Room and Pillar)

LOCATION IS NOT AVAILABLE

The issuance of this permit means only that the application to conduct a coal mining operation meets the requirements of Chapter 1513 of the Revised Code, and as such DOES NOT RELIEVE the operator of any obligation to meet other federal, state or local requirements.

This permit is issued in accordance with and subject to the provisions, conditions, and limitations of Chapter 1513 of the Revised Code and Chapters 1501:13-1, 1501:13-3 through 1501:13-14 of the Administrative Code.

The water monitoring plan for this permit shall be:

Quality: See Page 26, F3 of the Permit Application
Quantity See Page 26, F3 of the Permit Application

Note: These monitoring requirements are separate from NPDES monitoring requirements.

Signature: Michael K. Sponder by R. Potter **Date:** 11/27/2002
Chief, Mineral Resources Management

ORIGINAL

F46 Rev: 07/01/2001

PERMIT SUMMARY SHEET
Division of Mineral Resources Management

Permit Number: D-425

Application Number: D-0425-4

See permit cover sheet for specific conditions and hydrologic monitoring requirements.

Inspector's Note:
This summary is designed only to advise you of important provisions of a permit that require your attention and monitoring. Your familiarity with requirements and permitted activities will insure that mining and reclamation occurs as was intended and approved at the time of permit issuance. Please take the time to review relevant provisions of the permit carefully and thoroughly. Should you have questions about this or any permit, please do not hesitate to contact the application manager within the Permitting Section.

Items marked are applicable to this permit:

- ☐ Auger Mining (attachment 18)
- ☐ Alternate Resoiling Material (attachment 19)
- ☐ Blasting Plans
- ☐ Buffer Zone Variance Request (BZVR)
- ☐ Coal Waste Disposal (attachment 28)
- ☐ Delay in Contemporaneous Reclamation
- ☐ Excess Spoil Disposal
- ☐ Experimental Mining Practices
- ☐ Federal Lands
- ☐ Mountain Top Removal
- ☐ MSHA Impoundment
- ☐ AML No-Cost Area
- ☐ Prime Farmlands (attachment 15)
- ☐ Remining (attachment 33)
- ☐ Remining (Modified effluent)
- ☐ Special handling of acid-forming/toxic material
- ☐ Beneficial Use of CCB's (Att. 34)
- ☐ Public Road Permit (attachment 9)
- ☐ Small Area Drainage Exemption (SADE)
- ☐ Steep Slope Mining
- ☐ Slurry Impoundment
- ☑ Test Hole Variance
- ☐ Variance from AOC
- ☐ Wetlands Affectment/Avoidance
- ☐ Within 500' of active UG mine
- ☐ Within 500' of abandoned UG mine
- ☐ Within 100' of a cemetery
- ☐ Within 300' of occupied dwelling (attachment 10)
- ☐ Within 300' of public building, church, school, community or institutional building or public
- ☐ Within 1000' of wild, scenic or recreational river
- ☐ OEPA 401/COE 404 permits needed for wetlands or stream affectment and/or reconstruction
- ☐ Tree Planting in Reclamation Plans

Application Manager: Scott Stiteler, Application Manager **Date:** 11-27-02

ORIGINAL

F103 Rev. 07/01/2001

APPROVED UNDERGROUND COAL MINING PERMIT APPLICATION

Applicant:

Name: AMERICAN ENERGY CORP
Address: 43521 Mayhugh Hill Rd.
Beallsville, OH 43716
Telephone: (740) 926-9152

Application Number: D-0425-4

Number of acres in underground workings: 849.4

Number of surface acres to be affected: 0.0

The water monitoring plan for this permit shall be:

Quality: See Page 26, F3 of the Permit Application
Quantity: See Page 26, F3 of the Permit Application

Note: These monitoring requirements are separate from NPDES monitoring requirements.

This application is APPROVED since it demonstrates and the Division has found that the criteria in paragraph (E) of rule 1501: 13-5-01 of the Administrative Code have been met.

Signature: Michael D. Gorsuch by R. Olsen **Date:** 11-27-02

ORIGINAL

F63 Rev: 07/01/2001

OHIO DEPARTMENT OF NATURAL RESOURCES

Division of Mineral Resources Management

Written Findings

Applicant: AMERICAN ENERGY CORP

Application Number: D-0425-4

The Division of Mineral Resources Management completed a regulatory review of this application on 11/27/2002. As required in provisions of 1501:13-5-01(E) of the Ohio Administrative Code (OAC), the Division's comprehensive review of this application resulted in finding the following:

1. The permit area is not within an area designated as unsuitable for mining pursuant to 1501:13-3-07 of the Ohio Administrative Code. As of this date, three areas within the state have been designated as unsuitable: Guernsey County, Valley Township Sections 7 & 8 (for all coal mining operations); Carroll County, Harrison Township Sections 4 and 5, Center Township Sections 27 and 33, Washington Township Sections 28, 29, 30, 34, 35, and 36 (for full coal recovery underground mining operations); and Belmont County, Smith Township Sections 27, 28, 33, 34 (for surface operations), and Sections 27, 33, 34 (for underground operations above the Meigs Creek No. 9 coal seam).

2. The permit area is not within an area under study for designation as unsuitable for mining. This finding was determined following a review of lands unsuitable petitions on file with the Division as of 11/27/2002.

3. The permit area is not within one hundred feet of a cemetery or a pre-historic burial mound. This finding was determined following a field review conducted by the Division's Field Environmental Specialist and/or the Division's Archaeologist on 09/10/2002 and subsequent map review of the application area and review of Part 1, D(9) of the permit application.

4. The permit area is not within one hundred feet of the outside right-of-way of a public road. This was determined from a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 . We further confirmed this through a map review of the application area and a review of, Part 1, D(6) of the permit application.

5. The permit area is not within three hundred feet of an occupied dwelling. This was determined from a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 and from our map review of the application area and Part 1, D(7) of the permit application.

6. The proposed mining operation will not adversely affect publicly owned parks or places included or eligible for listing on the National Register of Historic Places. We determined this following reviews by the Division Archaeologist, the State Historic Preservation Office (SHPO), a field review conducted by the Division's Field Environmental Specialist, and map reviews conducted by the Division. Correspondence in the administrative file from the Division's Archaeologist and the SHPO dated 11/27/2002 support this finding.

7 The permit area is not within three hundred feet of a public building, school, church, community or institutional building, or public park. This finding was determined following a field review conducted by the Division's Field Environmental Specialist on 09/10/2002, the Division's subsequent map reviews, and a review of Part 1, D(8) of the permit application.

8 The permit area does not include any lands within the boundaries of the National Park System, The National Wildlife Refuge System, The National System of Trails, The National Wilderness Preservation System, The Wild and Scenic Rivers System, including study rivers designated under Section 5(a) of the Wild and Scenic Rivers Act (16 U.S.C. 1276 (a)), or study rivers or study river corridors as established in any guidelines pursuant to that Act, National Recreation Areas designated by Acts of Congress, or any nature preserve dedicated pursuant to Chapter 1517. of the Revised Code. This finding is based upon reviews by the U.S. Department of Interior dated 06/21/2002; the Ohio Department of Natural Resources, Division of Natural Areas and Preserves dated 06/30/2002; a field and map review by our Division Environmental Specialists on 09/10/2002; and our review of Part 1, D(1) and D(3) of the permit application.

9 The permit does not include any federal lands within the boundaries of any National Forest. This finding is based upon reviews by the U.S.D.A Forest Service dated 06/21/2002 , a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 , and map reviews conducted by the Division.

10 The permit area is not located within one thousand feet of the waterlines of any wild, scenic, or recreational river dedicated pursuant to Chapter 1501 of the Ohio Revised Code. This finding is based upon a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 , map reviews, and a review completed by the Ohio Department of Natural Resources, Division of Natural Areas & Preserves dated 06/30/2002 . Also see Part 1, D(2) of the permit application.

11 Coal mining operations proposed in this permit application will not affect the continued existence of threatened or endangered species or result in the destruction or adverse modification of their critical habitat as determined under the Endangered Species Act of 1973 (16 U.S.C. 1513 et seq.). There are several species on the federal list that are found in the coal mining region of Ohio. Sightings of Indiana Bat have been recorded in Belmont County. Review of the permit application; consultation with the U.S. Department of the Interior, Fish and Wildlife Service dated 06/21/2002; and information dated 06/30/2002 provided by the Natural Heritage Program administered by the Division of Natural Areas & Preserves; and/or consideration of the endangered and threatened species from the U.S. Fish & Wildlife Service (12/00) offer no indication of listed species having been sighted or critical habitat on or in the vicinity of the application area.

12 The private mineral estate has been severed from the private surface estate on the surface properties owned by See Permit. This finding is based upon a review of the following documents submitted under Part 1, C(9) of the permit application. We have determined that these documents allow for the extraction of coal by the mining method(s) identified in the application: Deed

13 The applicant and/or any affiliated company has corrected or is in the process of correcting, to the satisfaction of the issuing agencies, all notices of violations/IHCO's and has no unpaid final demand(s) for civil penalty assessments. This finding is based on verification of Division-issued NOV's, IHCO's, and CPA's and review of information through the AVS on 11/27/2002. See attached documentation verifying this information. This finding is also based on a records search by Scott Stiteler from the district office on 11/27/2002.

16 The applicant (and the operator, if applicable) does not control and has not controlled mining operations with a demonstrated pattern of willful violations of Chapter 1513. of the Revised Code and rules adopted thereunder of such nature, duration, and with such resulting irreparable damage to the environment as to indicate an intent not to comply with such provisions. This finding is based on a records search by Scott Stitsler from the district office on 11/27/2002

18a We determined that the postmining land uses are the same as the premining land uses based on review of Part 2, H(1), H(6) and H(12) of the permit application.

20 Coal mining and reclamation to be performed under this permit will be consistent with other operations to be performed during the same permit term in areas adjacent to the permit area. This finding is based upon the Division's review of the permit application and adjacent proposed or existing permit areas, including See Attachment 5 & 23 in the permit application

21 Based on our hydrologist's review of Part 2, Items B, C, D, E, F and Part 3, Items A(7), D(9), E, F, H of the permit application as documented in the Cumulative Hydrologic Impact Assessment (CHIA), we find that the proposed operations have been designed to prevent damage to the hydrologic balance outside the permit area.

22 The probable cumulative hydrologic impact for this mining operation area and adjacent areas on the hydrologic regime and water availability is See Attached CHIA. This finding is based upon the Division's hydrologist's a comprehensive review of the permit application, Attachment 14, analysis of existing ground water data maintained by the Division of Water, and other available hydrological and geological data which is part of the permit application. These findings are summarized in the (CHIA) completed by the Division's hydrologist on 10/29/2002.

23 Based upon the Division's review of the permit application; use of reasonable mining and reclamation practices proposed in the application; technical review by the Division's engineers, hydrologists, soil scientists, and other technical experts; consultation with other agencies; and the Division's previous experience with the applicant (if applicable), the chief of the Division has found that the mining and reclamation plans contained in Parts 2, 3, and 4 of the application can be feasibly and responsibly accomplished.

24 The permit application does not propose to use an existing structure in connection with or to facilitate the proposed coal mining and reclamation operation. This finding is based upon a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 , map reviews, and Part 3, B(1) of the permit application.

25a Based upon a comprehensive review of the permit application, a field review conducted by the Division's Field Environmental Specialist on 09/10/2002 , and our review of Part 4 of the permit application, the permit does not include provision for any special categories of mining such as experimental practices, mountaintop removal, steep slope mining, and other special categories of mining.

26 To protect against possible adverse effects of the proposed mining operations on properties listed or eligible for listing on the National Register of Historic Places, the Chief of the Division has implemented one of the following three actions after considering information provided by the Division Archaeologist and the SHPO dated 11/27/2002

- [ ] The permit is conditionally approved with strict limitations on mining activities in and around the historic resources. Please refer to the permit approval document that includes special conditions designed to protect historic resources that are applicable to this permit.
- [ ] Prior to application approval, the Chief requested specific revisions to the proposed mining and reclamation plan so that impacts to the historic resources on the permit area are eliminated and/or minimized. Submitted revisions are reflected in the permit application.
- [x] Following review by the Division's Archaeologist and representatives of the State Historic Preservation Office (SHPO), the Chief determined in a written finding that no additional protective measures are needed to protect the historic resource(s) found on the permit area.

27 Following review of the permit application, map reviews, field reviews conducted by the Division's Field Environmental Specialists and a review of Part 3, D(4) of the application, we determined that the application DOES NOT include lands eligible for remining

28 The Division of Mineral Resources Management has determined that permit application number D-0425-4 submitted on 06/18/2002 , is accurate, complete, and complies with the requirements of Chapter 1513 of the Ohio Revised Code and all rules adopted thereunder.

- [x] There are no special conditions on this permit.
- [ ] Check items 13, 17, 19e and 26 for the special conditions that may apply to this permit.

Application Manager Date

Chief Division of Mineral Resources Management Date

12/00

OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Mineral Resources Management

Written Findings

Applicant: AMERICAN ENERGY CORP

Application Number: D-0425-4

The Division of Mineral Resources Management completed a regulatory review of this application on 11/27/2002. As required in provisions of 1501:13-5-01(E) of the Ohio Administrative Code (OAC), the Division's comprehensive review of this application resulted in finding the following:

17 The Division has reviewed and the chief has approved each of the following items pursuant to 1501:13-01 through 1501:13-14 of the Ohio Administrative Code:

☐	Buffer Zone Variance Request:	Date of Approval
☑	Test Hole Variance Request:	Date of Approval ~~11/27/2002~~ 3/26/02
☐	Small Area Drainage Exemption:	Date of Approval
☐	Road Permit:	Date of Approval
☐	Alternative Resoiling Material:	Date of Approval
☐	Benefical use of CCP's	Date of Approval
☐	Other permits necessary to operate are issued or applied for including: NPDES, 404, 401, or the permit is conditioned appropriately.	Date of Approval

Refer to the administrative file for documentationnot any other specific approval required.

R. Scott Stutler 11-27-02

Application Manager Date

Michael D. Donnelly 11-27-02

Chief Division of Mineral Resources Management Date

Final Draft Cumulative Hydrologic Impact Assessment
American Energy Corporation, permit D-0425-4

Geologist: George Mychkovsky **Date**: October 29, 2002

Background

Location/Operation: The proposed shadow area, which will be part of the Century Mine, is located in the southwest corner of Washington Township, and the southeast corner of Wayne Township, Belmont County. The westernmost one-quarter of the shadow area is located within the Piney Creek watershed while the remainder of the proposed shadow area is located within the Crabapple Creek watershed; both the Piney Creek and Crabapple Creek watersheds are located with the Captina Creek Drainage Basin. The #8 Pittsburgh Coal seam of the Pennsylvanian Monongahela Group will be deep-mined by the room and pillar method beneath 849.4 acres, with a maximum extraction ratio of 48%, immediately to the south of adjacent area D-0425-1, under which full coal recovery via longwall mining occurred. Adequate coal support will remain in place, and no subsidence is anticipated. It should be noted that no permit area is involved.

Previous Mining: Longwall mining operations for the #8 Coal seam have been conducted in the general area for over 20 years. There is no record of previous surface or deep mining of the proposed shadow area. The nearest known abandoned deep mine is located approximately two miles to the east.

Geology, Ground Water, and Surface Water: Refer to the Written Findings for D-0425-1.

Predicted Consequences

Ground Water: Due to the fact that room and pillar mining with adequate remaining support is proposed, no subsidence is anticipated. Furthermore there is no report of subsidence or water loss occurring at the Allison Mine of the original permit or at permit D-0360 several miles to the northeast as a result of similar operations. In addition no acid mine drainage to the surface is anticipated, as the lowest surface elevation of 860 ft. msl within the combined Allison/Century Mine is 55 feet above the highest coal seam elevation of 805 ft. msl within the combined Allison/Century Mine. It should be noted that the lowest well bottom elevation within the hydrology review area is at least 260 feet above the #8 Coal seam. Consequently no ground water supplies will be adversely affected either quantitatively or qualitatively. Nevertheless as a precaution, legitimately used ground water supplies will be monitored in accordance with the submitted plan.

Following room and pillar mining, ground water will eventually accumulate in the mined-out voids, however the water at this level is brackish and unused, and in any event will not reach the surface. Any water pumped from the mine will be treated to the

applicable effluent limitations prior to discharge from permitted areas. It should be noted that evidence to-date indicates very little water in the Allison/Century Mine.

Surface Water: The proposed operation should not jeopardize Crabapple Creek and Piney Creek and their tributaries, and adequate stream monitoring will be assigned. Previous stream monitoring has shown no adverse impacts as a result of similar operations at permit D-0360, and no adverse impacts to the streams are anticipated, for the reasons addressed in the preceding Ground Water section.

Neither coal waste nor non-coal waste will be disposed on-site. In conclusion, the proposed operation will not result in material damage to the hydrologic balance beyond the permit area.

11/92

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION
UNDERGROUND COAL MINING AND RECLAMATION
PERMIT APPLICATION

Applicant: American Energy Corporation

A. Type of Operation (check appropriate space (s)):

____ Shaft, ____ Slope, ____ Drift,
X Room and Pillar, ____ Pillar Extraction,
____ Longwall, ____ Combined Surface and Underground

B. Type of Application (Check appropriate space (s)):

(1) ____ New
(2) ____ Initial Underground Workings to Existing Permit
(3) X Additional Underground Workings

C. Address the following if applicable:

(1) Permit Number D-0425
(2) Date Issued October 22, 1984

D. Did a person other than an employee of the applicant prepare this application? ____ Yes, X No. If Yes, provide:

Preparer's Name ____
Address
City ____ State ____ Zip ____
Telephone ____

E. I, the undersigned, a responsible official of the applicant, do hereby verify the information in the complete permit application as true and correct to the best of my information and belief.

Printed Name Robert D. Moore; Title President

Signature ____; Date

Sworn before me and subscribe in my presence this

18th day of April, 2002.

Barbara L. Rush
Notary Public

BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

ORIGINAL

D0425-4

AEC 18738

F. For Revision Review Only. This item is to be completed after revision, if any, have been made to the permit application.

I, the undersigned, a responsible official of the applicant, do hereby verify and acknowledge the revisions made during the permit review process as true and correct to the best of my information and belief.

Printed Name Robert D. Moore ; Title President
Signature _____ ; Date October 18, 2002
Sworn before me and subscribe in my presence this 18th day of October, 2002.

BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

Barbara L. Rush
Notary Public

PART 1, LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

A. IDENTIFICATION OF INTERESTS

(1) Applicant's Name American Energy Corporation
Address 43521 Mayhugh Hill Road
City Beallsville State Ohio Zip 43716
Telephone 740 - 926 - 9152
Employer Identification No. (EIN) _____ ,or
Social Security No. (SSN) _____

(2) Indicate business structure of applicant and additional information:

_____ Single Proprietorship,
_____ Partnership (registration no. and date obtained) _____ ,
X Corporation (charter no. and date incorporated) 00842695, 4/12/1993 ,
_____ Association, _____ Other, specify _____

(3) If the applicant is a single proprietorship, provide the following:
Owner's Name _____
Address _____
City _____ State _____ Zip _____
Telephone ____-____-____
EIN _____ , or SSN _____
Beginning date of ownership _____

ORIGINAL

D0425-4

F. For Revision Review Only. This item is to be completed after revision, if any, have been made to the permit application.

I, the undersigned, a responsible official of the applicant, do hereby verify and acknowledge the revisions made during the permit review process as true and correct to the best of my information and belief.

Printed Name Robert D. Moore ; Title President
Signature [illegible] ; Date
Sworn before me and subscribe in my presence this 16th day of November, 2004.

BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

Barbara L. Rush
Notary Public

PART II LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

A. IDENTIFICATION OF INTERESTS

(1) Applicant's Name American Energy Corporation
Address 43521 Mayhugh Hill Road
City Beallsville State Ohio Zip 43716
Telephone 740 - 926 - 9152
Employer Identification No. (EIN) ,or
Social Security No. (SSN)

(2) Indicate business structure of applicant and additional information:

____ Single Proprietorship,
____ Partnership (registration no. and date obtained) ,
X Corporation (charter no. and date incorporated) 00842695, 4/12/1993 ,
____ Association, ____ Other, specify

(3) If the applicant is a single proprietorship, provide the following:
Owner's Name
Address
City State Zip
Telephone - -
EIN , or SSN
Beginning date of ownership

ORIGINAL

0425-4

(4) If the applicant is a business entity other than a single proprietorship, provide the following for the applicants statutory agent and submit Attachment 1.

Agent's Name American Energy Corporation
Address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
Telephone 740 - 926 - 9152
EIN _____, or SSN (optional) _____

(5) Is the operator of the mine to be a person different from the applicant? ____ Yes, X No. If "yes," provide the operator's name and submit Attachment 17. (Note: if more than one operator, indicate operator's name and submit a separate attachment for each.)

Operator's Name _____

(6) Provide the following for the person who will pay the abandoned mine land reclamation fee for the applicant.

Name American Energy Corporation
Address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
Telephone 740 - 926 - 9152
EIN _____, or SSN (optional) _____

(7) Provide the following for all persons having the authority or ability to commit the financial, real property assets, or working resources of the applicant who are not otherwise identified as officers, directors, or owners of the applicant. If none, check box: [X].
If any person listed is a business entity and not an individual, also complete Attachment 1 for that person.

Name _____
Address _____
City _____ State _____ Zip _____
Telephone ____-____-____
EIN _____, or SSN _____
Date O & C relationship began/ended (if applicable)
_____/_____
Submit and identify additional pages necessary to complete response.

ORIGINAL

11/92

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION
ATTACHMENT 1
(OWNERS AND CONTROLLERS)

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity AMERICAN ENERGY CORPORATION

Name Robert D. Moore
Street address 43521 MAYHUGH HILL ROAD
City BEALLSVILLE State OHIO Zip 43716
EIN _____, or SSN _____
Title of position within entity PRESIDENT & TREASURER
Date position assumed/ended (if applicable) 6/25/01
Percent of ownership 0% Date of ownership _____
Location in organizational structure PRESIDENT & TREASURER

Name MURRAY ENERGY CORPORATION
Street address 43521 MAYHUGH HILL ROAD
City BEALLSVILLE State OHIO Zip 43713
EIN _____, or SSN _____
Title of position within entity SOLE SHAREHOLDER
Date position assumed/ended (if applicable) _____
Percent of ownership 100% Date of ownership 2/23/01
Location in organizational structure SOLE SHAREHOLDER

Name MICHAEL O. McKOWN
Street address 43521 MAYHUGH HILL ROAD
City BEALLSVILLE State OHIO Zip 43713
EIN _____ or SSN _____
Title of position within entity SECRETARY
Date position assumed/ended (if applicable) 11/01/99
Percent of ownership _____ Date of ownership _____
Location in organizational structure SECRETARY

Submit and identify additional pages necessary to complete response.

ORIGINAL

0425-4

AEC 18742

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION
ATTACHMENT 1
(OWNERS AND CONTROLLERS)

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity AMERICAN ENERGY CORPORATION

Name Bruce Hill
Street address 43521 MAYHUGH HILL ROAD
City BEALLSVILLE State OHIO Zip 43713
EIN _____ or SSN _____
Title of position within entity DIRECTOR
Date position assumed/ended (if applicable) 7/02/01-
Percent of ownership _____ Date of ownership _____
Location in organizational structure DIRECTOR

Name Clyde Borrell
Street address 43521 MAYHUGH HILL ROAD
City BEALLSVILLE State OHIO Zip 43716
EIN _____, or SSN _____
Title of position within entity Director
Date position assumed/ended (if applicable) 11/01/99-7/2/01
Percent of ownership 0% Date of ownership _____
Location in organizational structure Director

Name Coal Resources, Inc.
Street address 29325 Chagrin Blvd
City Pepper Pike State OHIO Zip 44122
EIN _____, or SSN _____
Title of position within entity OWNER
Date position assumed/ended (if applicable) _____
Percent of ownership 100% Date of ownership 11/01/99-2/23/01
Location in organizational structure SOLE SHAREHOLDER

Submit and identify additional pages necessary to complete response.

RECEIVED

ORIGINAL

11/92

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION
ATTACHMENT 1
(OWNERS AND CONTROLLERS)

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity MURRAY ENERGY CORPORATION

Name ROBERT E. MURRAY
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OHIO Zip 44122
EIN _____, or SSN _____
Title of position within entity PRESIDENT CEO, AND SHAREHOLDER
Date position assumed/ended (if applicable) 2/23/01
Percent of ownership 100% Date of ownership 2/23/01
Location in organizational structure _____

Name MICHAEL D. LOIACONO
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OHIO Zip 44122
EIN _____, or SSN _____
Title of position within entity TREASURER
Date position assumed/ended (if applicable) 2/23/01
Percent of ownership 0% Date of ownership ____
Location in organizational structure _____

Name MICHAEL O. McKOWN
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OHIO Zip 44122
EIN _____ or SSN _____
Title of position within entity SECRETARY
Date position assumed/ended (if applicable) 2/23/01
Percent of ownership 0% Date of ownership _____
Location in organizational structure _____

Submit and identify additional pages necessary to complete response.

ORIGINAL

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(8) Provide the following for all persons owning or controlling the coal to be mined by another person under a lease, sublease, or other contract and (a) having the right to receive the coal after mining, or (b) having the authority to determine the manner in which another person conducts coal mining operations. If none, check box: [X]. If any person listed is a business entity and not an individual, also complete Attachment 1 for that person.

Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____-_____-_____
EIN _____, or SSN _____
O & C relationship to entity _____
Date O & C relationship began/ended (if applicable)
_____/_____
Submit and identify additional pages necessary to complete response.

(9) List below the person or persons primarily responsible for ensuring that the applicant will comply with Chapter 1513 of the Revised Code and the rules adopted pursuant thereto while mining and reclaiming the area for which this permit is requested.
Robert D. Moore

(10) Has the applicant, any person listed under Items A(3), (7), and (8), or any person listed on Attachment 1 who "owned or controlled" or "owns or controls" as defined in 1501: 13-4-03(A), held a coal mining permit in the United States within the five years preceding the date of the application?
__X__ Yes, _____ No. If "yes," submit Attachment 5.
SEE ATTACHMENT 5

(11) Does the applicant, any person listed under Items A(3), (7), and (8), or any person listed on Attachment 1 have a pending coal mining application in any state of the United States?
__X__ Yes, _____ No. If "yes," submit Attachment 23.
SEE ATTACHMENT 23

(12) Indicate name of mine **Century Mine**

(13) List below the MSHA identification numbers for the mine and for all mine-associated structures requiring MSHA approval on the proposed permit area.

33-01070

(14) Submit Attachment 22, Certificate of Liability Insurance.
SEE ATTACHMENT 22

ORIGINAL

00425-4

11/92

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716
Telephone 740 - 926 - 9152
EIN _ or SSN

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
D-0425	OHIO	ODNR, DMR	33-01070 11/06/00
D-1159	OHIO	ODNR, DMR	33-01070 11/06/00

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

ORIGINAL

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: Maple Creek Mining Company
Address: 981 Route 917
City: Bentleyville State: PA Zip: 15314
Telephone: 724 - 258 - 2056
EIN: ____ or SSN: ____

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
63841302	PA	DEP	36-00970 – June 30, 1995
63733706	PA	DEP	36-00970 – June 30, 1995
63723707	PA	DEP	36-00970 – June 30, 1995

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray – Director

ORIGINAL

D0429-4

AEC 18747

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: The Ohio Valley Coal Company
Address: 56854 Pleasant Ridge Road
City: Alledonia State: OH Zip: 43902
Telephone: 740 - 926 - 1351
EIN: _____ or SSN: _____

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
D-0360	OH	DMRM	33-01159 5/25/88

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray - Director

ORIGINAL

D042564

AEC 18748

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: UtahAmerican Energy, Inc.
Address: P. O. Box 187
City: St. Clairsville State: OH Zip: 43950
Telephone: 435 - 613 - 0393
EIN: or SSN:

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
ACT/007/013	UT	DOGM	Horse Canyon Mine 42-00100 12/24/78 Lila Canyon Mine 42-02241 4/15/99

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray, Director

D0425-4

AEC 18749

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: Belmont Coal Company
Address: P. O. Box 146
City: Powhatan Point State: OH Zip: 43942
Telephone: 714 - 795 - 5200
EIN ___ or SSN: ___

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
D-1020	OH	DMRM	33-04397 7/31/97
D-0241	OH	DMRM	33-03048 7/2/93

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray, Shareholder, 100%

ORIGINAL

D0425-4

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: MonValley Transportation Center, Inc.
Address: P.O. Box 135 - 1060 Ohio Ave.
City: Glassport State: PA Zip: 15045
Telephone: 412 - 673 - 1500
EIN: or SSN:

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
02851602	PA	DEP	36-08678 06/08/95

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray - Director

ORIGINAL

00425-4

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: UMCO Energy, Inc.
Address: 981 Route 917
City: Bentleyville State: PA Zip: 15314
Telephone: 724 - 258 - 2056
EIN ____ or SSN: ____

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
63921301	PA	DEP	36-08375 June 08, 1994

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray – Director

ORIGINAL

00425-4

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: The American Coal Company
Address: 29325 Chagrin Blvd Suite 300
City: Pepper Pike State: OH Zip: 43122
Telephone: 216 - 765 - 1240
EI. ___ or SSN: ___

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
02	IL	Office of Mines And Minerals	11-02752 10/14/98
255	IL	Office of Mines And Minerals	11-02752 10/14/98
257	IL	Office of Mines and Minerals	11-02752 10/14/98
306	IL	Office of Mines and Minerals	11-02752 10/14/98
1410	IL	Office of Mines and Minerals	11-02752 10/14/98
352	IL	Office of Mines and Minerals	11-02752 10/14/98 (to replace #344 soon)

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray President

ORIGINAL

00425-4

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

ATTACHMENT 5
(PERMIT LISTING)

Applicant's Name: AMERICAN ENERGY CORPORATION

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity: The Oklahoma Coal Company
Address: 29325 Chagrin Blvd, Suite 300
City: Pepper Pike State: OH Zip: 44122
Telephone: 216 - 765 - 1240
EIN or SSN:

Permit No.	State	Regulatory Authority	MSHA No. and Date Issued
D-0230	OH	DMRM	No MSHA number

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including the percent ownership and location in organizational structure:

Robert E. Murray, Director

ORIGINAL

00425-4

AEC 18754

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 23
(PENDING PERMIT APPLICATIONS)

Applicant's Name AMERICAN ENERGY CORPORATION

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed The Ohio Valley Coal Company

Application No.	Name of Regulatory Authority	State
D-0360-12	DMRM	OH
D-0360-13	DMRM	OH

ORIGINAL

00429-6

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 23
(PENDING PERMIT APPLICATIONS)

Applicant's Name AMERICAN ENERGY CORPORATION

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed UMCO ENERGY, INC. - HIGH QUALITY MINE

Application No.	Name of Regulatory Authority	State
63921301	PA DEP	PA

ORIGINAL

0042544

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 23
(PENDING PERMIT APPLICATIONS)

Applicant's Name AMERICAN ENERGY CORPORATION

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed BELMONT COAL COMPANY INC.

Application No.	Name of Regulatory Authority	State
10168	DMRM	OH
1473	DMRM	OH

ORIGINAL

00429-4

12/95

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 23
(PENDING PERMIT APPLICATIONS)

Applicant's Name AMERICAN ENERGY CORPORATION

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed AMERICAN ENERGY CORPORATION

Application No.	Name of Regulatory Authority	State
D-0425-2	DMRM	OH
R-1159-4	DMRM	OH

ORIGINAL

00429-4

AEC 18758

149

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 22
(CERTIFICATE OF LIABILITY INSURANCE)

Name of Insured American Energy Corporation

This is to certify that the policy of insurance listed below has been issued to the above named insured and is in force at this time. The policy provides bodily injury and property damage insurance for all coal mining and reclamation operations of the insured in the State of Ohio as required by paragraph (B) of rule 1501:13-7-07 of the Administrative Code stated below.

Name of Insurer Federal Insurance Company
Policy Number 37104410
Policy Period 6/1/02 to 6/1/03
Name of Underwriting Agent Karen Williams
Address of Underwriting Agent % Reschini Agency, Inc. 922 Phil St., Indiana, PA 15701
Telephone Number of Underwriting Agent (800) 828 - 5040

In the event of cancellation or non-renewal of this policy, including non-payment of policy premiums, the insurer agrees to promptly notify:

The Division of Reclamation
Foundation Square
Columbus, OH 43224

6-17-02 K Williams
Date Signature of Underwriting Agent

This certificate is issued as a matter of information only and confers no rights upon the Division of Reclamation. This certificate does not amend, extend, or alter the coverage afforded by the policy listed above.

1501:13-7-07(B) The Public Liability Insurance Policy shall:

1.) Be in effect during the term of the permit or any renewal, including the length of all reclamation operations;

2.) Provide for personal injury and property damage protection in amounts adequate to compensate any persons injured or property damaged as a result of coal mining and reclamation operations, including the use of explosives. The minimum insurance coverage for bodily injury and property damage shall be three hundred thousand dollars for each occurrence and five hundred thousand dollars in the aggregate; and

3.) Include a rider requiring that the insurer notify the Chief whenever substantive changes are made in the policy, including any termination or failure to renew.

ORIGINAL

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B. COMPLIANCE INFORMATION

(1) Has the applicant, any subsidiary, affiliate, or persons controlled by or under common control with the applicant:

a) Had a federal or state coal mining permit suspended or revoked in the five years preceding the date of submission of this application? _____ Yes, __X__ No. If "yes," submit Attachment 6.

b) Forfeited a mining bond or similar security deposited in lieu of bond? _____ Yes, __X__ No. If "yes," submit Attachment 6.

(2) Has the applicant been issued a notice of violation (NOV) in connection with any coal mining and reclamation operation during the three years preceding the date of submission of this application for violations of Chapter 1513. of the Revised Code or these rules, or of any federal or state law, rule, or regulation pertaining to air or water environmental protection? __X__ Yes, _____ No. If "yes," submit Attachment 7A.

SEE ATTACHMENT 7A

(3) Have any unabated federal or state cessation orders (COs) and unabated air and water quality notices of violation (NOVs) been received prior to the submission date of this application by any coal mining and reclamation operation owned or controlled by either the applicant or by any person who owns or controls the applicant? _____ Yes, __X__ No. If "yes," submit Attachment 7B.

ORIGINAL

00423-4

11/92

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION
ATTACHMENT 7A
(NOTICES OF VIOLATION)

Applicants Name AMERICAN ENERGY CORPORATION (CENTURY MINE)

Permit No.	Violation Number	Date of Issuance	Issuing Agency	State	Brief Description of N.O.V.	Action Taken to Abate N.O.V.	Current Status of N.O.V. (*)
D-0425	21575	9/26/01	ODNR	OHIO	DAMAGE HAS RESULTED AS THE OPERATOR HAS DISTURBED GROUND, CRUBBED AN AREA, BEYOND THE SOUTHERN PERMIT LIMITS.	EROSION AND SEDIMENT CONTROLS WERE ESTABLISHED AND AN IBR WAS SUBMITTED AND ISSUED	TERMINATED
D-0425	21542	9/26/01	ODNR	OHIO	DAMAGE HAS RESULTED AS SEDIMENT FROM THE DISTURBED AREA HAS DISCHARGED OFF OF THE PERMIT INTO THE RECEIVING STREAM.	EROSION AND SEDIMENT CONTROLS WERE ESTABLISHED AND AN IBR WAS SUBMITTED AND ISSUED	TERMINATED

(*) If administrative or judicial proceedings have been initiated concerning any of the violations, identify the violation and provided an addendum indicating the date, location, type of proceeding, and current status.

ORIGINAL

AEC 18761

C. RIGHT OF ENTRY INFORMATION

(1)(a) Provide the following information for every legal or equitable owner of record, surface and mineral, of the property to be mined on the permit area (i.e. areas affected by surface operations and facilities), indicating whether the ownership is of surface, coal, or noncoal mineral.

N/A - NO PERMIT AREA

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____ , Coal _____ , Noncoal _____
Deed Parcel No.

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____ , Coal _____ , Noncoal _____
Deed Parcel No.

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____ , Coal _____ , Noncoal _____
Deed Parcel No.

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____ , Coal _____ , Noncoal _____
Deed Parcel No.

ORIGINAL

D0425-4

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

Name L. & L. ROAN
Address 53640 CRABAPPLE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-72, 2-13-71

Name H. CROOKS
Address 53345 CRABAPPLE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-156, 2-13-155

Name B. & R. FISHER
Address 53441 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-156

Name D. & J. HUGHES
Address 4910 SEMINOLE AVENUE
City WINTER PARK State FLORIDA Zip 32792
Surface X , Coal
Deed Parcel No. 2-13-156

Name G. LOUDEN
Address 53369 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160

Name G. & C. LOUDEN
Address 53337 BELMONT RIDGE ROAD

ORIGINAL
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00425-4
AEC 18763

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160

Name M. LOUDEN
Address 53370 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160

Name M. & D. LUCAS
Address 55181 PUGH RIDGE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-71

Name N. LUCAS
Address 46519 CAPTINA HIGHWAY
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-14, 2-15-11, 2-15-12

Name M. MEYER, ET AL C/O KENNETH MEYER, SR.
Address 53180 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160
Name R. & C. MOBLEY
Address 53859 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal

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ORIGINAL 00425-4

AEC 18764

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

Deed Parcel No. 2-13-18

Name T. & P. OTTO
Address 53900 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-18

Name M. & A. PERKINS
Address 53470 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-156

Name D. PHILLIPS & J. SMITH
Address 44140 HUDSON ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-54, 2-13-55, 2-13-56, 2-13-57

Name RAVEN ROCKS, INC.
Address 54061 CRUM ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-5-30, 2-13-155, 2-13-156, 2-13-157, 2-5-29

Name S. ROUTH
Address 3041 NORWOOD STREET
City CUYAHOGA FALLS State OHIO Zip 44221
Surface X , Coal
Deed Parcel No. 2-13-20, 2-13-160

RECEIVED

ORIGINAL

00425-4

AEC 18765

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

Name R. THOMAS
Address 53739 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-18, 2-13-157

Name J. & M. WARD
Address 53500 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-155, 2-13-156, 2-13-157

Name F. LUCAS
Address 53579 CRUM ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-5-29

Name J. & E. MAPLING
Address 53219 CRUM ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-5-25, 2-5-28
Name W. & N. HIBBITS
Address 820 BROADWAY BLVD.
City STEUBENVILLE State OHIO Zip 43952
Surface X , Coal
Deed Parcel No. 2-13-05

Name T. & T. LITTLETON
Address 322 JACQUETTE STREET

RECEIVED
ORIGINAL
00425-4

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

City BRIDGEPORT State OHIO Zip 43912
Surface X , Coal
Deed Parcel No. 2-13-96

Name W. PERKINS c/o HAZEL R. HOPTON
Address 1500 S. KENNETH
City MONAHANS State TEXAS Zip 79756-6314
Surface X , Coal
Deed Parcel No. 2-13-90, 2-13-108A

Name M. & C. BECKETT
Address 54305 CRABAPPLE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-105, 2-13-109

Name C. BONDY
Address 625 S. ZANE HIGHWAY
City MARTINS FERRY State OHIO Zip 43935
Surface X , Coal
Deed Parcel No. 2-13-129

Name J. & M. BONDY
Address 53871 CRABAPPLE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-129

Name C. & K. BROWN
Address 56859 FERRY LANDING ROAD
City SHADYSIDE State OHIO Zip 43947
Surface X , Coal

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ORIGINAL
AEC 18767

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

Deed Parcel No. 2-13-129

Name 20 BUCKHORN CLUB, INC. c/o PAUL BITTNER, TREA.
Address 1845 13TH STREET
City CUYAHOGA FALLS State OHIO Zip 44223
Surface X , Coal
Deed Parcel No. 2-13-100

Name D. ELROD
Address 1844 TOOMBS DRIVE
City AKRON State OHIO Zip 44306
Surface X , Coal
Deed Parcel No. 2-13-195

Name J. ERCHAK, ET AL
Address 11385 MARBURGER ROAD
City STOUTSVILLE State OHIO Zip 43154
Surface X , Coal
Deed Parcel No. 2-13-82, 2-13-104, 2-13-103, 2-13-173

Name J. & R. HUML
Address 42160 LURAY DRIVE
City ST. CLAIRSVILLE State OHIO Zip 43950
Surface X , Coal
Deed Parcel No. 2-13-131, 2-13-132

Name T. & N. LITTLETON
Address 45198 HUDSON ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-101, 2-13-188

RECEIVED

ORIGINAL

AEC 18768

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

Name F. ROTE
Address 1091 EAST BOULEVARD
City AURORA State OHIO Zip 44202
Surface X , Coal
Deed Parcel No. 2-13-132, 2-13-131, 2-13-129

Name D. TAYLOR, ET AL
Address 45368 HUDSON ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-105, 2-13-109, 2-13-30, 2-13-107, 2-13-108

Name F. WALKER
Address 6359 SMITH-KRAMER ROAD
City HARTVILLE State OHIO Zip 44632
Surface X , Coal
Deed Parcel No. 2-13-104, 2-13-104A

Name J. & T. EDGE
Address 1 WARWOOD TERRACE
City WHEELING State WV Zip 26003
Surface X , Coal
Deed Parcel No. 2-13-193, 2-13-182

Name CONSOLIDATED LAND COMPANY
Address BOX 505, 34208 AURORA ROAD
City SOLON State OHIO Zip 44139
Surface , Coal X
Deed Parcel No. 2-5-25, 2-5-28, 2-5-29, 2-5-30, 2-13-05 2-13-14, 2-13-18, 2-13-20, 2-13-30, 2-13-54, 2-13-55, 2-13-56, 2-13-57, 2-13-71, 2-13-72, 2-13-82, 2-13-96,

ORIGINAL

00425-4

C.(1)(b) Provide the following information for every legal or equitable owner of the property to be mined covered by the underground workings indicating whether ownership is for the surface or coal.

2-13-100, 2-13-101, 2-13-103, 2-13-104, 2-13-104A, 2-13-105, 2-13-107, 2-13-108, 2-13-108A, 2-13-109, 2-13-129, 2-13-131, 2-13-132, 2-13-155, 2-13-156, 2-13-157, 2-13-160, 2-13-173, 2-13-182, 2-13-188, 2-13-193, 2-13-195, 2-15-11, 2-15-12

Name S. LOUDEN
Address 53337 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160

Name R.T. LOUDEN
Address 53272 BELMONT RIDGE ROAD
City BEALLSVILLE State OHIO Zip 43716
Surface X , Coal
Deed Parcel No. 2-13-160

Name O. & N. PERKINS
Address 54060 PUGH RIDGE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-3, 2-13-04

Name N. & D. MOORE
Address 53676 PUGH RIDGE ROAD
City ALLEDONIA State OHIO Zip 43902
Surface X , Coal
Deed Parcel No. 2-13-08

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ORIGINAL

00425-4
AEC 18770

C. (2) Provide either of the following information for the holders of record of any leasehold interest in the coal to be mined or property to be affected by surface operations or facilities, indicating whether the held interest is of surface, coal, or noncoal rights.

Name Consolidated Land Company
Address 29325 Chagrin Boulevard, Suite 300
City Pepper Pike State Ohio Zip 44122
Surface _____, Coal X, Noncoal

Name *American Energy Corporation*
Address *43521 Mayhugh Hill Road*
City *Beallsville* State *Ohio* Zip *43716*
Surface _____, Coal *X*, Noncoal
Submit and identify additional pages necessary to complete response.

(3) Are there purchasers of record under a real estate contract of the coal to be mined or property to be affected by surface operations and facilities? ____ Yes, X No. If yes, submit Attachment 2.

(4) Is any owner, holder, or purchaser listed in items C(1)(a and b), (2), or (3) respectively, a business entity other than a single proprietorship? X Yes, ____ No. If yes, submit Attachment 3.
SEE ATTACHMENT 3

(5) Is any part of the proposed permit area adjacent to any lands which are not owned by those persons identified in item C(1)(a)? ____ Yes, X No. If yes, submit Attachment 4.

(6) Does the applicant hold lands, interests in lands, options, or pending bids on interests in lands which are contiguous to the property to be mined? X Yes, ____ No. If yes, provide a description of the lands.
SEE ADDENDUM TO PART 1, PAGE 8 C(7), FUTURE APPLICATION AREA SEQUENCE MAP

(7) Is it anticipated that individual mining permits will be sought for any of those lands described in item C(6) above? ____ Yes, X No. If yes, submit as an addendum and identify those lands to include the size, sequence and timing of future mining permits, utilizing a map pursuant to 1501:13-4-13(J)(20), Ohio Administrative Code.
ALL FUTURE MINING WILL BE PERFORMED UNDER PERMIT D-0425 WITH ADDITIONAL ACREAGES ADDED VIA ADJACENT AREA APPLICATIONS
SEE ADDENDUM TO PART 1, PAGE 8 C(7), FUTURE APPLICATION AREA SEQUENCE MAP

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 3
(IDENTIFICATION OF OTHER BUSINESS ENTITIES)

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity AMERICAN ENERGY CORPORATION

Statutory agent AMERICAN ENERGY CORPORATION

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name ROBERT D. MOORE Position PRESIDENT/TREASURER

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name MICHAEL O. MCKOWN Position SECRETARY

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name _____ Position

Street Address

City _____ State _____ Zip

Person's name _____ Position

Street Address

City _____ State _____ Zip

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES & RECLAMATION

ATTACHMENT 3
(IDENTIFICATION OF OTHER BUSINESS ENTITIES)

Applicant's Name **AMERICAN ENERGY CORPORATION**

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity **CONSOLIDATED LAND COMPANY**

Statutory agent A. H. STATUTORY AGEN CORP. #842696

Street Address 925 EUCLID AVENUE, SUITE 1100

City CLEVELAND State OHIO Zip 44115

Person's name PETER VULJANIC Position PRESIDENT

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name MICHAEL E. ELLIOT Position SECRETARY

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name ROBERT D. MOORE Position TREASURER AND ASSISTANT SECRETARY

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

Person's name MAYNARD R. ST. JOHN Position VICE PRESIDENT

Street Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

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C. (8)(a) Provide either of the following to allow for coal mining operations on the permit area:

N/A - NO PERMIT AREA

(i) A copy of the documents, or
(ii) An affidavit wherein the documents are described.

AFFIDAVIT

State of Ohio, _____ County, ss. _____ being first duly sworn, says that the following described documents convey to the applicant the legal right explained below and is a subject of litigation as shown below.

Typed of document
Execution Date
Expiration Date
Parties: From _____ To
Description of land: No. Acres
County _____ Township
Sections _____ Lots
Parcel #
Explanation of legal rights claimed

Pending litigation _____ Yes, _____ No.

Signature of Affiant Date

Position

Sworn before me and subscribed in my presence this _____ day of _____, 20 _____.

Notary Public

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C. (8)(b) Provide either of the following to allow for coal mining operations within the underground workings:

(i) A copy of the documents or
(ii) An affidavit wherein the documents are described. For all documents or affidavits provided for the underground workings, the specific parcels are to be identified on the application map.

AFFIDAVIT

State of Ohio, Belmont County, ss. Robert D. Moore being first duly sworn, says that the following described documents convey to the applicant the legal right explained below and is a subject of litigation as shown below.

Type of document LEASE
Execution Date
Expiration Date NONE
Parties: From CONSOLIDATED LAND COMPANY To AMERICAN ENERGY CORPORATION

Description of land: No. Acres
County BELMONT Township SEE BELOW
Sections WAYNE: 1, 7
WASHINGTON: 31, 25, 32, 26
Lots N/A
Parcel # 2-5-30 2-5-29 2-5-28 2-5-25 2-13-193 2-15-12 2-15-11 2-13-96 2-13-82 2-13-72 2-13-71 2-13-57 2-13-56 2-13-55 2-13-54 2-13-20 2-13-195 2-13-188 2-13-182 2-13-18 2-13-173 2-13-160 2-13-157 2-13-156 2-13-155 2-13-14 2-13-132 2-13-131 2-13-129 2-13-109 2-13-108 2-13-107 2-13-105 2-13-104 2-13-103 2-13-101 2-13-100 2-13-05 2-13-30, 2-13-104A, 2-13-108A **2-13-3 2-13-04 2-13-31 2-13-07 2-13-06 2-13-27 2-13-28 2-13-29 2-13-174 2-13-175**

Explanation of legal rights claimed
SEE ATTACHED ADDENDA

Pending litigation _____ Yes, X No.

Signature of Affiant Date October 18, 2002

PRESIDENT
Position

Sworn before me and subscribed in my presence this 18th day of October, 2002.

Barbara L. Rush
Notary Public

BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

RECEIVED

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ADDENDUM TO PAGE 10, PART 1, C (a)(b)
AMERICAN ENERGY CORPORATION

JUN 19 2002

Item 1 - Mining rights for tract 2-5-29

TOGETHER with the free and uninterrupted right of way into, upon and under the above described Parcels of land numbered from 52 to 62 both inclusive, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, coking, draining and ventilating and carrying away said coal, hereby waiving all surface damages or damages of any sort arising therefrom or from the removal of all of said coal, together with the privilege of mining and removing through said described premises other coal belonging to the grantee, its successors and assigns, or which may be hereafter acquired by said grantee, its successors and assigns.

Item 2 - Mining rights for tract 2-5-28, 2-5-30

TOGETHER with the free and uninterrupted right of way into, upon and under the above described Parcels of land numbered from 52 to 62 both inclusive, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, coking, draining and ventilating and carrying away said coal, hereby waiving all surface damages or damages of any sort arising therefrom or from the removal of all of said coal, together with the privilege of mining and removing through said described premises other coal belonging to the grantee, its successors and assigns, or which may be hereafter acquired by said grantee, its successors and assigns.

Item 3 - Mining rights for tract 2-5-25

TOGETHER with the free and uninterrupted use and enjoyment of right of way into, upon and under said land, at such points and in such manner as may be considered proper and necessary for the advantageous and economical operation thereof, and in the digging and mining of said coal, and without liability therefore and hereby waiving any and all damages that might or could arise therefrom by reason of such digging, mining and carrying away all of said coal, together with the privilege of carrying, transporting and removing through the described premises, this and other coal now owned or acquired by said Grantee, its successors or assigns, generally freed, clear and discharged of any servitude whatever to the overlying land or anything therein or thereon. The said Grantors reserved, however to them, their heirs and assigns, the right to drill through said coal for oil and gas, and water, etc. The said Grantee, its successors and assigns, have the right to purchase at any time as much of the surface (reserving three acres around the buildings, if any buildings are on the land) of said land as may be necessary in mining, manufacturing, or marketing said coal, at the price of $150.00 per acre, which payment shall entitle them to a deed in fee simple for the same. Said grantee shall have the right to enter upon said farm to drill and test said coal without liability for damages, except as to growing crops.

Item 4 - Mining rights for tract 2-13-14, 2-13-18, 2-13-20, 2-13-54, 2-13-55, 2-13-56, 2-13-57, 2-13-72, 2-13-71, 2-13-82, 2-13-100, 2-13-101, 2-13-103, 2-13-104, 2-13-107, 2-13-105, 2-13-109, 2-13-05, 2-13-108, 2-13-129, 2-13-131, 2-13-132, 2-13-96, 2-13-30, 2-13-55, 2-13-54

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"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantees, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs, and assigns, a good and sufficient deed of General Warranty, (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances), conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth, And said Grantees agree to purchase the same at not exceeding said above stipulated price per acre."

Item 5 - Mining rights for tract 2-13-155, 2-13-156, 2-13-157

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said Grantees, their heirs and assigns, from all liability for

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damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."

"And the said Grantors do for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of at the rate of One Hundred Dollars per acre, by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"And the said Grantees do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of $100 per acre.

Item 6 - Mining rights for tract 2-13-160

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said Grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."

"And the said Grantor does for herself and her heirs, executors, administrators and assigns, covenant and agree that Grantor will upon demand and payment of at the rate of One Hundred Dollars per acre by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and

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necessary structures, and for the operation of railroads."

"And said Grantees do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the above purpose herein next above set forth at the rate of $100 per acre."

Item 7 - Mining rights for tract 2-15-11, 2-15-12

Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be proper and necessary for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises, other coal belonging to said Grantees, their heirs, or which may be hereafter acquired, together with the right and privilege to make drains on the surface and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all coal of the said Pittsburgh Vein underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying and spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges.

It is expressly understood and agreed that the enumeration herein is in enlargement of and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges.

And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, be necessary for the purpose of mining said coal or exercising any rights incidental thereto, or that may be necessary for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of necessary buildings and machinery; or for the construction thereon of tracks, shafts, mine openings and necessary structures and for the operation of railroads; and the said Grantor does for himself and his heirs, executors, administrators and assigns covenant and agree that Grantor will upon demand and payment of, at the rate not exceeding Two Hundred Dollars ($200) per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs and assigns, a good and sufficient deed of General Warranty (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances) conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth. And said Grantees agree to purchase the same at not exceeding said above stipulated price per acre.

Item 8 - Mining rights for tract 2-13-173

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said

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premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said grantees, their heirs and assigns, and waiving and releasing said grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."

"And the said Grantors do for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will up demand and payment of at the rate of One Hundred Dollars per acre by the grantees, their heirs and assigns, convey in fee simple unto the said grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"And the said grantees do, for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of $100.00 per acre."

Item 9 - Mining rights for tract 2-13-182

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining, and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said seam of coal under said described premises, other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right and privilege to make drains on the surface and air holes and change the same as the convenience of mining may require, together with all the mining privileges on said surface or under it necessary for the removal of all of said seam of coal underlying said premises and for the removal of coal underlying neighboring properties now owned or hereafter acquired by said grantees, their heirs and assigns, through said seam of coal under said premises."

"And said grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said grantee by virtue of the within grant of coal

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and mining privileges."

"Said grantors reserve the free right and privilege to operate through said seam of coal for oil, gas, coal or other material lying below said Seam No. 8."

Item 10 - Mining rights for tract 2-13-195

"Together with the free, uninterrupted use and enjoyment of right of way into, upon and under said lands at such points and in such manner as may be considered proper and necessary for the advantageous and economical operation thereof, and in the digging and mining of said coal and draining and ventilating of the mines, and without liability therefor, and hereby waiving any and all damages that might or could arise therefrom by reason of such digging, mining, draining and ventilating and carrying away of all of said coal or the manufacture of said coal or other coal into coke or other products, together with the privilege of carrying or transferring and removing through the described premises this and other coal and mine supplies now owned or hereafter acquired by said grantee, his heirs and assigns, generally freed, clear and discharged of any servitude whatever to the overlying land or anything therein or thereon, reserving however, the right to drill through said coal for oil or gas in such manner as not to endanger the working of said mines. Said grantee, his heirs and assigns, shall have the right to purchase at any time so much of said land as may be necessary for railroad, and in mining, manufacturing and marketing said coal at the price of $100 per acre, upon receipt of which payment the said grantor, her heirs and assigns agree to deliver a deed in fee for the same.

"It is agreed that said second party, his heirs or assigns, shall have the right at any time to enter upon said land and drill or test said coal, and to remove at any time all machinery used for such purpose, without being liable for any damages."

It is expressly understood and agreed that the words "grantor" or "grantors", as used in the foregoing grants of rights and options under the headings "PARCEL 1" and "PARCEL 2" hereof, refer to the grantors of S. H. Robbins, and not to S. H. Robbins, as Grantor in former deed, and that in the execution and delivery of former deed said S. H. Robbins did assign and make over to The Cleveland Trust Company, as Grantee therein, only the interest which said S. H. Robbins had in such rights and options.

Item 11 - Mining rights for tract 2-13-193

"TOGETHER with the right in perpetuity of mining, taking out and removing such coal; also the further right in perpetuity to remove coal to and from other lands or lands through entries, shafts, air ways and mine openings of any and every kind whatsoever with the same rights in removing coal to or from such other lands to use the surface, entries, shafts, pits and other appliances for mining, upon, in and through or under the lands herein described, as are herein granted for the mining and removal of the coal hereby granted; provided further that the said grantee, his heirs, executors, administrators and assigns, shall have and are hereby given the right to re-enter and take from time to time so much of and such part of the surface over the aforesaid coal rights as said grantee, his heirs, executors, administrators or assigns, may desire, and as may be necessary for pits, shafts, buildings, structures and appurtenances thereto, platforms, drifts, drains,

reservoirs, roads, switches, side tracks, machinery and chutes to facilitate the taking out, mining and removing of such coal paying therefor at the rate of $100 per acre, provided, however, that no part of the surface of said premises within 100 yards of any building now erected shall be taken except upon the payment of the just and reasonable value of said surface so taken and the actual damage resulting to the residue of said premises by the use to which said surface is put; and also granting the right to enter upon said land at any time for the purpose of testing for said coal. Giving and granting the rights and privileges hereinbefore mentioned without liability by reason of or in any way resulting from their enjoyment or from the removal of said coal from over and under said premises or any part thereof. Excepting and reserving the right to drill and operate through said vein of coal for oil, gas and other minerals.

Item 12 - Mining rights for tract 2-13-188

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said Grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of within grant of coal and mining privileges."

"And the said Grantors do for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of at the rate of One Hundred Dollars per acre by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"And the said Grantors do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of One Hundred Dollars per acre."

"The Grantors reserve the right to operate through said coal for oil, gas and other minerals."

Item 12 - Mining rights for tract 2-13-104A, 2-13-108A

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ADDENDUM TO PAGE 10, PART I, C (8)(b)
AMERICAN ENERGY CORPORATION

Together with the right to mine and remove said coal by the long wall mining method, room and pillar method, underground method, or any other method of mining whether now known or hereafter developed and together with the right to ingress, egress and regress to from over and across said premises and adjoining premises owned or controlled by said Grantee, its successors and assigns, for the purpose of removing and transporting, without additional charge, said coal, or any other coal that said Grantee, its successors and assigns, may now or may hereafter acquire, and together with the right to bring upon said properly men, machinery, materials and equipment necessary, convenient or useful for the mining and marketing of said coal by the methods hereunder authorized and including the right to deposit spoil, rock, earth and gob on said premise caused by such operations or operations on adjoining premises, together with full and complete right of drainage , all free from any liability whatsoever on the part of Grantee, its successors and assigns, for any damage to the lands, minerals, other veins of coal, and the surface thereof, of any water, water course, or structure thereon and together with the right to enter upon said property for the purpose of plugging oil and gas wells in order that the same do not interfere with the mining of said coal, Grantor, their heirs, successors and assigns, waive and forever release all rights of subjacent and lateral support and all subsidence damages from the mining and removal of all the coal or any part thereof.

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(9)(a) List below the following information for each surface owner of land within the proposed permit area.

N/A - NO PERMIT AREA

OWNER NAME	COUNTY	TOWNSHIP	SEC./LOT	T- , R-

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C. (9) (b) List below the following information for each surface owner of land within the proposed underground workings.

OWNER NAME		COUNTY	TOWNSHIP	SEC./LOT	T-	R-
L. & L.	BOAN	BELMONT	WAYNE	1	6	5
H.	CROOKS	BELMONT	WAYNE	1	6	5
B. & B.	FISHER	BELMONT	WAYNE	1	6	5
D. & J.	HUGHES	BELMONT	WAYNE	1	6	5
G.	LOUDEN	BELMONT	WAYNE	1	6	5
G. & C.	LOUDEN	BELMONT	WAYNE	1	6	5
M.	LOUDEN	BELMONT	WAYNE	1	6	5
S.	LOUDEN	BELMONT	WAYNE	1	6	5
R.T.	LOUDEN	BELMONT	WAYNE	1	6	5
M. & D.	LUCAS	BELMONT	WAYNE	1	6	5
N.	LUCAS	BELMONT	WAYNE	1	6	5
M.	MEYER, ET AL	BELMONT	WAYNE	1	6	5
R. & C.	MOBLEY	BELMONT	WAYNE	1	6	5
T. & P.	OTTO	BELMONT	WAYNE	1	6	5
M. & A.	PERKINS	BELMONT	WAYNE	1	6	5
D. PHILLIPS & J. SMITH		BELMONT BELMONT	WAYNE WASHINGTON	1 31	6 5	5 4
RAVEN ROCKS, INC.		BELMONT	WAYNE	1, 7	6	5
S.	ROUTH	BELMONT	WAYNE	1	6	5
R.	THOMAS	BELMONT	WAYNE	1	6	5
J. & M.	WARD	BELMONT	WAYNE	1	6	5
F.	LUCAS	BELMONT	WAYNE	7	6	5
J. & E.	MARLING	BELMONT	WAYNE	7	6	5
W. & N.	HIBBITS	BELMONT	WASHINGTON	25	5	4
T. & T.	LITTLETON	BELMONT	WASHINGTON	25	5	4
W.	PERKINS	BELMONT	WASHINGTON	25	5	4

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AEC 18785

M. & C.	BECKETT	BELMONT	WASHINGTON	31, 32	5	4
C.	BONDY	BELMONT	WASHINGTON	31	5	4

-12-

C. (9) (b) List below the following information for each surface owner of land within the proposed underground workings.

OWNER NAME		COUNTY	TOWNSHIP	SEC./LOT	T-	R-
J. & M.	BONDY	BELMONT	WASHINGTON	31	5	4
C. & K.	BROWN	BELMONT	WASHINGTON	31	5	4
20 BUCKHORN CLUB, INC.		BELMONT	WASHINGTON	31	5	4
D.	ELROD	BELMONT	WASHINGTON	31	5	4
J.	ERCHAK, ET AL	BELMONT	WASHINGTON	31	5	4
J. & R.	HUML	BELMONT	WASHINGTON	31, 32	5	4
T. & N.	LITTLETON	BELMONT	WASHINGTON	31	5	4
F.	ROTE	BELMONT	WASHINGTON	31	5	4
D.	TAYLOR, ET AL	BELMONT	WASHINGTON	31, 32, 25	5	4
F.	WALKER	BELMONT	WASHINGTON	31	5	4
J. & T.	EDGE	BELMONT	WASHINGTON	26	5	4
O. & N.	PERKINS	BELMONT	WASHINGTON	25, 26	5	4
N. & D.	MOORE	BELMONT	WASHINGTON	25	5	4

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D. AREAS WHERE MINING IS PROHIBITED OR LIMITED-**Permit Area**

(1) Does the permit area included in this permit application include any area dedicated as a nature preserve pursuant to Chapter 1517., Ohio Revised Code? _____ Yes, _____ No. If "yes," submit proof of valid existing right.

N/A, NO PERMIT AREA

(2) Does the permit area included in this permit application include any area within one thousand feet of the waterlines of any wild, scenic, or recreational river dedicated pursuant to Chapter 1501., Ohio Revised Code? _____ Yes, _____ No. If yes, submit proof of valid existing right.

N/A, NO PERMIT AREA

(3) Does the permit area included in this permit application include any area within the boundaries of the following systems: national park, national wildlife refuge, national trails, national wilderness preservation, national recreational areas, or wild and scenic rivers or river corridors, including those rivers under study? _____ Yes, _____ No. If yes, submit proof of valid existing right.

N/A, NO PERMIT AREA

(4) Does the permit area included in this permit application include any federal lands within the boundaries of any national forest? _____ Yes, _____ No. If yes, submit approval of the U.S. Secretary of Interior of proof of valid existing right.

N/A, NO PERMIT AREA

(5) Will operations in the permit area conducted under this permit adversely affect any publicly owned park or place included on the National Register of Historic Places? _____ Yes, _____ No. If yes, submit joint approval from the chief and the federal, state, or local agency with jurisdiction over the park or places or proof of valid existing right.

N/A, NO PERMIT AREA

(6) Will operations in the permit area conducted under this permit affect land within one hundred feet of the outside right-of-way of a public highway? _____ Yes, _____ No. If yes, list the highway(s) in the space below and submit Attachment 9 or proof of valid existing right.

N/A, NO PERMIT AREA

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D. (7) Will operations in the permit area conducted under this permit affect land within three hundred feet of any occupied dwelling? _____ Yes, _____ No. If yes, list the name of the owner(s) in the space below and submit Attachment 10 or proof of valid existing right.

N/A, NO PERMIT AREA

(8) Will operations in the permit area conducted under this permit affect land within three hundred feet of any public building, school, church, community or institutional building, or public park? Yes, _____ No. If yes, submit proof of valid existing right.

N/A, NO PERMIT AREA

(9) Will operations in the permit area conducted under this permit affect land within one hundred feet of a cemetery? _____ Yes, _____ No. If yes, submit proof of valid existing right or appropriate authorization to relocate the cemetery.

N/A, NO PERMIT AREA

(10) Will operations conducted during this permit result in the extension of any part of the pit within fifty feet of horizontal distance to any adjacent land or water in which the applicant does not own either the surface or mineral rights? _____ Yes, _____ No. If yes, list below the name(s) of the adjacent owner(s) and submit Attachment 11.

N/A, NO PERMIT AREA

E. AREAS WHERE MINING IS PROHIBITED OR LIMITED -**Permit and Shadow Area**

Are there areas within the proposed permit area, shadow area, or adjacent areas designated unsuitable for coal mining operations under rule 1501:13-3-07 of the Administrative Code or under study for designation in an administrative proceeding under this rule? _____ Yes, **X** No.

(1) If yes to the item above, did the applicant make substantial legal and financial commitments in the proposed areas prior to January 4, 1977? _____ Yes, _____ No.

(2) If yes to item (1) above, submit as an addendum to the permit application information supporting the assertions that the commitments were made prior to January 4, 1977.

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F. PERMIT TERM AND EXTENT -Permit and Underground Workings

(1) Anticipated/actual date for:
(a) Starting mining operations OCTOBER 1, 2002

(b) Terminating mining operations JANUARY 1,2005

(2) Does the applicant propose a permit term in excess of five (5) years? _ Yes, X No. If yes, submit an addendum with the information required by 1501:13-4-03(E)(3), Ohio Administrative Code.

(3) Indicate the following acreage figures:
(a) Total Acres N/A (Permit area)
(b) Total Acres 849.4 (Underground Workings)

(4) Horizontal extent of underground workings over life of permit in acres:
(a) Full coal Recovery N/A
(b) Room and Pillar 849.4 ACRES

G. PUBLIC NOTICE-Permit and Shadow Area

(1) In the space below, provide the name and address of the public office where a complete copy of this permit application is to be filed.
SEE ADDENDUM TO PAGE 15(G)(2)

(2) In the space below, list name and address of the newspaper and submit an addendum providing the text of the advertisement that is to be published in a newspaper of general circulation in the locality of the proposed operation. Note: The advertisement is to provide the information required by paragraph (A) of rule 1501:13-5-01 of the Administrative Code.
THE TIMES LEADER
200 SOUTH 4TH STREET
MARTINS FERRY, OH 43935

RECEIVED
OCT 15 [illegible]

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ADDENDUM TO PART 1, PAGE 15, ITEM G(2)
AMERICAN ENERGY CORPORATION

PUBLIC NOTICE

Pursuant to Section 1501:13-5-01 of the Ohio Administrative Code, notice is hereby given that AMERICAN ENERGY CORPORATION, 43521 Mayhugh Hill Road, Beallsville, has submitted an Adjacent Area Application to the Ohio Department of Natural Resources, Division of Mineral Resources Management.

AMERICAN ENERGY CORPORATION, 43521 Mayhugh Hill Road, Beallsville, Ohio, 43716 has submitted an underground coal mining application designated as D-0425-4 to the Ohio Department of Natural Resources, Division of Mineral Resource Management. The proposed additional acreages for permit D-0425 is located in sections section 1 and 7 in Wayne Township, and 31, 25, 32 and 26 in Washington Township in Belmont County. The area is located in the Woodsfield, and Cameron Quads 7 – ½ minute U. S. G. S. Quadrangle maps approximately 2.5 miles south of State Route 148, immediately North and East of Beallsville, Ohio. The proposed underground workings encompass 794.6 Acres. Coal in this underground area will be removed using partial coal recovery methods (i.e. room and pillar mining).
The Adjacent Area Application is on file at the Belmont County Courthouse, Recorders Office, Main Street, St.Clairsville, Ohio, 43950 for public viewing. Written comments or requests for informal conference may be sent to the Chief, Department of Natural Resources, Division of Mineral Resources Management, 1855 Fountain Square Court, Columbus, Ohio 43224, within thirty (30) days of the last date of publication of this notice.

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D-425-4

PROOF OF PUBLICATION

The State of Ohio
County of Belmont, ss:

The undersigned, being sworn, says that he or she is an employee of Eastern Ohio Newspapers, Inc., A Corporation, publisher of the Times Leader a newspaper published in Martins Ferry, Belmont County, Ohio, each day of the week and of general circulation in said city and county; that it is a newspaper meeting the requirements of sections 7.12 and 5721.01 Ohio Revised Code as amended effective September 24, 1957; that affiant has custody of the records and files of said newspaper; and that the advertisement of which the annexed is a true copy, was published in said newspaper on each of the days in the month and year stated, as follows:

Sept. 3, 10, 17, 24

2002

Subscribed by Affiant and sworn to before me, this 24th day of Sept, A.D. 2002.

Rebecca L Anderson
Notary Public

REBECCA L. ANDERSON
Notary Public, State of Ohio
My Commission Expires Nov. 28, 2006

Printer's Fee $ 291.20

Notary's Fee $

The Times Leader
Martins Ferry, Ohio

Pursuant to Section 1501:13-5-01 of the Ohio Administrative Code, notice is hereby given that AMERICAN ENERGY CORPORATION, 33521 Mayhugh Hill Road, Beallsville, has submitted an Adjacent Area Application to the Ohio Department of Natural Resources, Division of Mineral Resources Management. AMERICAN ENERGY CORPORATION, 33521 Mayhugh Hill Road, Beallsville, Ohio, 43716 has submitted an underground coal mining application designated as D-0425-4 to the Ohio Department of Natural Resources, Division of Mineral Resource Management. The proposed additional acreages for permit D-0425 is located in sections 1 and 7 in Wayne Township, and 31, 25, 32 and 36 in Washington Township in Belmont County. The area is located in the Woodsfield, and Cameron Quads 7 - 1/2 minute U.S.G.S. Quadrangle maps approximately 2.5 miles south of State Route 148, immediately North and East of Beallsville, Ohio. The proposed underground workings encompass 784.8 Acres. Coal in this underground area will be removed using partial coal recovery methods (i.e room and pillar mining).

The Adjacent Area Application is on file at the Belmont County Courthouse, Recorders Office, Main Street, St. Clairsville, Ohio, 43950, for public viewing. Written comments or requests for informal conference may be sent to the Chief, Department of Natural Resources, Division of Mineral Resources Management, 1855 Fountain Square Court, Columbus, Ohio 43224, within thirty (30) days of the last date of publication of this notice.

TL - ADV - 4 TUES. - SEPT. 3, 10, 17, 24

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D0425-4

PART 2 ENVIRONMENTAL RESOURCES INFORMATION

A. CULTURAL, HISTORIC, AND ARCHEOLOGICAL INFORMATION -**Permit and Planned Subsidence Area**

(1) Are there any cultural or historic resources or structures listed or eligible for listing on the National Register of Historic Places within the proposed permit or planned subsidence area? ___ Yes, ___ No. If yes, submit an addendum describing the resources and structures including the location and submit Attachment 27 or 27A as appropriate.

N/A - NO PERMIT OR PLANNED SUBSIDENCE AREA

(2) Are there any know archeological sites within the proposed permit or planned subsidence area? Yes, ___No. If yes, submit an addendum describing the site including the location and submit Attachment 27 or 27A as appropriate.

N/A - NO PERMIT OR PLANNED SUBSIDENCE AREA

(3) If applicable, based upon the review of the proposed planned subsidence areas and the completed Attachment 27A for the initial six months of projected mining, have any properties listed or eligible for listing on the National Register of Historic Places been identified? Yes, ____No. If yes, submit an addendum listing each property identified.

N/A - NO PERMIT OR PLANNED SUBSIDENCE AREA

(4) Submit an addendum indicating the method to be used to identify historic properties on planned subsidence areas as mining progresses.

N/A - NO PERMIT OR PLANNED SUBSIDENCE AREA

B. GEOLOGY DESCRIPTION - **Permit and Shadow Area**

(1) Submit an addendum describing the geology within the proposed permit area and shadow area down to and including the first stratum below the lowest coal seam to be mined or any aquifer below the lowest coal seam to be mined which may be adversely affected by mining. The description shall also include information on the areal and structural geology of the permit and shadow area and any other geologic parameters which may influence the probable hydrologic consequences and protection of the hydrologic balance from material damage outside of the permit area.

SEE ORIGINAL PERMIT D-0425 AND ADDENDUM TO PART 2, PAGE 16, ITEM B(1)

(2) Submit an addendum describing how the areal and structural geology may affect the occurrence, availability, movement, quantity, and quality of potentially affected surface and ground waters per paragraph (C) of rule 1501:13-4-13 of the Administrative Code.

SEE ORIGINAL PERMIT D-0425 AND ADDENDUM TO PART 2, PAGE 16, ITEM B(2)

ORIGINAL 88-25-9

GEOLOGY DESCRIPTION

Stratigraphy of the proposed permit area is formed by the Monongahela formation of the Pennsylvania period, and the Dunkard group of Permian time. The primary strata of both sections consists of an alternating sequence of limestone, sandstone, clay, shale, claystone, soapstone, and coal.

The Monongahela formation is approximately 245 feet thick. In ascending order, it occupies the interval from the Pittsburgh No. 8 to the Waynesburg No. 11 coal bed. The primary rock units are limestone, shale, and claystone. Limestone forms 44 to 68 percent of this stratigraphic interval.

The Dunkard group is 250 to 300 feet thick, occupying the interval from the Waynesburg No. 11-coal bed to the ground surface. The primary rock units here are shale and claystone. These soft units form about 85 percent of this stratigraphic interval.

The constrained zone affords the main safety against inflow of groundwater into the CENTURY MINE. The nature and thickness of the individual beds found here are of particular importance. Through extensive core drilling, multiple beds of claystone, with total thicknesses of 79 to 108 feet, have been identified. These claystone beds are relatively impermeable and generally capable of absorbing large amounts of strain energy before fracture. In the application area, it is our opinion that sufficient claystones are in-place to provide an adequate barrier against inflow from surface water. The rock strata of Belmont County typically form a gentle monocline that dips southeasterly at grades less than one percent. This dip trend accurately represents the application area with the base elevation of the No. 8 seam ranging from approximately 680 ft. in the southeast corner to approximately 715 ft. in the northwest corner.

The orientation of the major joints in rock and face cleat in coal is approximately N 75° W. The minor joints and butt cleats are generally perpendicular to these (N 15° E).

Geology and Coal Resources of Belmont County, Ohio, Geological Survey Professional Paper 380, reports that a small dome-shaped anticline lies in eastern Belmont County, primarily in Mead Township. This structure is located over five miles northeast of the CENTURY MINE application area and, therefore, is not expected to have an impact on ground water flow in the application area.

In addition, there is a graben structure that passes through portions of Belmont County. This graben has been tracked through the adjacent Powhatan No. 3 Mine and enters the No. 6 reserve on the eastern boundary. It proceeds in a southwesterly direction, turns approximately 90 degrees, proceeds in a northwesterly direction, then turns again and proceeds in a general

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westerly direction off the neighboring Powhatan No. 6 mine property.

The structural contours of the No. 8 Seam indicate that the graben is made up of a series of slumps in the deposit, indicated by a thickening of the seam at the bottom of the structure. This structure apparently affected the structural contours to the north of the graben, but these effects do not extend into the application area.

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ADDENDUM TO PAGE 16, B(2)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

Geological Impact of Coal Removal Upon Ground Water

The Pittsburgh (No. 8) coal seam will be mined, and in this area has dip of approximately 0.5% to the southeast, with the strike to the northeast. Ground water occurs in this area in several disconnected saturated zones associated with the occurrence of the coal seams and underlying clay stone units that prevent downward migration of the ground water. Ground water is generally limited to within the first 100 ft of the surface. Since primary porosity in the rock units is poor, nearly all of the ground water in this area of Ohio occurs as secondary porosity in the joints, cleats, fractures, and bedding planes of the rocks.

This area will be mined using partial-recovery mining techniques from which there will be no subsidence or disruption of the groundwater. Impacts of coal removal upon the groundwater are not anticipated. Low extraction ratios, and high safety factors assure no subsidence during mining of the gate sections. Impacts to individual water supplies are addressed in the addendum to page 18 F(1). The PHC addresses impacts to aquifers.

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B. (3) For those areas to be affected by underground mining surface operations where removal of the overburden down to the level of the coal seam will occur, submit Attachment 12(s) as required by paragraphs (C)(2)(a) and (C) of rule 1501:13-4-13 of the Administrative Code.

N/A

(4) For those areas within the shadow area where the stratum above the coal seam to be mined will not be removed, submit Attachment 13(s) as required by paragraphs (C)(2)(d) and (e) of rule 1501:13-4-13 of the Administrative Code.

SEE APPROVED TEST HOLE VARIANCE REQUEST AND ATTACHMENTS

C. GROUND WATER INFORMATION-Permit, **Shadow Area, and Adjacent Area**

(1) Submit an Attachment 14B which describes the ground water hydrology of the proposed permit area, shadow area, and adjacent area. The Attachment 14B is to include information on each waterbearing stratum or zone as required by paragraph (D) of rule 1501:13-4-13 of the Administrative Code, including the first waterbearing stratum below the coal to be mined.

SEE ATTACHMENT 14B AND ADDENDA

(2) Are there any wells on the proposed permit area, shadow area, and adjacent area? __X__ Yes, _____ No. If yes, submit Attachment 14C.

(3) Are there any springs on the proposed permit area, or developed springs on the shadow area and adjacent area? __X__ Yes, _____ No. If yes, submit Attachment 14C.

(4) Are there any public water supply sources on the proposed permit area, shadow area, and adjacent area? _____ Yes, __X__ No. If yes, submit Attachment 14A, Attachment 14D, and show location on the hydrology map.

(5) Submit Attachment 14A for representative wells and developed springs as required by paragraph (D)(4) of rule 1501:13-4-13. Based on this data identify the seasonal variations of ground water quality and quantity.

D. SURFACE WATER INFORMATION-Permit, **Shadow Area, and Adjacent Area**

(1) List the name of the watershed that will receive water discharges from the proposed permit, shadow and adjacent areas as listed in the Gazetteer of Ohio Streams published by the Ohio Department of Natural Resources.

CAPTINA CREEK

(2) Are there any perennial or intermittent streams or other surface water bodies on the proposed permit, shadow area, and adjacent area? __X__ Yes, _____ No. If yes, submit Attachment 14A and Attachment 14D and show location on application and hydrology map.

SEE ATTACHMENT 14A, 14D, AND APPLICATION AND HYDROLOGY MAP

OFFICIAL

APR 01 2002

March 21, 2002

Mr. Michael S. Sponsler, Chief
Ohio Department of Natural Resources
Division of Mineral Resources Management
1855 Fountain Square Court, Bldg. H-2
Columbus, Ohio 43224-1383

Attn: Mr. George Mychkovsky, Geologist

Dear George,

The American Energy Corporation is preparing an application to add 4,060 acres of underground (Pittsburgh No. 8 Seam) reserves adjacent to our currently approved underground mining area, referred to as Century Mine, Permit D-0425-3. The proposed workings are located in Sections 7 & 1, T-6 R-5, Wayne Township, Sections 13, 14, 19, 20, 25, 26, 31, & 32, T-5 R-4, Washington Township, Belmont County, Ohio, and Sections 6 & 12, T-5 R-5, and Sections 30 & 36, T-4 R-4, Sunsbury Township, Monroe County, Ohio. With the exception of the mains and entries, American Energy Corporation plans to use full-recovery mining for the entire application area.

The Pittsburgh No. 8 Coal seam ranges in elevation from approximately 610 feet to 711 feet msl, with overburden ranging from approximately 280 feet to 676 feet within the proposed shadow area. The lowest overburden thickness of 280 feet was determined at the low spot near Section corner 32 /26, 31 / 25. Due to the fact that the Pittsburgh #8 coal lies at least 280 below the surface, there is no potential for acid mine drainage. All water that cannot be utilized within the mine for dust control will be pumped to a surface sediment pond for treatment, if necessary, before being released to the stream system.

Pursuant to OAC 1501:13-4-13 (C)(2)(e)(ii), twenty-six (26) test holes are required. A total of nineteen (19) test holes are being submitted with this request. Attachment 13's for thirteen (13) of the test holes are being submitted, twelve (12) of which have complete chemical analysis. The remaining seven (7), (one Attachment 13 and 6 drill logs) being submitted represent geologic data only. In summary, seven (7) test holes are lacking pursuant to the above referenced rule. See attached Addendum to this variance request.

The following information is submitted in support of this request:

1. A Test Hole Variance Request Map showing existing test holes, their surface elevations, their coal elevations and the structural contours based on these holes and the surrounding test holes. The proposed mining area boundary and panel layout, hydrologic boundary, and location of geologic cross sections are also shown on the map.

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2. Logs of test holes and/or Attachment 13's for each hole.

3. A total of two (2) cross sections, A - A' and B - B', one along strike and one along dip.

We believe that all the data submitted with the original permit application and the previous adjacent area application (D-0425-1), combined with the information submitted herein demonstrates that the structure and stratigraphy of this application area is well known, and adequately represents the conditions of the proposed shadow area. Your prompt review and approval of this variance request is appreciated.

The approved test hole variance request with all attached information will be submitted with the application. Should you have any questions, please contact me as soon as possible.

Sincerely,

Jack A. Hamilton & Associates, Inc.
Consultants for American Energy Corporation

Ellen M. Greer, Permitting

Enclosures

cc: American Energy Corporation
File

APPROVED ☒
DISAPPROVED ☐
DATE: 3/26/02
SIGNED Michael Y. Ramsler
by R. Wallace
Chief

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D0425-4

ADDENDUM TO TEST HOLE VARIANCE REQUEST
AMERICAN ENERGY CORPORATION
APPLICATION D-0425-3

Test Hole	Location	Surf. Elev.	Top of Coal Elev.	Overburden Thickness	Attachment 13	Drill Log	Chemical Analysis
AEC-2000-01	NE Qtr. Sec. 36	1023	682	341	X		Yes
*AEC-2000-02	NE Qtr. Sec. 30	1264	664	600	X		Yes
AEC-2000-03	NE Qtr. Sec. 31	976	676	300	X		Yes
AEC-2000-04	NE Qtr. Sec. 19	1267	670	597	X		Yes
AEC-2001-02	NE Qtr. Sec. 25	1239	677	562	X		Yes
AEC-2001-04	NW Qtr. Sec. 31	1004	676	328	X		Yes
AEC-2001-10	NW Qtr. Sec. 36	1267	687	580	X		Yes
*AEC-2001-14	SE Qtr. Sec. 30	1315	641	674	X		Yes
AEC-2001-16	SW Qtr. Sec. 31	1225	688	537	X		Yes
AEC-2001-24	SE Qtr. Sec. 7	1140	711	429	X		Yes
AEC-2001-25	SW Qtr. Sec. 1	1220	707	513	X		Yes
CLC-2001-29	SE Qtr. Sec.31	1210	688	522	X		No
N94-15	SE Qtr. Sec. 36	1199	653	546		X	No
N94-16	SE Qtr. Sec. 25	1279	677	602		X	No
N94-17	NW Qtr. Sec. 6	1183	707	476		X	No
*N94-41	NE Qtr. Sec. 5	1149	676	473	X		Yes
*NA-87-10	SE Qtr. Sec. 30	1332	656	676		X	No
*DDH-09	NE Qtr. Sec. 24	1120	610	510		X	No
Y & O-7	SE Qtr. Sec. 1	1060	701	359		X	No

* N94-41 located outside proposed shadow area, south of southwest corner.

* DDH-09 located outside proposed shadow area, south of northeast corner.

* AEC-2000-02 located outside proposed shadow area, east of southeast corner.

* NA-87-10 located outside proposed shadow area, east of southeast corner.

* AEC-2001-14 located outside proposed shadow area, east of southeast corner.

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D0425-8

ATTACHMENT 13

DIAMOND DRILL HOLE:
Y&O-7

HETAGER DIAMOND DRILLING

R, INC.

NIA 15767

Field Engineer: Kim Cecil
Surface Elevation: 1,060
Drill Hole Coordinates (State Plane 1927 NA Datum) DATE 2-16-67 19
Northing: 683,189
Easting: 2,415,888 nt STATE Ohio
Drilling Company: Leroy G. Hetager, Inc. DRILL NO. 1

FOR Y. & O. COAL
Latta Boan Proper
ON between twp. road
Crabapple Creek,
HOLE NO. DDH-7

Page I CLASSIFICATION	THICKNESS OF STRATA FEET	INS.	DEPTH FROM SURFACE FEET	INS.	Properties
Surface sand and silt, soft	5.	0	5.	0	CV, eV
Brown sandstone coarse grained	21.	0	26.	0	cs, es
Gray sandstone, coarse grained	26.	10	52.	10	cs, es
COAL, dirty with shale Waynesburg "A"	0.	9	53.	7	ac, cv, ev
Gray ~~sk~~ clay shale	16.	5	70.	0	CV, eV
Gray sandstone	11.	0	81.	0	cs, es
Green shale	2.	8	83.	8	cm, em
Gray limestone	2.	4	86.	0	ak, cs, es
Green shale	8.	0	94.	0	cm, em
Limestone	3.	2	97.	2	ak, cs, es
Shale, gray	2.	10	100.	0	cm, em
Black shale	0.	10	100.	10	ac, cm, e
Gray limey shale	9.	2	110.	0	ak, cm, em
Gray sandstone	7.	5	117.	5	cs, es
Gray clayey shale	2.	7	120.	0	cm, em
Black shale	2.	0	122.	0	ac, cm, em
Gray shale & Limestone	30.	2	152.	2	ak, cs, es
Black shale	0.	4	152.	6	ac, cm, em
Green shale	3.	6	156.	0	cm, em
Red shale	0.	9	156.	9	cm, em
Gray limey shale	10.	0	166.	9	ak, cm, em
Red shale	0.	3	167.	0	cm, em
	continued to page 2				

STARTED 2-8-67 COMPLETED 2-14-67 19 TOTAL

FORM 2

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D0425-4

AEC 18800

EROY G. HETTAGER, INC.
DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Y. & O. COAL COMPANY ADDRESS Martin's Ferry, Ohio DATE 2-16-67 19

ON Latta Ban Property located between twp. road 103 and Crab- apple Creek, w. of twp. line TWP. Sec. 1 Wayne Twp. COUNTY Belmont STATE Ohi

HOLE NO. DDH-7 SIZE HOLE 4" EL DRILLER HARRY MERRITT DRILL NO. 1

Page II CLASSIFICATION	THICKNESS OF STRATA FEET	INS. THS.	DEPTH FROM SURFACE FEET	INS. THS.	Propert
Green shale	2.	0	169.	0	Cm, cm
Gray sandstone	3.	0	172.	0	Cs, cs
Green shale	2.	8	174.	8	Cm, cm
Gray limestone	12.	7	187.	3	Ck, cs, c
Green weathered shale	1.	3	188.	6	Cm, cm
Red shale	1.	6	190.	0	Cm, cm
Green shale with some red	15.	00	205.	0	Cm, cm
Gray limestone	6.	0	211.	0	ck, cs, c
Green shale	4.	9	215.	0	Cm, cm
Gray limestone	9.	6	224.	6	ck, cs, c
Green shale	3.	0	227.	6	Cm, cm
Gray limestone with some shale	38.	6	266.	0	ck, cs, c
Black shale	3.	3	269.	3	oc, cm, c
COAL Sewickley No. 9	2.	6	271.	9	oc, cv, cv
Gray shale	10.	3	282.	0	Cm, cm
Gray limestone	8.	0	290.	0	ck, cs, c
COAL	1.	8	291.	8	oc, cv, cv
Binder	0.	3	291.	11	Cm, cm
COAL	0.	7	292.	6	oc, cv, cv
Gray clayey shale	2.	0	294.	6	Cm, cm
Gray limestone	5.	0	299.	6	ck, cs, c
Black limestone	0.	6	300.	0	Cm, cm
			continued on page 3		

STARTED 2-8-67 COMPLETED 2-14-67 19 TOTAL

FORM 2

ORIGINAL

DD-25-9

AEC 18801

EROY G. HETTAGER, INC.
DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Y. & O. COAL CO. ADDRESS Martin's Ferry DATE 2-16-67 19

ON Lotta Boan Property located between twp. road 103 and Crabapple Creek, W. of twp. line TWP. Sec. 1 Wayne Twp. COUNTY Belmont STATE Ohio

HOLE NO. DDH-7 SIZE HOLE 4" EL. DRILLER HARRY MERKINT DRILL NO. 1

Page III

CLASSIFICATION	THICKNESS OF STRATA FEET	INS. THS.	DEPTH FROM SURFACE FEET	INS. THS.	
Gray limestone	15.	6	315.	6	ak,cs,es
Gray limey shale	7.	6	323.	0	ak,cm,cv
Gray limestone	2.	7	325.	7	ak,cs,es
Gray clay shale	2.	6	328.	1	cm,cm
Black shale	0.	6	328.	7	ac,cm,cv
COAL	1.	0	329.	7	ac,cv,cv
Gray limestone	16.	5	346.	0	ak,cs,es
Gray clah shale	5.	9	351.	9	cm,cm
COAL Roof Coal	1.	2	352.	11	ac,cv,c
Binder (shale)	1.	0	353.	11	cm,cv
COAL Pay - 2	5.	1	359.	0	ac,cv,c
Gray shale	3.	0	362.	0	cm,cm

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 150.83 ft 41%
Soft Rock 211.17 ft 59%
362.00 ft

STARTED 2-8-67 COMPLETED 2-14-67 19 TOTAL 362. 0 362.0

FORM 2

ORIGINAL

DD425-4

AEC 18802

ATTACHMENT 13

DIAMOND DRILL HOLE:
DDH-09

arkay
arce

Field Engineer: Kim Cecil
Surface Elevation: 1,120
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 677,890 le plugged.
Easting: 2,431,025
Drilling Company:

	Thickness		Total Depth		Propr
	Feet	Inches	Feet	Inches	
Surface	15	0	15	0	—
Brown and Gray Sandstone	5	11	20	11	cs, e
Gray Shale	2	4	23	3	cm, e
Soft Gray Clay	8	8	31	11	cv, e
Red Clay, Not Recovered	4	1	36	0	cv, e
Soft Red Clay	14	5	50	5	cv, e
Gray Shale	10	0	60	5	cm, e
Gray Sandy Shale	6	5	66	10	cs, e
Gray Silty Shale	15	4	82	2	cm, e
Gray Sandy Shale	1	8	83	10	cs, e
Soft Red Clay, Not Cored	5	4	89	2	cv, e
Gray Sandy Shale	6	9	95	11	cs, e.
Red Shale	1	6	97	5	cm, e
Gray Shale	3	6	100	11	cm, e
Red and Gray Shale	1	10	102	9	cm, e
Gray Sandy Shale	14	1	116	10	cs, e
Gray Argillaceous Shale	9	8	126	6	cm e
Fine Grained Gray Sandstone	4	0	130	6	cs, e
Gray Sandy Shale	4	2	134	8	cs, e
Soft Dark Calcareous Clay	5	4	140	0	cv, ev
Black Shale	0	5	140	5	ac, cm
Coal Washington No. 12	4	0	144	5	ac, cv, e
Hard Gray Calcareous Clay	13	5	157	10	ak, cm, e
Gray Sandy Shale	9	10	167	8	cs, es
Gray Calcareous Clay	5	0	172	8	ak, cv, e
Gray Sandy Shale	3	10	177	6	cs, es
Gray Clay	1	10	179	4	cv, ev
Red Clay	2	7	181	11	cv, ev
Gray Clay	5	11	187	10	cv, ev
Gray Shale	10	10	198	8	cm, em
Coal WAYNESBURG "A" COAL	3	2	201	10	ac, cv, e
Pyrite	0	2	202	0	ac, cs, e
Coal	3	2	205	2	ac, cv, e
Argillaceous Limestone	5	5	210	7	ak, cs, e
Calcareous Clay	9	0	219	7	ak, cv, e
Gray Sandy Shale	6	4	225	11	cm, em
Gray Shale	2	5	228	4	cm, em
Gray Argillaceous Limestone	2	0	230	4	ak, cs, e
Gray Sandy Shale	7	3	237	7	cs, es
Dark Gray Shale	2	7	240	2	cm, em

ORIGINAL

AEC 18803

	Thickness Feet	Thickness Inches	Total Depth Feet	Total Depth Inches	Proper
Gray Argillaceous Shale	4	5	244	7	cm, e
Soft Dark Gray Clay	2	3	246	10	cv, e
Shaley Coal	0	11	247	9	ac, cm
Gray Shale	4	3	252	0	cm, e
Gray Sandy Shale	4	0	256	0	cs, e
Gray Carbonaceous Sandstone	5	1	261	1	cs, e
Gray Sandy Shale	3	10	264	11	cs, es
Gray Shale	1	7	266	6	cm, e
Shaley Coal Waynesburg No. 11	0	9	267	3	ac, cm
Soft Gray Clay	2	0	269	3	cv, e
Gray Limestone	3	2	272	5	ak, cs,
Hard Gray Clay	4	4	276	9	cm, e
Gray Argillaceous Limestone	11	2	287	11	ak, cs,
Soft Gray Clay	3	8	291	7	cv, ev
Gray Argillaceous Limestone	2	4	293	11	ak, cs
Soft Pyritic Clay	1	9	295	8	ac, cm
Gray Sandy Shale	2	7	298	3	cs, es
Fine Grained Gray Sandstone	6	11	305	2	cs, es
G ray Sandy Shale	3	4	308	6	cs, es
Green Shale	1	0	309	6	cm, e
Red Shale	1	6	311	0	cm, e
Green Shale	0	11	311	11	cm, e
Gray Argillaceous Limestone	9	0	320	11	ak, cs,
Green Shale	3	9	324	8	cm, e
Red Shale	0	8	325	4	cm, e
Gray Argillaceous Limestone	9	0	334	4	ak, cs,
Gray Limestone	3	5	337	9	ak, cs,
Gray Argillaceous Shale	6	6	344	3	cm, en
Gray Calcareous Clay	3	3	347	6	ak, cv,
Gray Silty Shale	20	6	368	0	cm, e
Gray Argillaceous Shale	14	11	382	11	cm, en
Green Shale	1	7	384	6	cm, en
Gray Limestone	6	3	390	9	ak, cs,
Gray Argillaceous Shale	6	9	397	6	cm, e
Gray Silty Shale	5	3	402	9	cm, en
Gray Argillaceous Shale	6	9	409	6	cm, e
Black Carbonaceous Shale	4	2	413	8	ac, cm,
Coal Sewickley No. 9	2	2	415	10	ac, cv,
Black Shale	2	0	417	10	ac, cm,
Dark Gray Shale	3	2	421	0	cm, e
Gray Shale	6	4	427	4	cm, en
Gray Sandy Shale	1	2	428	6	cs, c
Gray Shale	7	5	435	11	cm, e
Coal	0	9	436	8	ac, cv, e
Gray Shale	3	1	439	9	cm, e
Coal	0	7	440	4	ac, cv, e
Black Shale	1	0	441	4	ac, cm, e
Coal	0	7	441	11	ac, cv, e
Black Shale	0	11	442	10	ac, cm, e
Gray Argillaceous Shale	19	5	462	3	cm, em
Dark Shale	8	6	470	9	cm, em
Gray Argillaceous Limestone	5	2	475	11	ak, cs, e
Gray Clay	2	2	478	1	cv, ev
Shaley Coal	0	6	478	7	ac, cm, e
Gray Shale	3	8	482	3	cm, em
Dark Gray Sandy Shale	5	2	487	5	cs, cs

ORIGINAL

00425-4

AEC 18804

	Thickness Feet	Thickness Inches	Total Depth Feet	Total Depth Inches	Prop
Hard Gray Limestone	1	10	489	3	ak,cs
Medium Gray Limestone	2	0	491	3	ak, cs
Hard Gray Limestone	2	0	493	3	ak,cs,
Medium Gray Calcareous Shale	3	0	496	3	ak,cm
Gray and Medium Gray Shale	2	5	498	8	cm,c
Gray Clay Shale (With Calcareous Nodules)	0	6	499	2	ak,cm,
Gray Shale with Limestone Bands	0	6	499	8	ak,cm
Gray Clay Shale	2	3	501	11	cm,c
Dark Gray to Black Shale	0	5	502	4	ac,cm
Roof Coal	1	2-1/2	503	6-1/2	ac,cv,
Dark Gray to Black Shale	0	2-1/2	503	9	ac,cm
Gray Shale (Draw Slate)	0	10	504	7	
(Slightly Bony Coal	0	1-1/4	504	8-1/4	ac,cm
(Coal, few thin fusian streaks, occasional pyrite	1	8-3/4	506	5	
(Medium Gray Shale	0	0-1/4	506	5-1/4	
(Coal (vertical fracture) few fusian lenses	2	2	508	7-1/4	
No. 8 coal 5' - 1½" (Dark Gray Shale	0	0-1/4	508	7-1/2	
(Coal	0	2-3/8	508	9-7/8	
(Shale	0	0-1/8	508	10	ac,cv,
(Coal	0	5	509	3	
(Coal, thin fusian streaks	0	5-1/2	509	8-1/2	
Medium Gray Shale	2	3-1/2	512	0	

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 84.8 ft 16%
Soft Rock 427.2 ft 84%
512.00 ft

ORIGINAL

00425-4

AEC 18805

ATTACHMENT 13

DIAMOND DRILL HOLE:
NA-87-10

Field Engineer: Kim Cecil
Surface Elevation: 1,332 72-1UH
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 676,339
Easting: 2,426,242

DRILL HOLE N Drilling Company: L J Hughs & Sons, Inc. AMRICK

DRILLING FOR CLEVELAND, OHIO

SURFACE ELEV r 16, 1987
r 27, 1987

LOCATION: OHIO, MONROE COUNTY
SUNSBURY TOWNSHIP
SOUTHEAST 1/4
SECTION 30.

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Properti
CASING	18.00	18.00	
GREEN SANDSTONE	12.00	30.00	CS eS
RED AND GREEN SHALE	15.00	45.00	cm, em
RED AND GREEN CLAYSTONE	15.00	60.00	cV eV
GREEN SHALE	15.00	75.00	cm, em
RED CLAYSTONE	10.00	85.00	cV eV
GREEN SHALE	13.40	98.40	cm, em
RED AND GREEN SHALE	3.60	102.00	cm, em
GREEN SHALE	6.00	108.00	cm, em
GRAY SANDSTONE	7.00	115.00	cS eS
GREEN SHALE	4.70	119.70	cm, em
RED AND GREEN SHALE	4.20	123.90	cm, em
GRAY CLAYSTONE	5.00	128.90	cV, eV
GRAY SHALE	1.10	130.00	cm, em
GREEN LIMY SHALE	7.00	137.00	cK, cm, e
RED CLAYSTONE	3.50	140.50	cV, eV
GREEN SHALE	7.50	148.00	cm, em
RED AND GREEN SHALE	4.70	152.70	cm, em
GREEN LIMY SHALE	2.30	155.00	cK, cm, e
GRAY SANDSTONE	2.90	157.90	cS eS
GREEN SHALE	2.10	160.00	cm, em
RED CLAYSTONE	5.00	165.00	cV eV
GREEN SHALE	14.00	179.00	cm, em
RED SHALE	21.00	200.00	cm, em
GREEN LIMY SHALE	11.90	211.90	cK, cm, e
RED AND GREEN CLAYSTONE	16.10	228.00	cV eV
GREEN LIMY SHALE	7.00	235.00	cK, cm, e
GREEN SHALE	15.00	250.00	cm, em

ORIGINAL

0425-

AEC 18806

LJ HUGHES & SONS, INC.

THE NORTH AMERICAN COAL CORPORATION

CONTINUATION OF DRILL HOLE NO. NA-87-10

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE	Properties
			250.00	
RED AND GREEN CLAYSTONE	5.80		255.80	cv, ev
LIMESTONE	2.50		258.30	ak, cs, e
RED AND GREEN CLAYSTONE	1.30		259.60	cv, ev
GREEN LIMY SHALE	5.40		265.00	ak, cm, e
GREEN SHALE	2.00		267.00	cm, em
GRAY SANDSTONE	3.90		270.90	cs, es
GREEN SHALE	6.50		277.40	cm, em
RED SHALE	2.60		280.00	cm, em
GREEN SHALE	25.00		305.00	cm, em
GRAY CLAYSTONE	6.00		311.00	cv, ev
COAL	2.10		313.10	ac, cv, e
GRAY SHALE	0.50	WASHINGTON (No.12)	313.60	cm, em
COAL	1.00		314.60	ac, cv, e
GRAY CLAYSTONE	2.90		317.50	cv, ev
GREEN CLAYSTONE	10.30		327.80	cv, ev
RED CLAYSTONE	6.60		334.40	cv, ev
GREEN SANDY SHALE	5.60		340.00	cs, es
GRAY SANDY SHALE	16.60		356.60	cs, es
GREEN SHALE	1.60		358.20	cm, em
COAL	0.55		358.75	ac, cv, e
GRAY SHALE WITH PYRITE	0.45		359.20	ac, cm, e
COAL	0.20	WAYNESBURG "A"	359.40	ac, cv, e
GRAY SHALE	0.30		359.70	cm, em
COAL WITH SHALE STREAKS	6.50		366.20	ac, cm, e
GRAY SHALE	0.80		367.00	cm, em
LIMESTONE WITH SHALE	3.00		370.00	ak, cs, e
GREEN LIMY SHALE	8.50		378.50	ak, cm, e
GRAY SANDSTONE	6.50		385.00	cs, es
GREEN SHALE	3.80		388.80	cm, em
LIMESTONE	1.30		390.10	ak, cs, e
GREEN LIMY SHALE	1.50		391.60	ak, cm, e
GRAY SANDSTONE	5.60		397.20	cs, es
GREEN SHALE	4.90		402.10	cm, em
LIMESTONE	4.50		406.60	ak, cs, e
GRAY CLAYSTONE	3.10		409.70	cv, ev
BLACK SHALE	0.50		410.20	ac, cm, e
COAL	0.60	Waynesburg No. 11	410.80	ac, cv, e
GRAY SHALE	4.20		415.00	cm, em
GRAY SANDSTONE WITH SHALE	8.20		423.20	cs, es
GRAY SHALE	2.50		425.70	cm, em
COAL	0.30		426.00	ac, cv, e
GRAY SHALE	0.50		426.50	cm, em
GRAY CLAYSTONE	3.50		430.00	cv, ev
LIMESTONE WITH SHALE	20.30		450.30	ak, cs, e
GREEN CLAYSTONE	7.50		457.80	cv, ev
GRAY CLAYSTONE	2.20		460.00	cv, ev
GREEN CLAYSTONE	1.60		461.60	cv, ev
GREEN SHALE	4.00		465.60	cm, em

ORIGINAL

00625-4

AEC 18807

LJ HUGHES & SONS, INC.

THE NORTH AMERICAN COAL CORPORATION

CONTINUATION OF DRILL HOLE NO. NA-87-10

FORMATION	STRATA THICKNESS		DEPTH FROM SURFACE 465.60	Properties
RED AND GREEN SHALE	3.40		469.00	cm, em
LIMESTONE WITH SHALE	24.20		493.20	ak, cs, e
GRAY CLAYSTONE	2.00		495.20	cv, ev
LIMESTONE WITH SHALE	5.20		500.40	ak, cs, e
GREEN CLAYSTONE	4.10		504.50	cv, ev
LIMESTONE	10.30		514.80	ak, cs, s
GREEN SHALE	3.60		518.40	cm, em
LIMESTONE WITH SHALE	46.60		565.00	ak, cs, e
GRAY CLAYSTONE	2.40		567.40	cv, ev
GRAY SHALE	0.30		567.70	cm, em
COAL	0.20	SEWICKLEY (No.9)	567.90	ac, cv, e
GRAY SHALE	2.00		569.90	cm, em
GREEN SANDY SHALE	10.10		580.00	cs, es
GRAY SANDSTONE	14.00		594.00	cs, es
GRAY SANDY SHALE	1.00		595.00	cs, es
GRAY SHALE	6.45		601.45	cm, em
GRAY SANDSTONE WITH COAL STREAKS	1.30		602.75	cs, es
GRAY CLAYSTONE	0.40		603.15	cv, ev
COAL	1.20		604.35	ac, cv, e
GRAY SHALE	0.20	FISHPOT	604.55	cm, em
COAL	0.60		605.15	ac, cv, e
LIMESTONE WITH SHALE	19.85		625.00	ak, cs, e
GREEN SHALE	4.30		629.30	cm, em
GRAY SHALE	5.00		634.30	cm, em
LIMESTONE	9.70		644.00	ak, cs, e
BONY COAL	0.85	REDSTONE	644.85	ac, cv, e
LIMY SHALE	2.50		647.35	ak, cm, e
LIMESTONE	2.65		650.00	ak, cs, e
LIMESTONE WITH CLAYSTONE STREAKS	15.00		665.00	ak, cs, e
GREEN CLAYSTONE	3.90		668.90	cv, ev
GRAY SHALE	0.50		669.40	cm, em
BONY COAL	0.85	ROOF COAL	670.25	ac, cv, e
GRAY SHALE	0.85		671.10	cm, em
COAL	5.05	PITTSBURGH (No.8)	676.15	ac, cv, e
GRAY LIMY SHALE	8.85		685.00	ak, cm, e

TOTAL DEPTH: 685 FEET

25 BAGS CEMENT PLACED IN HOLE

Hard Rock 218.3ft 32%
Soft Rock 466.7ft 68%

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate, s-slight)
Erodible: e(v-very, m-moderate, s-slight)

00425-4

ATTACHMENT 13

DIAMOND DRILL HOLE:
N94-15

Field Engineer: Kim Cecil
Surface Elevation: 1,199 872-1111
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 675,369
Easting: 2,420,873

DRILL HOLE: Drilling Company: L J Hughs & Sons H MILLER

DRILLING FO

SURFACE ELE

ER 4 1994
ER 5 1994

LOCATION: OHIO BELMONT COUNTY

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Prepared
CASING	20.00	20.00	
RED SHALY CLAYSTONE	16.10	36.10	CV eV
GRAY SHALY CLAYSTONE	9.00	45.10	CV, eV
RED SHALY CLAYSTONE	6.30	51.40	CV, eV
GRAY LIMY SHALY CLAYSTONE	8.60	60.00	aK, CV, e
RED AND GRAY SHALY CLAYSTONE	17.90	77.90	CV, eV
GRAY LIMY SHALY CLAYSTONE	16.00	93.90	aK, CV, e
GRAY SHALE	6.10	100.00	CM, eM
GRAY SHALY CLAYSTONE	4.40	104.40	CV, eV
RED SHALY CLAYSTONE	0.80	105.30	CV, eV
GRAY LIMESTONE	2.50	107.70	aK, CS, e
GRAY LIMY SHALE	8.70	116.40	aK, CM, e
RED SHALY CLAYSTONE	1.30	117.70	CV, eV
GRAY LIMY SHALE	7.60	125.30	aK, CM, e
RED AND GRAY SHALY CLAYSTONE	3.50	128.80	CV, eV
GRAY SHALY CLAYSTONE	6.00	134.80	CV, eV
RED AND GRAY SHALY CLAYSTONE	3.50	138.30	CV, eV
GRAY LIMY SHALY CLAYSTONE	5.60	143.90	aK, CV, e
GRAY SANDSTONE	0.80	144.70	CS, eS
GRAY SHALY CLAYSTONE	2.20	146.90	CV, eV
GRAY SANDSTONE	1.00	147.90	CS, eS
GRAY SHALY CLAYSTONE	2.60	150.50	CV, eV
GRAY SHALY CLAYSTONE WITH COAL SPARS	0.30	150.80	aC, CV, e

ORIGINAL

00425-4

AEC 18809

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Proper
		150.80	
DARK GRAY SHALY CLAYSTONE	5.00	155.80	CV CV
BONY COAL	0.50	156.30	ac, cv,
COAL WITH PYRITE NODULES AND SHALE STREAKS . . .	0.50	156.80	ac, cv,
COAL	1.42 Washington No. 12	158.22	ac, cv,
DARK SHALE	0.19	158.41	cm, c
COAL	0.09	158.50	ac, cv,
DARK SHALE	0.07	158.57	cm, c
COAL (LOSS 0.30) . . .	1.08	159.65	ac, cv,
GRAY SHALY CLAYSTONE	8.05	167.70	CV, CV
GRAY SHALY CLAYSTONE WITH SANDSTONE BANDS	3.60	171.30	cm, c
GRAY SANDSTONE	48.10	219.40	cs, cs
GRAY SHALE	1.50	220.90	cm, c
GRAY SANDSTONE WITH SHALE STREAKS	1.80	222.70	cs, cs
GRAY SANDSTONE	3.00	225.70	cs, cs
GRAY SHALY CLAYSTONE	0.10	225.80	CV, CV
GRAY SANDSTONE WITH SOME SHALE STREAKS	5.70	231.50	cs, cs
COAL WITH PYRITE . . .	0.15	231.65	ac, cv,
DARK SHALY CLAYSTONE	0.21	231.86	CV, CV
GRAY SANDSTONE	0.24	232.10	cs, cs
GRAY SHALY CLAYSTONE	0.27	232.37	CV, CV
GRAY SANDSTONE WITH SHALE NODULES	0.40	232.77	cs, cs
GRAY SANDY SHALE WITH SANDSTONE STREAKS	0.73	233.50	cs, cs
GRAY SANDSTONE	15.60	249.10	cs, cs
DARK GRAY SANDY SHALE	0.60	249.70	cs, c
GRAY SANDSTONE WITH SHALE STREAKS	8.40	258.10	cs, c
GRAY SANDSTONE WITH COAL SPARS	6.70	264.80	cs, c
GRAY SHALY CLAYSTONE WITH LIME NODULES	1.80	266.60	ak, cm,
GRAY LIMESTONE	0.90	267.50	ak, cs, c
GRAY LIMY SHALY CLAYSTONE	4.30	271.80	ak, cm,
GRAY LIMESTONE	3.50	275.30	ak, cs, c
DARK GRAY LIMY SHALY CLAYSTONE	3.70	279.00	ak, cm, c
BLACK BONY SHALE	0.70	279.70	ac, cm, c
GRAY SHALY CLAYSTONE	1.20	280.90	CV, CV
GRAY SANDY SHALE	2.20	283.10	cs, cs
GRAY SANDSTONE	1.60	284.70	cs, cs
GRAY LIMY SHALY CLAYSTONE	2.10	286.80	ak, cm, c
GRAY SANDSTONE	10.00	296.80	cs, cs
GRAY SANDY SHALE WITH SANDSTONE STREAKS	3.45	300.25	cs, cs

ORIGINAL

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE 300.25	Proper
COAL	0.10 Waynesburg No. 11	300.35	aa,cv,c
GRAY SHALY CLAYSTONE	0.50	300.85	cv,cv
COAL WITH PYRITE . . .	0.28	301.13	aa,cv,c
DARK GRAY SHALY CLAYSTONE	1.98	303.11	cv,cv
COAL	0.05	303.16	aa,cv,
GRAY SHALY CLAYSTONE	0.90	304.06	cv,cv
GRAY LIMESTONE	1.34	305.40	ak,cs
GRAY LIMY SHALY CLAYSTONE	7.10	312.50	ak,cm
GRAY LIMESTONE	5.00	317.50	ak,cs,c
GRAY LIMY SHALY CLAYSTONE	3.60	321.10	ak,cm
GRAY LIMESTONE	1.30	322.40	ak,cs,c
GRAY LIMY SHALY CLAYSTONE	7.70	330.10	ak,cm
GRAY LIMESTONE	1.60	331.70	ak,cs,c
GRAY LIMY SHALY CLAYSTONE	6.00	337.70	ak,cm
RED AND GRAY SHALY CLAYSTONE	2.70	340.40	cv,cv
GRAY LIMY SHALY CLAYSTONE	13.40	353.80	ak,cm
GRAY SANDSTONE WITH SHALE STREAKS	2.40	356.20	cs,cs
GRAY SHALY CLAYSTONE	0.90	357.10	acm,c
GRAY SHALY LIMESTONE	19.60	376.70	ak,cs,c
GREEN LIMY SHALY CLAYSTONE	3.20	379.90	ak,cm,c
GRAY SANDSTONE WITH SHALE STREAKS	0.80	380.70	cs,cs
GREEN SHALE	0.70	381.40	cm,cm
GRAY SHALY LIMESTONE	3.90	385.30	ak,cs,c
GREEN SHALY LIMY CLAYSTONE	0.90	386.20	ak,cm,c
GRAY LIMESTONE	4.20	390.40	ak,cs,c
GREEN LIMY SHALY CLAYSTONE	5.20	395.60	ak,cm,c
GRAY LIMESTONE	2.70	398.30	ak,cs,c
DARK GRAY LIMY SHALY CLAYSTONE	1.30	399.60	ak,cm,c
GRAY LIMESTONE	3.70	403.30	ak,cs,c
GRAY LIMY SHALE	6.30	409.60	ak,cm,c
GRAY LIMESTONE	3.50	413.10	ak,cs,c
GRAY LIMY SHALE	4.10	417.20	ak,cm,c
WHITE LIMESTONE	5.70	422.90	ak,cs,c
GRAY LIMESTONE WITH GREEN LIMY SHALY CLAYSTONE	7.90	430.80	ak,cs,c
GRAY GREEN LIMY SHALE	2.80	433.60	ak,cm,c
GRAY LIMESTONE	2.90	436.50	ak,cs,c
GRAY GREEN LIMY SHALY CLAYSTONE	5.40	441.90	ak,cm,c
DARK GRAY SHALY CLAYSTONE	1.20	443.10	cv,cv
GRAY LIMESTONE	0.40	443.50	ak,cs,c
DARK GRAY SHALY CLAYSTONE	1.80	445.30	cv,cv
DARK SHALE	0.30	445.60	cm,cm

ORIGINAL

DC425-4

AEC 18811

L) HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	
		445.60	
BLACK SHALE WITH COAL SPARS	0.15	445.75	
PYRITE	0.02	445.77	
COAL	0.58	446.35	
DARK SHALE	0.05	446.40	
COAL	1.95	448.35	
BLACK SHALE WITH PYRITE AND COAL STREAKS	0.10	448.45	
GRAY SHALY CLAYSTONE	2.05	450.50	
GRAY GREEN LIMY SHALY CLAYSTONE	16.60	467.10	
DARK SHALY CLAYSTONE	0.30	467.40	
DARK SHALY CLAYSTONE WITH COAL SPARS	0.12	467.52	
COAL	0.15	467.67	
GRAY SHALY CLAYSTONE	0.18	467.85	
COAL	0.16	468.01	
BONE	0.08	468.09	
COAL	0.08	468.17	
DARK SHALE	0.26	468.43	
GRAY SHALE	0.20	468.63	
COAL	1.19	469.82	
GRAY SHALY CLAYSTONE	0.20	470.02	
DARK SHALE	0.88	470.90	
GRAY LIMESTONE WITH SOME SHALE	19.20	490.10	
GRAY GREEN SANDY SHALE WITH SANDSTONE STREAKS	9.20	499.30	
DARK SHALY CLAYSTONE	3.90	503.20	
DARK GRAY LIMESTONE	3.30	506.50	
GRAY GREEN SHALY CLAYSTONE	1.80	508.30	
GRAY SHALY CLAYSTONE	1.20	509.50	
DARK SHALY CLAYSTONE	5.50	515.00	
BLACK SHALE	0.60	515.60	
DARK GRAY LIMY SHALY CLAYSTONE	4.60	520.20	
WHITE LIMESTONE	12.10	532.30	
GRAY SHALY CLAYSTONE WITH LIMESTONE NODULES	3.80	536.10	
GRAY SHALY CLAYSTONE	1.60	537.70	
DARK GRAY SHALY CLAYSTONE WITH PYRITE STREAKS	1.10	538.80	
GRAY SHALY CLAYSTONE WITH SHALE STREAKS	0.54	539.34	
DARK SHALY CLAYSTONE	0.33	539.67	
BONY COAL	0.05	539.72	
COAL WITH PYRITE STREAKS . . .	0.86	540.58	

Seowalley No. 9

Roof Coal

ORIGINAL

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

FORMATION	STRATA THICKNESS	540.58 DEPTH FROM SURFACE	Proper
BONE	0.09	540.67	ac, cv
DARK SHALE	0.13	540.79	cm, c
GRAY SHALY CLAYSTONE	0.67	541.46	cv, cs
DARK SHALE WITH COAL SPARS	0.05	541.51	ac, cm
PYRITE WITH COAL SPARS	0.09 Pittsburgh NO. 8	541.60	ac, cm
COAL	1.71	543.31	ac, cv
GRAY CLAYSTONE	0.03	543.34	cv, cv
COAL	3.01	546.35	ac, cv
COAL WITH PYRITE NODULES . . .	0.08	546.43	ac, cv
COAL	0.18	546.61	ac, cv
COAL WITH PYRITE NODULES AND STREAKS . . .	0.07	546.68	ac, cv
DARK GRAY SHALY CLAYSTONE	0.23	546.91	cv, cv
GRAY LIMY SHALY CLAYSTONE	8.19	555.10	ak, cm
GRAY SANDSTONE WITH LIME	2.00	557.10	ak, cs
GRAY SANDSTONE	1.60	558.70	cs, cs
GRAY SHALY CLAYSTONE	1.90	560.60	cv, cv
GRAY SANDSTONE	2.50	563.10	cs, cs
GRAY SANDY SHALE WITH SANDSTONE AND LIME STREAKS	1.90	565.00	ak, cs,

TOTAL DEPTH OF HOLE = 565.00 FEET

20 BAGS CEMENT PLACED IN HOLE

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 217.88 38.5%
Soft Rock 347.12 61.5%
565.00 ft

ORIGINAL

00425-4

AEC 18813

ATTACHMENT 13

DIAMOND DRILL HOLE:
B94-16

Field Engineer: Kim Cecil
Surface Elevation: 1,279 872-1111
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 680,939
Easting: 2,426,487

Drilling Company: L J Hughs & Sons, Inc. H MILLER

DRILL HOLE:

DRILLING FO

SURFACE ELE

ER 6 1994
ER 11 1994

LOCATION: OHIO BELMONT COUNTY

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Properties
CASING	20.00	20.00	
RED SHALY CLAYSTONE	2.00	22.00	CV, eV
GRAY SANDY SHALE	7.50	29.50	CS, eS
GRAY SHALY CLAYSTONE	0.80	30.30	CV, eV
SHALY COAL . . .	0.40	30.70	aC, CV, e
DARK GRAY SHALY CLAYSTONE	2.00	32.70	CV, eV
GRAY SANDY LIMESTONE	3.00	35.70	aK, CS, e
GRAY LIMY SHALY CLAYSTONE	2.30	38.00	aK, Cm, e
GRAY LIMY SANDSTONE	7.10	45.10	aK, CS, e
GRAY SHALY CLAYSTONE	3.10	48.20	CV, eV
RED SHALY CLAYSTONE	6.30	54.50	CV, eV
GRAY SHALY CLAYSTONE	3.70	58.20	CV, eV
SHALY COAL . . .	0.20	58.40	aC, CV, e
DARK SHALE	3.40	61.80	Cm, en
GRAY SHALY CLAYSTONE	0.10	61.90	CV, eV
BLACK SHALE	1.20	63.10	aC, Cm, e
GRAY LIMY SHALY CLAYSTONE	17.20	80.30	aK, Cm, e
GRAY SHALE	6.80	87.10	Cm, en
RED SHALY CLAYSTONE	3.40	90.50	CV, eV
GRAY SHALY CLAYSTONE	4.30	94.80	CV, eV
RED AND GRAY SHALY CLAYSTONE	3.20	98.00	CV, eV
GRAY SANDSTONE	4.10	102.10	CS, eS
RED AND GRAY SHALY CLAYSTONE	9.20	111.30	CV, eV
GRAY SANDY SHALE	6.10	117.40	CS, eS
GRAY SHALY CLAYSTONE	5.80	123.20	CV, eV

ORIGINAL

00425-4

AEC 18814

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

FORMATION	STRATA THICKNESS	123.20 DEPTH FROM SURFACE	Report
RED SHALY CLAYSTONE	4.40	127.60	cv, cv
GRAY LIMY SHALY CLAYSTONE	14.50	142.10	ak cm,
RED SHALY CLAYSTONE	9.70	151.80	cv, cv
GRAY LIMY SHALY CLAYSTONE	9.90	161.70	ak cm
RED SHALY CLAYSTONE	1.70	163.40	cv, cv
GRAY SHALE	16.60	180.00	cm, cm
GRAY SHALY CLAYSTONE	6.50	186.50	cv, cv
GRAY LIMESTONE	2.40	188.90	ak, cs, c
GRAY SHALY CLAYSTONE	11.10	200.00	cv, cv
RED AND GRAY SHALY CLAYSTONE	1.40	201.40	cv, cv
GRAY SHALE	4.70	206.10	cm, cm
GRAY SHALY CLAYSTONE	2.00	208.10	cv, cv
GRAY LIMY SHALY CLAYSTONE	5.90	214.00	ak, cm,
GRAY SANDSTONE	3.70	217.70	cs, cs
GRAY SHALY CLAYSTONE	1.10	218.80	cv, cv
GRAY SANDSTONE WITH SHALE STREAKS	1.80	220.60	cs, cs
GRAY SHALY CLAYSTONE	0.60	221.20	cv, cv
BONY COAL	0.40	221.60	ac, cv, c
GRAY LIMY SHALY CLAYSTONE	15.70	237.30	ak, cm, c
BONY SHALE WITH GRAY SHALE STREAKS	1.20	238.50	cm, cm
COAL	0.33 Washington No. 12	238.83	ac, cv, c
BONE	0.05	238.88	ac, cv, c
COAL	1.32	240.20	ac, cv, c
BLACK SHALE	0.12	240.32	ac, cm, c
COAL	0.23	240.55	ac, cv, c
DARK GRAY SHALY CLAYSTONE	0.33	240.88	cv, cv
BLACK SHALE	0.05	240.93	ac, cm, c
COAL	1.35	242.28	ac, cv, c
GRAY SHALY CLAYSTONE	16.12	258.40	cv, cv
GRAY SANDY SHALE	3.00	261.40	cs, cs
GRAY SANDSTONE	6.60	268.00	cs, cs
GRAY SANDY SHALE	12.80	280.80	cs, cs
DARK GRAY SHALY CLAYSTONE	0.90	281.70	cv, cv
COAL	0.86	282.56	ac, cv, c
GRAY SHALY CLAYSTONE	0.14	282.70	cv, cv
COAL WITH BONE BANDS . . .	4.53	287.23	ac, cv, c
GRAY SHALY CLAYSTONE	0.16	287.39	cv, cv
COAL	0.25	287.64	ac, cv, c
BONY COAL	0.07	287.71	ac, cv, c
COAL	1.00	288.71	ac, cv, c
BLACK SHALE	0.04	288.75	ac, cm, c
GRAY LIMESTONE	0.77	289.52	ak, cs, cs
DARK SHALY CLAYSTONE WITH LIME BANDS	0.30	289.82	ak, cm, c
BLACK SHALE	0.60	290.42	ac, cm, c

ORIGINAL

00625-4

AEC 18815

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

FORMATION	STRATA THICKNESS	290.42 DEPTH FROM SURFACE	Proper
GRAY LIMESTONE	1.40	291.82	aK,cs,c
GRAY SHALY CLAYSTONE	0.75	292.57	cV,cV
BLACK SHALE	0.15	292.72	ac,cm,
DARK GRAY LIMESTONE	1.28	294.00	aK,cs,
GRAY LIMY SHALY CLAYSTONE	2.60	296.60	aK,cm,
GRAY LIMY SANDY SHALE	4.20	300.80	aK,cs,
GRAY SHALE	3.10	303.90	cm,c
GRAY LIMY SHALY CLAYSTONE	6.20	310.10	aK,cm,
GRAY SANDSTONE WITH LIME NODULES	6.90	317.00	cs,cs
GRAY LIMY SHALY CLAYSTONE	4.40	321.40	aK,cm,
GRAY LIMESTONE	5.40	326.80	aK,cs,
DARK GRAY SHALY CLAYSTONE	1.60	328.40	cV,cV
GRAY SANDY SHALE	4.80	333.20	cs,c
GRAY SANDSTONE	14.70	347.90	cs,cs
DARK GRAY LIMY SHALY CLAYSTONE	1.00	348.90	aK,cm,
DARK GRAY SHALE	1.70	350.60	cm,c
DARK GRAY SHALY CLAYSTONE	2.10	352.70	cV,cV
COAL WITH PYRITE	0.30 Waynesburg No. 11	353.00	ac,cV,c
GRAY SHALY CLAYSTONE	1.40	354.40	cV,cV
GRAY SHALY LIMESTONE	17.00	371.40	aK,cs,
GRAY LIMESTONE	1.70	373.10	aK,cs,c
GRAY LIMY SHALY CLAYSTONE	4.50	377.60	aK,cm,
GRAY LIMESTONE	3.20	380.80	aK,cs,c
DARK GRAY SHALY CLAYSTONE	2.20	383.00	cV,cV
GREEN SHALY CLAYSTONE	2.20	385.20	cV,cV
GRAY SANDSTONE	5.10	390.30	cs,cs
GRAY SANDY SHALE	1.50	391.80	cs,cs
RED SHALY CLAYSTONE	2.40	394.20	cV,cV
GRAY SHALY CLAYSTONE	1.90	396.10	cV,cV
GRAY LIMESTONE	1.40	397.50	aK,cs,c
GRAY LIMY SHALY CLAYSTONE	11.60	409.10	aK,cm,c
GRAY SHALY LIMESTONE	15.70	424.80	aK,cs,c
GRAY LIMY SHALY CLAYSTONE	21.50	446.30	aK,cm,c
GRAY LIMESTONE	2.70	449.00	aK,cs,c
GRAY LIMY SHALE	13.70	462.70	aK,cm,c
WHITE LIMESTONE	5.70	468.40	aK,cs,c
GRAY SHALY CLAYSTONE	0.80	469.20	cV,cV
GRAY SHALY LIMESTONE	14.80	484.00	aK,cs,c
GRAY LIMY SHALY CLAYSTONE	7.90	491.90	aK,cm,c
GRAY SANDY SHALE	5.80	497.70	cs,cs
GRAY SANDSTONE	27.80	525.50	cs,cs
DARK SHALE	3.40	528.90	cm,cm
DARK SANDSTONE	0.20	529.10	cs,cs
DARK SANDY SHALE WITH COAL AND SANDSTONE STREAKS AND NODULES	0.78	529.88	cm,cm

ORIGINAL 8025-4

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Properties
		529.88	
GRAY SHALE	1.26	531.14	cm,c
COAL	0.20	531.34	ac,cv,c
DARK SHALE WITH PYRITE	0.13	531.47	ac,cm,
COAL	0.72	532.19	ac,cv,
GRAY SHALY CLAYSTONE	0.29	532.48	cv,cv
COAL WITH SHALE BANDS . . .	0.61	533.09	ac,cv,c
DARK SHALY CLAYSTONE	0.90	533.99	cv,cv
GRAY LIMESTONE	16.90	550.89	ak,cs,
GRAY LIMY SHALY CLAYSTONE	5.41	556.30	ak,cm,
GRAY SANDSTONE	3.70	560.00	cs,cs
GRAY LIMY SHALY CLAYSTONE	4.40	564.40	ak,cm,
GRAY LIMESTONE	1.50	565.90	ak,cs,
GRAY SHALY CLAYSTONE	3.00	568.90	cm,c
BONE	0.34	569.24	ac,cs,
PYRITE	0.05	569.29	ac,cs,
COAL	0.45	569.74	ac,cv,
GRAY SHALY CLAYSTONE	0.76	570.50	cv,cv
BLACK SHALY CLAYSTONE	0.50	571.00	ac,cv,
GRAY SHALY CLAYSTONE	0.90	571.90	cv,cv
GRAY LIMY SHALE	2.30	574.20	ak,cm,
GRAY SHALY LIMESTONE	11.20	585.40	ak,cs,
GRAY LIMY SHALY CLAYSTONE	5.60	591.00	ak,cm,
GRAY SHALY CLAYSTONE	1.70	592.70	cv,c
BONE	0.12	592.82	ac,cv,
GRAY SHALY CLAYSTONE	1.05	593.87	cv,cv
BONE	0.06	593.93	ac,cv
BONE WITH PYRITE STREAKS	0.05	593.98	ac,cv,
COAL	1.47 Roof Coal	595.45	ac,cv,
DARK SHALE	0.04	595.49	cm,c
COAL	0.06	595.55	ac,cv,
DARK SHALE	0.03	595.58	cm,c
COAL	0.09	595.67	ac,cv,c
DARK SHALY CLAYSTONE WITH COAL SPARS	0.10	595.77	cv,cv
DARK GRAY SHALY CLAYSTONE	0.36	596.13	cv,cv
GRAY SHALE	0.28	596.41	cm,c
COAL	5.41 Pittsburgh No. 8	601.82	ac,cv,
BONE WITH COAL BANDS	0.12	601.94	ac,cv,
COAL WITH PYRITE NODULES . . .	0.11	602.05	ac,cv,
BLACK SHALE	0.17	602.22	ac,cm,
DARK GRAY LIMY SHALY CLAYSTONE	7.90	610.12	ak,cm,
GRAY SHALE	2.01	612.13	cm,c
DARK GRAY SANDY SHALE	0.67	612.80	cs,cs
GRAY SANDSTONE	2.20	615.00	cs,cs

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

ORIGINAL

AEC 18817

ATTACHMENT 13

DIAMOND DRILL HOLE:
BD4-17

Field Engineer: Kim Cecil
Surface Elevation: 1,183
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 679,526
Easting: 2,413,456

Drilling Company: L J Hughs & Sons, Inc. HILLER

DRILL HOLE NO.

DRILLING FOR.

SURFACE ELEVAT 12 1994
13 1994

LOCATION: OHIO BELMONT COUNTY

FORMATION	STRATA THICKNESS	DEPTH FROM SURFACE	Properties
CASING	20.00	20.00	
GRAY AND BROWN SANDSTONE	12.00	32.00	CS, CS
GRAY SHALY CLAYSTONE	10.10	42.10	CV, CV
RED AND GRAY LIMY SHALY CLAYSTONE	10.20	52.30	CK, CM, C
GRAY LIMY SHALY CLAYSTONE	9.80	62.10	CK, CM, C
RED AND GRAY SHALY CLAYSTONE	5.00	67.10	CV, CV
GRAY SHALY CLAYSTONE	13.40	80.50	CV, CV
GRAY LIMY SHALE	5.20	85.70	CK, CM, C
DARK GRAY LIMY SHALY CLAYSTONE	6.53	92.23	CK, CM, C
BLACK SHALY CLAYSTONE	1.25	93.48	CC, CV, C
COAL	0.95 Washington No. 12	94.43	CC, CV, C
DARK GRAY SHALY CLAYSTONE	1.10	95.53	CV, CV
GRAY LIMY SHALY CLAYSTONE	12.27	107.80	CK, CM, C
GRAY LIMY SANDSTONE	61.30	169.10	CK, CS, C
COAL	0.80	169.90	CC, CV, C
DARK GRAY SHALY CLAYSTONE	0.30	170.20	CV, CV
GRAY SANDY SHALY CLAYSTONE	11.90	182.10	CM, CM
GRAY SHALY CLAYSTONE	3.60	185.70	CV, CV
GRAY SANDSTONE	7.60	193.30	CS, CS
GRAY SANDY SHALE	3.90	197.20	CS, CS
GRAY SANDY SHALY CLAYSTONE	3.10	200.30	CM, CM
GRAY LIMESTONE	1.20	201.50	CK, CS, C
GRAY SHALY CLAYSTONE	8.00	209.50	CV, CV
GRAY LIMESTONE	3.00	212.50	CK, CS, C

ORIGINAL

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

FORMATION	STRATA THICKNESS	212.50 DEPTH FROM SURFACE	Report
DARK GRAY SHALY CLAYSTONE	4.50	217.00	cv, cv
GRAY SANDSTONE	2.60	219.60	cs, c
GRAY SANDY SHALE	6.10	225.70	cs, cs
GRAY SANDSTONE	4.50	230.20	cs, cs
GRAY SANDY SHALE	1.00	231.20	cs, c
GRAY SANDSTONE	3.40	234.60	cs, c
GRAY SANDY SHALE WITH SANDSTONE STREAKS	1.00	235.60	cs, c
GRAY SANDY SHALE	1.00	236.60	cs, c
GRAY SANDSTONE WITH GRAY CLAYSTONE BANDS	0.96	237.56	cs, c
GRAY SHALY CLAYSTONE WITH PYRITE NODULES	0.70	238.26	ac, cv,
COAL	0.10 Waynesburg No. 11	238.36	ac, cv,
GRAY CLAYSTONE	0.15	238.51	cv, c
COAL	0.25	238.76	ac, cv,
GRAY LIMY SHALY CLAYSTONE	1.14	239.90	ak, cm,
BONY COAL	0.10	240.00	ac, cv,
GRAY LIMY SHALY CLAYSTONE	9.10	249.10	ak, cm,
GRAY LIMESTONE	4.50	253.60	ak, cs,
GRAY LIMY SHALY CLAYSTONE	2.60	256.20	ak, cm,
GRAY LIMESTONE	2.20	258.40	ak, cs,
GRAY GREEN LIMY SHALY CLAYSTONE	5.90	264.30	ak, cm,
GRAY LIMESTONE	2.80	267.10	ak, cs, c
GRAY GREEN LIMY SHALY CLAYSTONE	5.20	272.30	ak, cm, c
GRAY SANDSTONE	2.30	274.60	cs, cs
GRAY SHALY CLAYSTONE	1.10	275.70	cv, cv
RED SHALY CLAYSTONE	1.00	276.70	cv, cv
GRAY LIMY SHALY CLAYSTONE	7.50	284.20	ak, cm, c
GRAY GREEN LIMY SANDY SHALE	9.10	293.30	ak, cs, c
GRAY LIMESTONE	5.70	299.00	ak, cs, c
GRAY LIMY SHALY CLAYSTONE	13.10	312.10	ak, cm, c
GRAY LIMY SANDSTONE	7.40	319.50	ak, cs, c
GRAY LIMY SHALY CLAYSTONE	2.10	321.60	ak, cm, c
GRAY LIMESTONE	4.20	325.80	ak, cs, c
GRAY GREEN LIMY SHALY CLAYSTONE	5.30	331.10	ak, cm, c
GRAY LIMY SHALY CLAYSTONE	5.50	336.60	ak, cm, c
GRAY LIMESTONE	2.90	339.50	ak, cs, c
GRAY LIMY SHALY CLAYSTONE	5.30	344.80	ak, cm, c
GRAY LIMESTONE	6.90	351.70	ak, cs, c
GREEN SHALY CLAYSTONE	1.10	352.80	cv, cv
WHITE LIMESTONE	5.30	358.10	ak, cs, c
GRAY LIMESTONE WITH LIMY SHALY CLAYSTONE	9.60	367.70	ak, cs, c
DARK SHALY CLAYSTONE	3.40	371.10	cv, cv

ORIGINAL

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

FORMATION	STRATA THICKNESS		371.10 DEPTH FROM SURFACE	Report
GRAY LIMESTONE WITH GREEN CLAY STREAKS	2.40		373.50	aK,cS,c
GREEN SHALE WITH LIME NODULES	1.50		375.00	aK,cm
GRAY SHALY LIMESTONE	3.30		378.30	aK,cS,
DARK GRAY LIMY SHALY CLAYSTONE	3.03		381.33	aK,cm,
DARK SHALY CLAYSTONE	1.47		382.80	cV,cV
PYRITE WITH COAL SPARS	0.09		382.89	aC,cm,
COAL	0.25	Sewickley No. 9	383.14	aC,cV,
BONE	0.02		383.16	aC,cV,
GRAY SHALY CLAYSTONE	0.03		383.19	cV,cV
COAL	0.40		383.59	aC,cV,
DARK GRAY SHALY CLAYSTONE	0.05		383.64	cV,cV
COAL	1.27		384.91	aC,cV,
DARK SHALE WITH COAL SPARS	0.15		385.06	aC,cV,
DARK GRAY SHALY CLAYSTONE	0.65		385.71	cV,cV
GRAY GREEN SHALY CLAYSTONE WITH DARK SHALE STREAKS AND BANDS	17.01		402.72	cm,cr
DARK GRAY SHALY CLAYSTONE	0.57		403.29	cV,cV
DARK SHALY CLAYSTONE WITH COAL SPARS	0.10		403.39	aC,cV,c
GRAY SANDY SHALE	0.80		404.19	cS,cS
COAL	0.19		404.38	aC,cV,
GRAY SHALY CLAYSTONE	0.04		404.42	cV,cV
COAL	0.74		405.16	aC,cV,
DARK SHALE WITH PYRITE	0.07		405.23	aC,cm,
COAL	0.04		405.27	aC,cV,
GRAY SHALY CLAYSTONE	0.07		405.34	cV,cV
COAL	0.28		405.62	aC,cV,
GRAY SHALE	0.05		405.67	cm,cr
COAL	0.89		406.56	aC,cV,
DARK GRAY SHALE	0.30		406.86	cm,cr
COAL	0.30		407.16	aC,cV,
BLACK SHALE WITH COAL SPARS	0.09		407.25	aC,cm,
COAL WITH SHALE BANDS . . .	0.20		407.45	aC,cV,
BLACK SHALE	0.04		407.49	aC,cm,
DARK SHALY CLAYSTONE	0.55		408.04	cV,cV
GRAY LIMESTONE	17.20		425.24	aK,cS,
GRAY SANDSTONE	2.56		427.80	cS,cS
GRAY GREEN LIMY SHALY CLAYSTONE	7.00		434.80	aK,cm,
GRAY LIMESTONE	4.90		439.70	aK,cS,
GRAY SHALY CLAYSTONE	2.30		442.00	cV,cV
COAL	0.80		442.80	aC,cV,
DARK SHALY CLAYSTONE	0.23		443.03	cV,cV
COAL	0.19		443.22	aS,cV,

ORIGINAL

00429-4

LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

FORMATION	STRATA THICKNESS	443.22 DEPTH FROM SURFACE	Proper
DARK SHALY CLAYSTONE	0.23	443.45	cv c
GRAY SHALY CLAYSTONE	2.25	445.70	cv,c
GRAY LIMESTONE	1.20	446.90	ak,cs
DARK GRAY SHALY CLAYSTONE	2.30	449.20	cv c
GRAY LIMESTONE	7.00	456.20	ak,cs
WHITE LIMESTONE	5.10	461.30	ak,cs
GRAY LIMY SHALY CLAYSTONE	8.87	470.17	ak,cm
BLACK SHALY COAL WITH CLAY STREAKS	0.13 Rock Coal	470.30	ac,cv
COAL WITH PYRITE . . .	0.50	470.80	ac,cv
DARK SHALY CLAYSTONE	0.79	471.59	cv,cv
BONE	0.25	471.84	ac,cv
COAL	4.75 Pittsburgh No 8	476.59	ac,cv
PYRITE AND SHALE	0.03	476.62	ac,cm
DARK SHALE	0.08	476.70	cm,cm
DARK GRAY SHALY CLAYSTONE	2.20	478.90	cv,c
GRAY LIMESTONE	2.10	481.00	ak,cs,c
GRAY LIMY SHALY CLAYSTONE	19.00	500.00	ak,cm,s

TOTAL DEPTH OF HOLE = 500.00 FEET

22 BAGS CEMENT PLACED IN HOLE

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 191.62 ft 38%
Soft Rock 308.38 ft 62%
500.00 ft

ORIGINAL

00425-4

AEC 18821

ATTACHMENT 10

DIAMOND DRILL HOLE: N94-41

Field Engineer: William Spilvey
Surface Elevation: 1,149.20
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 674,396
Easting: 2,413,650
Drilling Company: LJ Hughes and Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
20.00	0.00	20.00	Casing				0.00
20.00	20.00	40.00	Claystone, redgrn	YES	cv, ev		0.00
20.00	40.00	60.00	Claystone, gy	YES	cv, ev		0.00
7.80	60.00	67.80	Claystone, grn	YES	cv, ev		0.00
0.90	67.80	68.70	Sandstone, gy		cs, es	y	0.90
10.00	68.70	78.70	Claystone, gy		cv, ev		0.00
1.00	78.70	79.70	Coal, WASHINGTON No. 12		ac, cv, ev		0.00
16.30	79.70	96.00	Claystone, gy		cv, ev		0.00
5.00	90.00	95.00	Claystone, grn		cv, ev		0.00
61.25	95.00	156.25	Sandstone, gy		cs, es	y	61.25
0.10	156.25	156.35	Coal		ac, cv, ev		0.00
0.60	156.35	156.95	Sandstone, gy		cs, es	y	0.60
0.20	156.95	157.15	Shale, gy w/ coal stks		cm, em		0.00
0.70	157.15	157.85	Coal		ac, cv, ev		0.00
0.80	157.85	158.65	Shale, gy w/ ls nods		ak, cm, em		0.00
2.00	158.65	160.65	Limestone		ak, cs, es	y	2.00
28.35	160.65	189.00	Claystone, grn w/ ls nods		ak, cv, ev		0.00
1.00	189.00	190.00	Limestone		ak, cs, es	y	1.00
1.00	190.00	191.00	Shale, grn		cm, em		0.00
8.60	191.00	199.60	Sandstone, gy w/ sh stks		cs, es	y	8.60
1.00	199.60	200.60	Shale, gy		cm, em		0.00
5.05	200.60	205.65	Limestone w/ sh layers		ak, cs, es	y	5.05
4.35	205.65	210.00	Claystone, gy		cv, ev		0.00
4.50	210.00	214.50	Shale, gy, sandy		cs, es		0.00
3.65	214.50	218.15	Sandstone, gy		cs, es	y	3.65
1.95	218.15	220.10	Shale, gy, sandy		cs, es		0.00
5.70	220.10	225.80	Shale, gy		cm, em		0.00
0.30	225.80	226.10	coal, WAYNESBURG No. 11		ac, cv, ev		0.00
3.90	226.10	230.00	Claystone, gy		cv, ev		0.00
20.40	230.00	250.40	Limestone w/ claystone stks		ak, cs, es	y	20.40
3.70	250.40	253.10	Claystone, grn		cv, ev		0.00
5.10	253.10	258.20	Limestone w/ claystone stks		ak, cs, es	y	5.10
16.35	258.20	274.55	Shale, redgrn		cm, em		0.00
8.75	274.55	283.30	Shale, grn		cm, em		0.00
11.50	283.30	294.80	Limestone		ak, cs, es	y	11.50
10.00	294.80	304.80	Claystone, grn, limey		ak, cv, ev		0.00
2.20	304.80	307.00	Sandstone, gy w/ sh stks		cs, es	y	2.20
8.10	307.00	315.10	Limestone w/ claystone stks		ak, cs, es	y	8.10
5.40	315.10	320.50	Claystone, grn, limey		ak, cv, ev		0.00
9.50	320.50	330.00	Limestone w/ claystone stks		ak, cs, es	y	9.50
10.00	330.00	340.00	Limestone		ak, cs, es	y	10.00
2.00	340.00	342.00	Claystone, grn		cv, ev		0.00
14.70	342.00	356.70	Limestone, nodular		ak, cs, es	y	14.70
10.00	356.70	366.70	Claystone, grn w/ ls nods		ak, cv, ev		0.00
3.55	366.70	370.25	Claystone, gy		cv, ev		0.00
1.80	370.25	372.05	Coal, SEWICKLEY No. 9		ac, cv, ev		0.00
3.40	372.05	375.45	Claystone, gy		cv, ev		0.00
14.55	375.45	390.00	Shale, grn w/ ss bands		cs, es		0.00
3.30	390.00	393.30	Shale, gy, sandy		cs, es		0.00
3.70	393.30	397.00	Shale, gy		cm, em		0.00
1.15	397.00	398.15	Claystone, gy		cv, ev		0.00
0.10	398.15	398.25	Coal		ac, cv, ev		0.00

ORIGINAL

D0-25-4

AEC 18822

ATTACHMENT 13

DIAMOND DRILL HOLE: M94-41

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
0.33	398.25	398.58	Shale, gy		cm, em		0.00
0.85	398.58	399.43	Coal, bony w/ pyrite		ac, cv, ev		0.00
0.17	399.43	399.60	Shale, gy		cm, em		0.00
1.30	399.60	400.90	Coal, bony		ac, cv, ev		0.00
0.30	400.90	401.20	Shale, gy		cm, em		0.00
0.45	401.20	401.65	Coal, bony		ac, cv, ev		0.00
0.50	401.65	402.15	Shale, gy		cm, em		0.00
15.85	402.15	418.00	Limestone		ak, cs, es	y	15.85
2.00	418.00	420.00	Claystone, gm, limey		ak, cv, ev		0.00
4.00	420.00	424.00	Claystone, gm w/ ss bands		cm, em		0.00
3.00	424.00	427.00	Claystone, gm		cv, ev		0.00
4.20	427.00	431.20	Limestone		ak, cs, es	y	4.20
4.20	431.20	435.40	Claystone, gm		cv, ev		0.00
19.05	435.40	454.45	Limestone, nodular		ak, cs, es	y	19.05
8.65	454.45	463.10	Claystone, gm w/ ls silts		cm, em		0.00
1.85	463.10	464.95	Claystone, gy		cv, ev		0.00
0.50	464.95	465.45	Coal, bony, ROOF COAL		ac, cv, ev		0.00
1.20	465.45	466.65	Shale, gy		cm, em		0.00
0.80	466.65	467.45	Shale, dk gy w/ coal silts		cm, em		0.00
0.55	467.45	468.00	Shale, gy		cm, em		0.00
2.87	468.00	470.87	Coal, PITTSBURGH No.8		ac, cv, ev		0.00
0.13	470.87	471.00	Pyrite		ac, cs, es		0.00
2.10	471.00	473.10	Coal		ac, cv, ev		0.00
6.00	473.10	479.10	Claystone, gy, limey		ak, cv, ev		0.00
12.00	479.10	491.10	Sandstone, gy		cs, es	y	12.00
4.00	491.10	495.10	Shale, gy, sandy		cs, es		0.00
2.00	495.10	497.10	Limestone, nodular		ak, cs, es	y	2.00
2.90	497.10	500.00	Claystone, gy		cv, ev		0.00
	Total Depth	500.00					217.65

Acid Producing: ac
Alkaline Producing: ak
Compactibler: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 217.65

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 44%

	Thickness (Ft.)	Percent (%)
Hard Rock:	217.65	44%
Soft Rock:	282.35	56%
	500.00	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	1.43	3.32	2.95	104.0	102.6
Coal	2.30	6.40	4.42	200.00	197.7
Bottom, 10 ft.	23.70	4.14	3.68	129.00	105.3

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ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-01

Field Engineer: Kim Cecil
Surface Elevation: 1,033.19
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 678,882
Easting: 2,420,954
Drilling Company: LJ Hughes and Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
23.00	0.00	23.00	Casing				0.00
16.40	23.00	39.40	Shale, blk	YES	cm, em		0.00
1.30	39.40	40.70	Claystone, dk gy	YES	cv, ev		0.00
0.70	40.70	41.40	Claystone, gy	YES	cv, ev		0.00
3.10	41.40	44.50	Claystone, dk gy		cv, ev		0.00
11.90	44.50	56.40	Sandstone, gy w/ sh stks		cs, ss	y	11.90
0.60	56.40	57.00	Claystone, grn		cv, ev		0.00
12.00	57.00	69.00	Claystone, gy		cv, ev		0.00
0.80	69.00	69.80	Shale, dk gy, layered		cm, em		0.00
2.60	69.80	72.40	Claystone, gy		cv, ev		0.00
0.30	72.40	72.70	Shale, dk gy		cm, em		0.00
0.50	72.70	73.20	Claystone, dk gy		cv, ev		0.00
3.70	73.20	76.90	Shale, dk gy		cm, em		0.00
21.80	76.90	98.70	Claystone, dk gy		cv, ev		0.00
0.20	98.70	98.90	Bone w/ coal, WAYNESBURG No. 11		ac, cv, ev		0.00
1.30	98.90	100.20	Claystone, gy		cv, ev		0.00
0.60	100.20	100.80	Shale, blk		ac, cm, em		0.00
26.80	100.80	127.60	Claystone, dk gy w/ ss stks		ak, cv, ev		0.00
2.90	127.60	130.50	Shale, gy		cm, em		0.00
7.40	130.50	137.90	Claystone, red/ grn		cv, ev		0.00
7.50	137.90	145.40	Limestone		ak, cs, ss	y	7.50
8.10	145.40	153.50	Claystone, grn		cv, ev		0.00
12.70	153.50	166.20	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.20	166.20	167.40	Claystone, grn		cv, ev		0.00
21.50	167.40	188.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.90	188.90	192.80	Shale, grn		cm, em		0.00
3.60	192.80	196.40	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.35	196.40	196.75	Claystone, grn		cv, ev		0.00
0.55	196.75	197.30	Shale, blk		ac, cm, em		0.00
19.00	197.30	216.30	Limestone, shaley, layered		ak, cs, ss	y	19.00
1.80	216.30	218.10	Claystone, grn		cv, ev		0.00
5.70	218.10	223.80	Limestone		ak, cs, ss	y	5.70
0.90	223.80	224.70	Flintclay, layered		ak, cs, ss		0.00
2.30	224.70	227.00	Claystone, gy		cv, ev		0.00
5.50	227.00	232.50	Claystone, grn		cv, ev		0.00
0.90	232.50	233.40	Claystone, gy		cv, ev		0.00
8.90	233.40	242.30	Limestone		ak, cs, ss	y	8.90
1.40	242.30	243.70	Claystone, dk gy		cv, ev		0.00
1.50	243.70	245.20	Shale, blk		ac, cm, em		0.00
4.10	245.20	249.30	Coal, SEWICKLEY No. 9		ac, cv, ev		0.00
6.60	249.30	255.90	Shale, gy/ grn		cm, em		0.00
9.80	255.90	265.10	Claystone, gy/ grn		cv, ev		0.00
2.10	265.10	267.20	Shale, dk gy		cm, em		0.00
4.50	267.20	271.70	Coal		ac, cv, ev		0.00
1.00	271.70	272.70	Shale, gy/ grn		cm, em		0.00
17.00	272.70	289.70	Limestone		ak, cs, ss	y	17.00
0.30	289.70	290.00	Claystone, grn		cv, ev		0.00
21.80	290.00	311.80	Claystone, gy		cv, ev		0.00
4.10	311.80	315.90	Shale, blk		ac, cm, em		0.00
10.90	315.90	326.80	Claystone, gy/ grn		cv, ev		0.00
1.90	326.80	328.70	Limestone, massive		ak, cs, ss	y	1.90
2.10	328.70	330.80	Shale, dk gy w/ ls nods		ak, cm, em		0.00

ORIGINAL

00425-4

AEC 18824

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-01

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
1.80	330.80	332.60	Limestone, shaley, nodular		ak, cs, es	y	1.80
1.60	332.60	334.20	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.80	334.20	336.00	Claystone, dk gy w/ ss stks		cm, em		0.00
0.30	336.00	336.30	Coal w/ bone stks		ac, cv, ev		0.00
0.10	336.30	336.40	Shale, bk		ac, cm, em		0.00
0.10	336.40	336.50	Coal w/ bone stks, ROOF COAL		ac, cv, ev		0.00
0.50	336.50	337.00	Shale, gy, soft		cm, em		0.00
0.35	337.00	337.35	Shale w/bone		cm, em		0.00
3.61	337.35	340.96	Coal w/ bone stks, PITTSBURGH No.8		ac, cv, ev		0.00
1.49	340.96	342.45	Coal w/ bone, pyritic		ac, cv, ev		0.00
1.00	342.45	343.45	Shale, dk		cm, em		0.00
3.40	343.45	346.85	Shale, gy w/ ls nods		ak, cm, em		0.00
3.50	346.85	350.35	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.00	350.35	353.35	Shale, gy, sandy		cs, es		0.00
2.20	353.35	355.55	Shale, gy		cm, em		0.00
2.70	355.55	358.25	Sandstone w/sh stks		cs, es	y	2.70
6.40	358.25	364.65	Shale, gy		cm, em		0.00
	Total Depth	364.65					76.40

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 76.40

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 21%

	Thickness (Ft.)	Percent (%)
Hard Rock.	76.40	21%
Soft Rock.	288.25	79%
	364.65	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	203.49	1.91	1.66	59.7	-143.8
Coal	2.96	4.71	1.68	147.00	144.0
Bottom, 10 ft.	320.60	3.64	3.62	113.55	-207.1

ORIGINAL

0028-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2006-02

Field Engineer: Ken Cecil
Surface Elevation: 1,264.00
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 678,055
Easting: 2,426,386
Drilling Company: LJ Huges and Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
21.00	0.00	21.00	Casing				0.00
5.00	21.00	26.00	Shale, gro	YES	cm, em		0.00
7.00	26.00	33.00	Sandstone, gy	YES	cs, es	y	7.00
4.70	33.00	37.70	Shale, grn		cm, em		0.00
4.20	37.70	41.90	Shale, red/grn	YES	cm, em		0.00
5.00	41.90	46.90	Claystone, gy		cv, ev		0.00
1.10	46.90	48.00	Shale, gy	YES	cm, em		0.00
7.00	48.00	55.00	Shale, grn, limey		ak, cm, em		0.00
11.00	55.00	66.00	Shale, red/grn		cm, em		0.00
7.00	66.00	73.00	Shale, gy w/ ls nods		ak, cm, em		0.00
2.90	73.00	75.90	Sandstone, gy		cs, es	y	2.90
2.10	75.90	78.00	Shale, grn		cm, em		0.00
5.00	78.00	83.00	Claystone, red		cv, ev		0.00
14.00	83.00	97.00	Shale, grn		cm, em		0.00
21.00	97.00	118.00	Shale, red		cm, em		0.00
11.90	118.00	129.90	Shale, grn w/ ls nods		ak, cm, em		0.00
16.10	129.90	146.00	Claystone, red/grn		cv, ev		0.00
7.00	146.00	153.00	Shale, grn w/ ls nods		ak, cm, em		0.00
15.00	153.00	168.00	Shale, grn		cm, em		0.00
5.80	168.00	173.80	Claystone, red/grn		cv, ev		0.00
2.50	173.80	176.30	Limestone, nodular		ak, cs, es	y	2.50
1.30	176.30	177.60	Claystone, red/grn		cv, ev		0.00
5.40	177.60	183.00	Shale, grn, limey		ak, cm, em		0.00
2.00	183.00	185.00	Shale, grn		cm, em		0.00
3.90	185.00	188.90	Sandstone, gy		cs, es	y	3.90
6.50	188.90	195.40	Shale, grn		cm, em		0.00
2.60	195.40	198.00	Shale, red		cm, em		0.00
25.00	198.00	223.00	Shale, grn		cm, em		0.00
10.00	223.00	233.00	Claystone, gy		cv, ev		0.00
2.10	233.00	235.10	Coal w/ sh layers, WASHINGTON No. 12		ac, cv, ev		0.00
0.50	235.10	235.60	Shale, gy		cm, em		0.00
1.00	235.60	236.60	Coal		ac, cv, ev		0.00
2.90	236.60	239.50	Claystone, gy		cv, ev		0.00
10.30	239.50	249.80	Claystone, grn		cv, ev		0.00
6.60	249.80	256.40	Claystone, red		cv, ev		0.00
5.60	256.40	262.00	Shale, gy, sandy		cs, es		0.00
16.60	262.00	278.60	Shale, gy, sandy		cs, es		0.00
8.60	278.60	287.20	Shale, grn		cm, em		0.00
0.55	287.20	287.75	Coal, WAYNESBURG "A"		ac, cv, ev		0.00
0.45	287.75	288.20	Shale, gy, pyrite		ac, cm, em		0.00
0.20	288.20	288.40	Coal w/ bone		ac, cv, ev		0.00
0.30	288.40	288.70	Coal w/ sh stks		ac, cv, ev		0.00
0.80	288.70	289.50	Shale, gy		cm, em		0.00
3.00	289.50	292.50	Limestone, nodular		ak, cs, es	y	3.00
8.50	292.50	301.00	Limestone, shaley		ak, cs, es	y	8.50
6.50	301.00	307.50	Sandstone, gy		cs, es	y	6.50
3.80	307.50	311.30	Shale, grn		cm, em		0.00
1.30	311.30	312.60	Limestone, nodular		ak, cs, es	y	1.30
1.50	312.60	314.10	Shale, grn w/ ls nods		ak, cm, em		0.00
5.60	314.10	319.70	Sandstone, gy		cs, es	y	5.60
4.90	319.70	324.60	Shale, grn		cm, em		0.00
4.50	324.60	329.10	Limestone		ak, cs, es	y	4.50
3.10	329.10	332.20	Claystone, gy		cv, ev		0.00
0.50	332.20	332.70	Shale, blk		ac, cm, em		0.00
0.95	332.70	333.65	Shale, dk gy		cm, em		0.00
4.20	333.65	337.85	Shale, gy		cm, em		0.00

ORIGINAL

00425-4

AEC 18826

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2009-02

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
13.20	337.85	351.05	Sandstone, gy w/sh stks		cs, es	y	13.20
0.50	351.05	351.55	Shale, blk		ac, cm, em		0.00
0.30	351.55	351.85	Coal, WAYNESBURG No. 11		ac, cv, ev		0.00
0.50	351.85	352.35	Shale, gy		cm, em		0.00
3.50	352.35	355.85	Claystone, gy		cv, ev		0.00
20.30	355.85	376.15	Limestone, shaley		ak, cs, es	y	20.30
7.50	376.15	383.65	Claystone, grn		cv, ev		0.00
2.20	383.65	385.85	Claystone, gy		cv, ev		0.00
1.60	385.85	387.45	Claystone, grn		cv, ev		0.00
3.40	387.45	390.85	Shale, red/grn		cm, em		0.00
24.20	390.85	415.05	Limestone w/ sh layers		ak, cs, es	y	24.20
2.00	415.05	417.05	Claystone, gy		cv, ev		0.00
5.20	417.05	422.25	Limestone w/ sh layers		ak, cs, es	y	5.20
4.10	422.25	426.35	Claystone, grn		cv, ev		0.00
10.30	426.35	436.65	Limestone		ak, cs, es	y	10.30
3.60	436.65	440.25	Shale, grn		cm, em		0.00
43.60	440.25	483.85	Limestone w/ sh layers		ak, cs, es	y	43.60
2.40	483.85	486.25	Claystone, gy		cv, ev		0.00
0.30	486.25	486.55	Shale, gy		cm, em		0.00
1.85	486.55	488.40	Coal, SEWICKLEY No. 9		ac, cv, ev		0.00
3.00	488.40	491.40	Shale, gy		cm, em		0.00
10.10	491.40	501.50	Shale, grn, sandy		cs, es		0.00
17.00	501.50	518.50	Sandstone, gy		cs, es	y	17.00
3.00	518.50	521.50	Shale, gy, sandy		cs, es		0.00
6.45	521.50	527.95	Shale, gy		cm, em		0.00
1.30	527.95	529.25	Sandstone, gy w/ coal stks		cs, es		0.00
0.40	529.25	529.65	Claystone, gy		cv, ev		0.00
1.25	529.65	530.90	Coal		ac, cv, ev		0.00
0.25	530.90	531.15	Shale, gy		cm, em		0.00
1.30	531.15	532.45	Coal		ac, cv, ev		0.00
19.85	532.45	552.30	Limestone w/ sh layers		ak, cs, es	y	19.85
2.40	552.30	554.70	Shale, grn		cm, em		0.00
3.20	554.70	557.90	Shale, gy		cm, em		0.00
9.70	557.90	567.60	Limestone, nodular		ak, cs, es	y	9.70
1.10	567.60	568.70	Coal, bony		ac, cv, ev		0.00
2.50	568.70	571.20	Shale, gy w/ ls nods		ak, cm, em		0.00
2.65	571.20	573.85	Limestone		ak, cs, es	y	2.65
14.00	573.85	587.85	Limestone w/ claystone stks		ak, cs, es	y	14.00
3.90	587.85	591.75	Claystone, grn		cv, ev		0.00
0.50	591.75	592.25	Shale, gy		cm, em		0.00
1.43	592.25	593.68	Coal w/ bone, pyritic, ROOF COAL		ac, cv, ev		0.00
0.82	593.68	594.50	Shale, gy		cm, em		0.00
5.15	594.50	599.65	Coal, PITTSBURGH NO. 8		ac, cv, ev		0.00
0.17	599.65	599.82	Bone w/ coal stks		ac, cv, ev		0.00
1.35	599.82	601.17	Shale, gy		cm, em		0.00
10.10	601.17	611.27	Shale, gy w/ ls nods		ak, cm, em		0.00
Total Depth		611.27					226.70

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 226.70

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 37%

Thickness (Ft.)	Percent (%)

ORIGINAL

00425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 3600-02

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
Hard Rock:	225.70	37%					
Soft Rock:	385.57	53%					
	611.27						

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	187.17	2.24	1.31	70.1	-117.2
Coal	3.88	5.91	3.04	185.00	181.0
Bottom, 10 ft.	28.40	5.08	4.21	159.00	130.0

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-03

Field Engineer: Kim Cecil
Surface Elevation: 976.43
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 682,837
Easting: 2,421,552
Drilling Company: LJ Hughes & Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
23.00	0.00	23.00	Casing				0.00
2.00	23.00	25.00	Shale, gy	YES	cm, em		0.00
3.30	25.00	28.30	Claystone, gy w/ ls nods	YES	ak, cv, ev		0.00
0.60	28.30	28.90	Limestone		ak, cs, es	y	0.60
0.30	28.90	29.20	Claystone, gy, soft	YES	cv, ev		0.00
0.50	29.20	29.70	Shale, dk gy, limey		ak, cm, em		0.00
0.80	29.70	30.50	Limestone		ak, cs, es	y	0.80
0.30	30.50	30.80	Claystone, gy, soft		cv, ev		0.00
3.20	30.80	34.00	Core loss				0.00
0.50	34.00	34.50	Claystone, dk gy		cv, ev		0.00
1.50	34.50	36.00	Shale, gy, sandy	YES	cs, es		0.00
2.00	36.00	38.00	Shale, gy		cm, em		0.00
0.50	38.00	38.50	Shale, gy, sandy		cs, es		0.00
0.60	38.50	39.10	Clay, soft		cv, ev		0.00
1.60	39.10	40.70	Shale, gy, sandy		cs, es		0.00
1.20	40.70	41.90	Shale, gy		cm, em		0.00
15.10	41.90	57.00	Sandstone, gy w/sh stks		cs, es	y	15.10
0.40	57.00	57.40	Claystone, gy		cv, ev		0.00
0.30	57.40	57.70	Bone w/ coal stks, WAYNESBURG No. 11		ac, cv, ev		0.00
2.10	57.70	59.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.00	59.80	62.80	Limestone, shaley, nodular		ak, cs, es	y	3.00
3.50	62.80	66.30	Shale, gy w/ ls nods		ak, cm, em		0.00
0.80	66.30	67.10	Limestone		ak, cs, es	y	0.80
1.60	67.10	68.70	Shale, gy w/ ls nods		ak, cm, em		0.00
4.00	68.70	72.70	Limestone, massive		ak, cs, es	y	4.00
2.80	72.70	75.50	Shale, gy, limey		ak, cm, em		0.00
8.50	75.50	84.00	Claystone, gy		cv, ev		0.00
2.00	84.00	86.00	Limestone, nodular		ak, cs, es	y	2.00
9.00	86.00	95.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.40	95.00	95.40	Claystone, red		cv, ev		0.00
2.60	95.40	98.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.70	98.00	98.70	Limestone		ak, cs, es	y	0.70
11.50	98.70	110.20	Shale, gy w/ ls nods		ak, cm, em		0.00
12.80	110.20	123.00	Limestone w/ sh layers		ak, cs, es	y	12.80
0.60	123.00	123.60	Limestone, shaley, nodular		ak, cs, es	y	0.60
14.90	123.60	138.50	Shale, gy, limey		ak, cm, em		0.00
4.00	138.50	142.50	Limestone, nodular		ak, cs, es	y	4.00
0.50	142.50	143.00	Shale, gy w/ ls nods		ak, cm, em		0.00
4.90	143.00	147.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.30	147.90	150.20	Limestone, shaley		ak, cs, es	y	2.30
2.30	150.20	152.50	Shale, gy w/ ls nods		ak, cm, em		0.00
16.00	152.50	168.50	Limestone, layered		ak, cs, es	y	16.00
2.40	168.50	170.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.00	170.90	175.90	Limestone		ak, cs, es	y	5.00
7.10	175.90	183.00	Shale, gy w/ ls nods		ak, cm, em		0.00
11.60	183.00	194.60	Limestone, nodular		ak, cs, es	y	11.60
4.40	194.60	199.00	Shale, dk gy, limey		ak, cm, em		0.00
1.40	199.00	200.40	Shale, dk gy, broken		cv, ev		0.00
0.20	200.40	200.60	Shale, blk		ac, cm, em		0.00
1.30	200.60	201.90	Coal w/ sh stks, SEWICKLEY No. 9		ac, cv, ev		0.00
1.20	201.90	203.10	Shale, dk gy		cm, em		0.00
4.30	203.10	207.40	Shale, gy, sandy		cs, es		0.00
6.40	207.40	213.80	Sandstone w/ sh stks		cs, es	y	6.40
12.40	213.80	226.20	Shale, gy		cm, em		0.00

ORIGINAL

20423-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-03

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
0.15	226.20	226.35	Shale, blk		ac, cm, em		0.00
1.75	226.35	228.10	Coal w/ sh stks, FISHPOT		ac, cv, ev		0.00
0.25	228.10	228.35	Shale w/ coal, carbonated		ac, cv, ev		0.00
0.70	228.35	229.05	Coal, pyritic		ac, cv, ev		0.00
0.50	229.05	229.55	Coal, bony		ac, cv, ev		0.00
0.85	229.55	230.40	Shale, dk gy		cm, em		0.00
17.10	230.40	247.50	Limestone, nodular		ak, cs, es	y	17.10
0.40	247.50	247.90	Claystone, grn		cv, ev		0.00
1.90	247.90	249.80	Limestone, shaley		ak, cs, es	y	1.90
0.60	249.80	250.40	Claystone, grn		cv, ev		0.00
1.30	250.40	251.70	Shale, gy		cm, em		0.00
3.70	251.70	255.40	Sandstone w/sh stks		cs, es	y	3.70
1.10	255.40	256.50	Shale, gy, sandy		cs, es		0.00
3.60	256.50	260.10	Shale, gy		cm, em		0.00
1.40	260.10	261.50	Shale, gy w/ ls nods		ak, cm, em		0.00
1.50	261.50	263.00	Limestone, nodular		ak, cs, es	y	1.50
4.10	263.00	267.10	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.20	267.10	268.30	Limestone, shaley		ak, cs, es	y	1.20
1.50	268.30	269.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.70	269.80	271.50	Limestone, shaley, nodular		ak, cs, es	y	1.70
1.40	271.50	272.90	Shale, gy w/ ls nods		ak, cm, em		0.00
13.40	272.90	286.30	Limestone, nodular		ak, cs, es	y	13.40
4.50	286.30	290.80	Shale, gy w/ ls nods		ak, cm, em		0.00
2.50	290.80	293.30	Claystone, gy		cv, ev		0.00
0.40	293.30	293.70	Shale, dk gy		cm, em		0.00
0.66	293.70	294.36	Coal, pyrite, ROOF COAL		ac, cv, ev		0.00
0.25	294.36	294.61	Coal, bony w/ sh		ac, cv, ev		0.00
0.97	294.61	295.58	Shale, dk gy		cm, em		0.00
3.84	295.58	299.42	Coal, bony w/ sh stks PITTSBURGH NO.8		ac, cv, ev		0.00
0.95	299.42	300.37	Coal		ac, cv, ev		0.00
0.21	300.37	300.58	Coal w/ sh stks		ac, cv, ev		0.00
0.50	300.58	301.08	Shale, dk gy		cm, em		0.00
1.95	301.08	303.03	Limestone, shaley, nodular		ak, cs, es	y	1.95
5.20	303.03	308.23	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.50	308.23	313.73	Shale, gy		cm, em		0.00
8.00	313.73	321.73	Sandstone w/ sh stks		cs, es	y	8.00
1.30	321.73	323.03	Limestone, nodular		ak, cs, es	y	1.30
	Total Depth	323.03					137.45

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 137.45

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 43%

	Thickness (Ft.)	Percent (%)
Hard Rock:	137.45	43%
Soft Rock:	185.58	57%
	323.03	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

	Potential Acidity, tons	CaCO3 Deficiency,

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-03

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
Stratum	Neutralization Potential, tons/100 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	/1000 tons as $CaCO_3$ (Total Sul.)	tons/1000 tons as $CaCO_3$ (Total Sul.)		
Roof, 10 ft.	154.06	2.90	2.14	90.7	-73.4		
Coal	7.63	5.62	3.02	175.0	168.0		
Bottom, 10 ft.	308.00	3.00	2.58	93.6	-214.0		

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-04

Field Engineer: Kim Cecil
Surface Elevation: 1,287.00
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 682,440
Easting: 2,430,373
Drilling Company: LJ Hughes and Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
23.00	0.00	23.00	Casing				0.00
14.00	23.00	37.00	Claystone, red/gy	YES	cv, ev		0.00
1.00	37.00	38.00	Core loss				0.00
2.30	38.00	40.30	Claystone, gy	YES	cv, ev		0.00
3.30	40.30	43.60	Shale, gy w/ ls nods		ak, cm, em		0.00
1.80	43.60	45.40	Shale, gy, broken		cv, ev		0.00
5.20	45.40	50.60	Shale, gy w/ ls nods		ak, cm, em		0.00
2.40	50.60	53.00	Claystone, red	YES	cv, ev		0.00
6.60	53.00	59.60	Claystone, red/gy	YES	cv, ev		0.00
5.40	59.60	65.00	Sandstone, gy w/ sh stks		cs, es	y	5.40
14.60	65.00	79.60	Shale, gy w/ ls nods		ak, cm, em		0.00
11.00	79.60	90.60	Claystone, red	YES	cv, ev		0.00
0.40	90.60	91.00	Core loss				0.00
11.50	91.00	102.50	Shale, red/gy		cm, em		0.00
0.50	102.50	103.00	Core loss				0.00
16.00	103.00	119.00	Shale, gy		cv, ev		0.00
0.20	119.00	119.20	**Bone, WASHINGTON No. 12**		ac, cv, ev		0.00
3.80	119.20	123.00	Shale, gy, limey		ak, cm, em		0.00
54.00	123.00	177.00	Shale, red/ gy w/ ls nods		ak, cm, em		0.00
2.60	177.00	179.60	Limestone, nodular		ak, cs, es	y	2.60
7.40	179.60	187.00	Shale, gy w/ ls nods		ak, cm, em		0.00
3.30	187.00	190.30	Shale, red		cm, em		0.00
18.30	190.30	208.60	Shale, gy w/ ls nods		ak, cm, em		0.00
0.20	208.60	208.80	Shale, blk		ac, cm, em		0.00
5.60	208.80	214.40	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
25.55	214.40	239.95	Sandstone, gy w/ ss stks		cs, es	y	25.55
0.10	239.95	240.05	Shale, blk		ac, cm, em		0.00
3.10	240.05	243.15	**Coal w/ shale stks, LITTLE WASHINGTON**		ac, cv, ev		0.00
2.70	243.15	245.85	Claystone, gy		cv, ev		0.00
0.25	245.85	246.10	Core loss				0.00
16.30	246.10	262.40	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.60	262.40	263.00	Core loss				0.00
10.90	263.00	273.90	Shale, gy		cm, em		0.00
9.10	273.90	283.00	Shale, gy, sandy		cs, es		0.00
2.35	283.00	285.35	Shale, gy		cm, em		0.00
5.75	285.35	291.10	**Coal, bony w/ sh stks WAYNESBURGH "A"**		ac, cv, ev		0.00
0.65	291.10	291.75	Shale, gy w/ ls nods		ak, cm, em		0.00
1.00	291.75	292.75	Shale, blk, carb.		ac, cm, em		0.00
10.25	292.75	303.00	Shale, gy w/ ls nods		ak, cm, em		0.00
1.00	303.00	304.00	Shale, gy, sandy		cs, es		0.00
10.90	304.00	314.90	Shale, gy		cm, em		0.00
5.50	314.90	320.40	Sandstone, gy		cs, es	y	5.50
2.90	320.40	323.30	Shale, gy, sandy		cm, em		0.00
3.50	323.30	326.80	Sandstone w/ sh stks		cs, es	y	3.50
0.80	326.80	327.60	Claystone, gy		cv, ev		0.00
3.70	327.60	331.30	Limestone, nodular		ak, cs, es	y	3.70
1.40	331.30	332.70	Claystone, gy, soft		cv, ev		0.00
0.50	332.70	333.20	Shale, dk gy, soft		cm, em		0.00
2.30	333.20	335.50	Shale, gy, sandy		cm, em		0.00
5.60	335.50	341.10	Sandstone, gy		cs, es	y	5.60
4.90	341.10	346.00	Shale, gy, sandy		cm, em		0.00
5.30	346.00	351.30	Sandstone w/ sh stks		cs, es	y	5.30

ORIGINAL

D042844

ATTACHMENT 10

DIAMOND DRILL HOLE: AEC 3009-04

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
1.30	351.30	352.60	Shale, gy w/ ss stks		cs, es		0.00
4.60	352.60	357.20	Shale, gy		cm, em		0.00
0.30	357.20	357.50	Shale, blk		ac, cm, em		0.00
1.00	357.50	358.50	Claystone, gy		cv, ev		0.00
4.50	358.50	363.00	Limestone, massive		ak, cs, es	y	4.50
3.80	363.00	366.80	Shale, gy w/ ls nods		ak, cm, em		0.00
10.60	366.80	377.40	Limestone		ak, cs, es	y	10.60
12.30	377.40	389.70	Shale, gy w/ ls nods		ak, cm, em		0.00
5.20	389.70	394.90	Shale, gy, sandy		cs, es		0.00
5.60	394.90	400.50	Shale, red/gy		cm, em		0.00
2.50	400.50	403.00	Limestone, nodular		ak, cs, es	y	2.50
20.00	403.00	423.00	Limestone w/ claystone parting		ak, cs, es	y	20.00
2.30	423.00	425.30	Limestone		ak, cs, es	y	2.30
11.80	425.30	437.10	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.90	437.10	443.00	Limestone, shaley		ak, cs, es	y	5.90
35.00	443.00	478.00	Limestone w/ sh layers		ak, cs, es	y	35.00
10.50	478.00	488.50	Shale, gy w/ ls nods		ak, cm, em		0.00
8.90	488.50	497.40	Limestone, shaley		ak, cs, es	y	8.90
3.00	497.40	500.40	Shale, gy w/ ls nods		ak, cm, em		0.00
2.05	500.40	502.45	**Coal, bone, pyrite, SEWICKLEY No. 9**		ac, cv, ev		0.00
22.35	502.45	524.80	Shale, gy		cm, em		0.00
1.60	524.80	526.40	Shale, dk gy, soft		cm, em		0.00
0.80	526.40	527.20	Claystone, gy		cv, ev		0.00
1.10	527.20	528.30	**Coal w/ sh stks**		ac, cv, ev		0.00
0.90	528.30	529.20	**Coal w/ pyrite**		ac, cv, ev		0.00
19.90	529.20	549.10	Limestone, nodular		ak, cs, es	y	19.90
8.60	549.10	557.70	Shale, gy w/ ls nods		ak, cm, em		0.00
3.90	557.70	561.60	Limestone, shaley		ak, cs, es	y	3.90
2.20	561.60	563.80	Claystone, gy		cv, ev		0.00
0.60	563.80	564.40	Shale, blk w/ coal		ac, cm, em		0.00
0.80	564.40	565.20	**Coal, bone**		ac, cv, ev		0.00
2.50	565.20	567.70	Shale, gy, limey		ak, cm, em		0.00
13.20	567.70	580.90	Limestone, nodular		ak, cs, es	y	13.20
6.20	580.90	587.10	Claystone, gy		cv, ev		0.00
1.60	587.10	588.70	Claystone, dk gy		cv, ev		0.00
0.60	588.70	589.30	Shale, blk, carb.		ac, cm, em		0.00
0.97	589.30	590.27	**Coal w/ bone, ROOF COAL**		ac, cv, ev		0.00
0.92	590.27	591.19	Shale, dk gy, soft		cm, em		0.00
3.97	591.19	595.16	**Coal w/ sh stks, pyrite, PITTSBURGH No.8**		ac, cv, ev		0.00
0.90	595.16	596.06	**Bone w/ coal layers**		ac, cv, ev		0.00
0.33	596.06	596.39	**Coal w/ pyrite**		ac, cv, ev		
4.20	596.39	600.59	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.40	600.59	605.99	Shale, gy, sandy		cs, es		0.00
2.60	605.99	608.59	Claystone, gy		cv, ev		0.00
2.00	608.59	610.59	Shale, gy		cm, em		0.00
	Total Depth	610.59					183.85

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 183.85

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 30%

	Thickness (Ft.)	Percent (%)
Hard Rock:	183.85	30%
Soft Rock:	426.74	70%
	610.59	

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-04

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft	278.84	2.94	2.64	91.93	-186.90
Coal	9.01	5.95	2.85	186.9	181.9
Bottom, 10 ft	164.00	3.32	3.17	103.85	-60.1

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2001-02

Field Engineer: Kim Cecil
Surface Elevation: 1,238.55
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 684,949
Easting: 2,425,410
Drilling Company: LJ Hughes and Sons, Inc.

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
22.00	0.00	22.00	Casing				0.00
1.30	22.00	23.30	Shale, gy	YES	cm, em		0.00
1.30	23.30	24.60	Claystone, gy, soft	YES	cv, ev		0.00
0.60	24.60	25.20	Shale, gy		cm, em		0.00
3.20	25.20	28.40	Limestone, massive	YES	ak, cs, es	y	3.20
16.10	28.40	44.50	Shale, red/gy w/ ls nods		ak, cm, em		0.00
2.40	44.50	46.90	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
4.60	46.90	51.50	Sandstone, gy	YES	cs, es	y	4.60
3.80	51.50	55.30	Shale, gy w/ ls nods		ak, cm, em		0.00
7.70	55.30	63.00	Claystone, red		cv, ev		0.00
33.50	63.00	96.50	Shale, red/gy	YES	cm, em		0.00
6.50	96.50	103.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
20.00	103.00	123.00	Claystone, red/gy w/ ls nods		ak, cv, ev		0.00
20.00	123.00	143.00	Shale, gy w/ ls nods		ak, cm, em		0.00
4.10	143.00	147.10	Claystone, red/gy		cv, ev		0.00
3.30	147.10	150.40	Limestone, nodular		ak, cs, es	y	3.30
1.00	150.40	151.40	Claystone, gy		cv, ev		0.00
0.40	151.40	151.80	Limestone		ak, cs, es	y	0.40
5.80	151.80	157.60	Claystone, gy		cv, ev		0.00
3.90	157.60	161.50	Shale, red/gy		cm, em		0.00
1.50	161.50	163.00	Shale, gy, sandy		cs, es		0.00
15.50	163.00	178.50	Shale, gy		cm, em		0.00
4.50	178.50	183.00	Claystone, gy		cv, ev		0.00
20.00	183.00	203.00	Shale, gy		cm, em		0.00
4.90	203.00	207.90	Claystone, gy		cv, ev		0.00
1.00	207.90	208.90	Shale, dk gy		cm, em		0.00
0.90	208.90	209.80	Shale, blk		ac, cm, em		0.00
2.65	209.80	212.45	Coal w/ pyrite, WASHINGTON No. 12		ac, cv, ev		0.00
0.55	212.45	213.00	Shale, gy w/ coal stks		ac, cv, ev		0.00
0.20	213.00	213.20	Coal w/ bone stks		ac, cv, ev		0.00
0.30	213.20	213.50	Shale, dk gy w/ coal stks		ac, cv, ev		0.00
0.95	213.50	214.45	Coal		ac, cv, ev		0.00
0.30	214.45	214.75	Shale, blk		ac, cm, em		0.00
14.00	214.75	228.75	Claystone, gy		cv, ev		0.00
12.00	228.75	240.75	Shale, gy		cm, em		0.00
4.50	240.75	245.25	Shale, gy, sandy		cs, es		0.00
1.20	245.25	246.45	Shale, gy		cm, em		0.00
6.10	246.45	252.55	Shale, dk gy		cm, em		0.00
7.00	252.55	259.55	Coal w/ pyrite and sh stks, LITTLE WASHINGTON		ac, cv, ev		0.00
0.40	259.55	259.95	Limestone, nodular		ak, cs, es	y	0.40
0.35	259.95	260.30	Shale, gy w/ ls nods		ak, cm, em		0.00
0.75	260.30	261.05	Shale, blk		ac, cm, em		0.00
0.80	261.05	261.85	Limestone		ak, cs, es	y	0.80
0.70	261.85	262.55	Claystone, gy		cv, ev		0.00
0.70	262.55	263.25	Limestone, nodular		ak, cs, es	y	0.70
6.30	263.25	269.55	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.20	269.55	274.75	Sandstone, gy, massive		cs, es	y	5.20
5.50	274.75	280.25	Shale, gy, sandy		cs, es		0.00
3.20	280.25	283.45	Shale, gy		cm, em		0.00
1.70	283.45	285.15	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
4.10	285.15	289.25	Sandstone, gy		cs, es	y	4.10
4.00	289.25	293.25	Shale, gy, sandy		cs, es		0.00
1.30	293.25	294.55	Shale, gy		cm, em		0.00
1.50	294.55	296.05	Shale, dk gy		cm, em		0.00
0.90	296.05	296.95	Shale, gy w/ ls nods		ak, cm, em		0.00
4.70	296.95	301.65	Claystone, dk gy		cv, ev		0.00

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2001-02

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
0.70	301.65	302.35	Shale, blk		ac, cm, em		0.00
0.20	302.35	302.55	Shale, dk gy		ac, cm, em		0.00
7.80	302.55	310.35	Shale, gy		cm, em		0.00
6.10	310.35	316.45	Shale, gy, sandy		cs, es		0.00
5.10	316.45	321.55	Shale, gy		cm, em		0.00
0.20	321.55	321.75	Coal w/ pyrite, WAYNESBURGH No. 11		ac, cv, ev		0.00
0.60	321.75	322.35	Shale, gy		cm, em		0.00
1.80	322.35	324.15	Shale, gy w/ ls nods		ak, cm, em		0.00
2.30	324.15	326.45	Limestone, nodular		ak, cs, es	y	2.30
3.80	326.45	330.25	Claystone, gy, w/ ls nods		ak, cv, ev		0.00
12.10	330.25	342.35	Limestone w/ sh layers		ak, cs, es	y	12.10
16.00	342.35	358.35	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.20	358.35	361.55	Shale, red/gy w/ ls nods		ak, cm, em		0.00
1.20	361.55	362.75	Limestone		ak, cs, es	y	1.20
3.80	362.75	366.35	Claystone, gy		cv, ev		0.00
1.20	366.35	367.55	Limestone, shaley		ak, cs, es	y	1.20
2.00	367.55	369.55	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.50	369.55	370.05	Limestone, nodular		ak, cs, es	y	0.50
2.00	370.05	372.05	Shale, gy		cm, em		0.00
1.30	372.05	373.35	Core loss				0.00
41.10	373.35	414.35	Limestone w/ sh layers		ak, cs, es	y	41.10
21.10	414.35	435.45	Limestone, shale, nodular		ak, cs, es	y	21.10
19.00	435.45	454.45	Limestone w/ sh layers		ak, cs, es	y	19.00
2.70	454.45	457.15	Shale, gy, limey		ak, cm, em		0.00
0.60	457.15	457.75	Shale, dk gy		cm, em		0.00
0.20	457.75	457.95	Shale, blk		ac, cm, em		0.00
0.90	457.95	458.85	Coal, SEWICKELY No. 9		ac, cv, ev		0.00
0.70	458.85	459.55	Shale, dk gy w/ coal		ac, cm, em		0.00
8.50	459.55	468.05	Shale, gy		cm, em		0.00
5.40	468.05	473.45	Shale, gy, sandy		cs, es		0.00
5.70	473.45	479.15	Shale, gy		cm, em		0.00
10.40	479.15	489.55	Sandstone w/ sh stks		cs, es	y	10.40
1.40	489.55	490.95	Shale, gy		cm, em		0.00
1.00	490.95	491.95	Coal w/ bone layers, FISHPOT		ac, cv, ev		0.00
0.35	491.95	492.30	Coal / shale layers		ac, cv, ev		0.00
0.90	492.30	493.20	Coal w/ pyrite		ac, cv, ev		0.00
19.65	493.20	512.85	Limestone, nodular		ak, cs, es	y	19.65
6.50	512.85	519.35	Shale, gy, sandy		cs, es		0.00
4.90	519.35	524.25	Shale, gy		cm, em		0.00
3.20	524.25	527.45	Limestone, massive		ak, cs, es	y	3.20
1.50	527.45	528.95	Claystone, gy		cv, ev		0.00
1.50	528.95	530.45	Claystone, dk gy		cv, ev		0.00
3.40	530.45	533.85	Shale, gy w/ ls nods		ak, cm, em		0.00
13.70	533.85	547.55	Limestone, nodular		ak, cs, es	y	13.70
5.40	547.55	552.95	Claystone, gy		cv, ev		0.00
0.25	552.95	553.20	Shale, dk gy		cm, em		0.00
0.50	553.20	553.70	Claystone, gy, soft		cv, ev		0.00
0.95	553.70	554.65	Claystone, gy		cv, ev		0.00
0.64	554.65	555.29	Coal w/ bone and sh stks, ROOF COAL		ac, cv, ev		0.00
0.70	555.29	555.99	Claystone, gy		cv, ev		0.00
2.06	555.99	558.05	Coal w/ pyrite, PITTSBURGH No.8		ac, cv, ev		0.00
1.21	558.05	559.26	Coal w/ bone		ac, cv, ev		0.00
2.08	559.26	561.34	Coal w/ sh layers		ac, cv, ev		0.00
1.87	561.34	563.21	Claystone, dk gy		cv, ev		0.00
2.60	563.21	565.81	Claystone, gy		cv, ev		0.00
5.50	565.81	571.31	Shale, gy, sandy		cs, es		0.00
9.80	571.31	581.11	Sandstone w/ sh stks		cs, es	y	9.80
Total Depth:		581.11					177.95

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ORIGINAL

22-25-4

AEC 18836

ATTACHMENT 15

DIAMOND DRILL HOLE: AEC 2001-02

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
Total Thickness of Hard Rock Overlying Mining Unit							177.95
Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit							31%

	Thickness (Ft.)	Percent (%)
Hard Rock	177.95	31%
Soft Rock	403.16	69%
	581.11	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	148.21	2.44	2.22	76.26	-71.95
Coal	4.74	5.44	2.92	170.0	165.3
Bottom, 10 ft.	156.50	3.64	3.40	113.55	-43.0

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 3001-04

Field Engineer: Kim Cecil
Surface Elevation: 1,003.59
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 684,675
Easting: 2,416,410
Drilling Company: Jay Little Drilling Company

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
18.00	0.00	18.00	Casing				0.00
1.42	18.00	19.42	Sandstone, gy	YES	cs, es	y	1.42
1.75	19.42	21.17	Shale, dk gy w/ coal	YES	cv, ev		0.00
1.00	21.17	22.17	Limestone	YES	ak, cs, es	y	1.00
0.58	22.17	22.75	Claystone, gy		cv, ev		0.00
1.45	22.75	24.20	**Coal w/ sh stks, WAYNESBURGH "A"**	YES	ac, cv, ev		0.00
1.08	24.20	25.28	Limestone		ak, cs, es	y	1.08
0.50	25.28	25.78	Claystone, gy	YES	cv, ev		0.00
9.67	25.78	35.45	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.34	35.45	39.79	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
8.25	39.79	48.04	Claystone, red/gy, sandy w/ ls nods		ak, cm, em		0.00
2.50	49.04	51.54	Limestone, shaley		ak, cs, es	y	2.50
2.16	51.54	53.70	Sandstone, gy		cs, es	y	2.16
4.25	53.70	57.95	Shale, gy, sandy		cs, es		0.00
1.58	57.95	59.53	Claystone, gy		cv, ev		0.00
3.75	59.53	63.28	Limestone w/ clay stks		ak, cs, es	y	3.75
3.92	63.28	67.20	Claystone, dk gy/ gy w/ ls nods		ak, cv, ev		0.00
18.16	67.20	85.36	Shale, gy, sandy		cs, es		0.00
30.00	85.36	115.36	Limestone w/ claystone		ak, cs, es	y	30.00
4.42	115.36	119.78	Shale, gy, sandy		cs, es		0.00
11.42	119.78	131.20	Limestone w/ sh layers		ak, cs, es	y	11.42
5.92	131.20	137.12	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
0.50	137.12	137.62	Sandstone, gy		cs, es	y	0.50
0.83	137.62	138.45	Shale, grn, sandy		cs, es		0.00
12.50	138.45	150.95	Limestone, w/ claystone		ak, cs, es	y	12.50
16.92	150.95	167.87	Shale, gy/grn, sandy, limey		ak, cs, es		0.00
9.16	167.87	177.03	Claystone, gy/grn w/ ls nods		ak, cv, ev		0.00
20.34	177.03	197.37	Limestone, shaley		ak, cs, es	y	20.34
3.50	197.37	200.87	Shale, grn, sandy, limey		ak, cs, es		0.00
14.00	200.87	214.87	Claystone, grn w/ ls nods		ak, cv, ev		0.00
3.25	214.87	218.12	Shale, grn w/ ls nods		ak, cm, em		0.00
9.58	218.12	227.70	Limestone, shaley, nodular		ak, cs, es	y	9.58
3.58	227.70	231.28	Claystone, gy		cv, ev		0.00
2.00	231.28	233.28	**Coal, bony w/ sh. Layers, SEWICKLEY No. 9**		ac, cv, ev		0.00
1.50	233.28	234.78	Shale, dk gy		cm, em		0.00
7.75	234.78	242.53	Sandstone, gy		cs, es	y	7.75
6.00	242.53	248.53	Shale, gy		cm, em		0.00
5.00	248.53	253.53	Claystone, gy		cv, ev		0.00
2.55	253.53	256.08	**Coal w/ sh layers**		ac, cv, ev		0.00
0.71	256.08	256.79	Shale, dk gy, sandy		cs, es		0.00
16.16	256.79	272.95	Limestone, shaley		ak, cs, es	y	16.16
5.58	272.95	278.53	Claystone, gy/ grn w/ ls nods		ak, cv, ev		0.00
4.58	278.53	283.11	Sandstone, gy		cs, es	y	4.58
4.42	283.11	287.53	Shale, gy		cm, em		0.00
2.16	287.53	289.69	Limestone, nodular		ak, cs, es	y	2.16
3.16	289.69	292.85	Claystone, gy/ grn w/ ls nods		ak, cv, ev		0.00
0.50	292.85	293.35	Shale, dk gy		cm, em		0.00
1.25	293.35	294.60	**Coal w/ pyrite**		ac, cv, ev		0.00
12.25	294.60	306.85	Limestone, shaley, nodular		ak, cs, es	y	12.25
3.25	306.85	310.10	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.00	310.10	313.10	Claystone, gy/grn w/ ls nods		ak, cv, ev		0.00
0.42	313.10	313.52	Limestone		ak, cs, es	y	0.42

ORIGINAL 00425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2001-04

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
2.92	313.52	316.44	Claystone, gy/grn w/ ls nods		ak, cv, ev		0.00
3.16	316.44	319.60	Claystone, gy		cv, ev		0.00
0.95	319.60	320.55	Coal w/ sh layers, ROOF COAL		ac, cv, ev		0.00
1.02	320.55	321.57	Shale, dk gy		cm, em		0.00
4.03	321.57	325.60	Coal, bony, PITTSBURGH No.8		ac, cv, ev		0.00
1.27	325.60	326.87	Coal w/ pyrite		ac, cv, ev		0.00
3.81	326.87	330.68	Limestone, shaley		ak, cs, as	y	3.81
4.00	330.68	334.68	Claystone, gy w/ ls nods		ak, cv, ev		0.00
7.83	334.68	342.51	Sandstone, gy		cs, as	y	7.83
0.84	342.51	343.35	Shale, gy, sandy		cs, as		0.00
	Total Depth	343.35					151.21

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 151.21

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 44%

	Thickness (Ft.)	Percent (%)
Hard Rock:	151.21	44%
Soft Rock:	192.14	56%
	343.35	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total S.A.)
Roof, 10 ft.	176.06	2.07	1.28	64.7	-110.4
Coal	4.61	5.05	3.19	158.00	153.4
Bottom, 10 ft.	401.60	2.01	1.81	62.81	-338.19

ORIGINAL

D0425-6

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-10

Field Engineer: Ken Cacii
Surface Elevation: 1,266.50
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 678,602
Easting: 2,417,321
Drilling Company: Keragen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
67.00	0.00	67.00	Casing				0.00
3.00	67.00	70.00	Claystone, gy	YES	cv, ev		0.00
10.00	70.00	80.00	Claystone, red/ grn	YES	cv, ev		0.00
9.00	80.00	89.00	Shale, gy, sandy	YES	cm, em		0.00
3.80	89.00	92.80	Shale, red		cm, em		0.00
12.10	92.80	104.90	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
3.70	104.90	108.60	Claystone, gy, sandy		cm, em		0.00
2.10	108.60	110.70	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
2.20	110.70	112.90	Shale, grn, sandy w/ ls nods		ak, cs, es		0.00
5.80	112.90	118.70	Shale, red/ grn, sandy		cs, es		0.00
0.90	118.70	119.60	Claystone, red/ grn		cv, ev		0.00
16.80	119.60	136.40	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
2.30	136.40	138.70	Shale, gy, sandy		cs, es		0.00
0.80	138.70	139.50	Claystone, red/ grn		cv, ev		0.00
10.50	139.50	150.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.60	150.00	153.60	Claystone, red/ grn, limey		ak, cv, ev		0.00
3.70	153.60	157.30	Shale, gy w/ ss stks		cs, es		0.00
6.40	157.30	163.70	Shale, red/ grn		cm, em		0.00
38.00	163.70	201.70	Sandstone, gy w/ sh stks		cs, es	y	38.00
0.60	201.70	202.30	Shale, blk w/ coal stks		ac, cv, ev		0.00
12.70	202.30	215.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
63.00	215.00	278.00	Sandstone, gy w/ sh stks		cs, es	y	63.00
1.80	278.00	279.80	Sandstone, gy w/ coal stks		cs, es	y	1.80
8.20	279.80	288.00	Sandstone, gy, massive		cs, es	y	8.20
0.40	288.00	288.40	Sandstone, gy w/ coal stks		cs, es	y	0.40
15.50	288.40	303.90	Sandstone, gy, massive		cs, es	y	15.50
1.60	303.90	305.50	Claystone, gy		cv, ev		0.00
2.10	305.50	307.60	Limestone, shaley		ak, cs, es	y	2.10
2.40	307.60	310.00	Shale, gy w/ interbedded ss		cs, es		0.00
4.60	310.00	314.60	Sandstone, gy w/ sh stks		cs, es	y	4.60
2.10	314.60	316.70	Shale, gy w/ ls nods		ak, cm, em		0.00
2.10	316.70	318.80	Shale, dk gy		cm, em		0.00
5.50	318.80	324.30	Limestone, shaley, layered		ak, cs, es	y	5.50
2.60	324.30	326.90	Shale, dk gy		cm, em		0.00
0.35	326.90	327.25	Shale, blk		ac, cm, em		0.00
0.65	327.25	327.90	Coal w/ bone stks, WAYNESBURGH No. 11		ac, cv, ev		0.00
5.10	327.90	333.00	Shale, gy		cm, em		0.00
2.20	333.00	335.20	Shale, gy w/ ss stks		cs, es		0.00
5.80	335.20	341.00	Sandstone, gy w/ sh stks		cs, es	y	5.80
0.90	341.00	341.90	Shale, gy		cm, em		0.00
0.30	341.90	342.20	Bone w/ coal, LITTLE WAYNESBURGH		ac, cv, ev		0.00
0.80	342.20	343.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
27.00	343.00	370.00	Limestone, shaley, layered		ak, cs, es	y	27.00
2.80	370.00	372.80	Claystone, gy		cv, ev		0.00
4.50	372.80	377.30	Sandstone, gy, channed		cs, es	y	4.50
4.60	377.30	381.90	Shale, red/ grn		cm, em		0.00
1.00	381.90	382.90	Limestone, shaley, massive		ak, cs, es	y	1.00
5.20	382.90	388.10	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.00	388.10	389.10	Shale, gy, sandy		cs, es		0.00
7.90	389.10	397.00	Sandstone, gy w/ sh stks		cs, es	y	7.90
10.80	397.00	407.80	Claystone, gy, sandy		cm, em		0.00
2.20	407.80	410.00	Limestone, massive		ak, cs, es	y	2.20

ORIGINAL

D8425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-10

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
1.00	410.00	411.00	Claystone, gy		cv, ev		0.00
5.20	411.00	416.20	Limestone, massive		ak, cs, es	y	5.20
2.00	416.20	418.20	Shale, gy, sandy		cs, es		0.00
3.00	418.20	421.20	Sandstone, gy w/ sh stks		cs, es	y	3.00
0.80	421.20	422.00	Claystone, gy		cv, ev		0.00
33.60	422.00	455.60	Limestone, shaley, layered		ak, cs, es	y	33.60
3.30	455.60	458.90	Shale, grn		cm, em		0.00
5.40	458.90	464.30	Limestone, massive		ak, cs, es	y	5.40
17.40	464.30	481.70	Limestone, shaley, layered		ak, cs, es	y	17.40
2.30	481.70	484.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.00	484.00	486.00	Shale, dk gy		cm, em		0.00
3.15	486.00	489.15	**Coal w/ bone stks, SEWICKLEY No. 9**		ac, cv, ev		0.00
0.10	489.15	489.25	Pyrite		ac, cs, es	y	0.10
1.35	489.25	490.60	Claystone, gy w/ ls nods		ak cv, ev		0.00
2.50	490.60	493.10	Shale, gy, sandy		cs, es		0.00
1.90	493.10	495.00	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
8.70	495.00	503.70	Shale, gy		cm, em		0.00
3.50	503.70	507.20	Shale, dk gy		cm, em		0.00
0.85	507.20	508.05	**Coal w/ bone stks**		ac, cv, ev		0.00
0.40	508.05	508.45	Claystone, dk gy		cv, ev		0.00
1.00	508.45	509.45	**Coal**		ac, cv, ev		0.00
0.30	509.45	509.75	Claystone, dk gy		cv, ev		0.00
0.55	509.75	510.30	**Coal w/ sh stks**		ac, cv, ev		0.00
1.50	510.30	511.80	Claystone, dk gy		cv, ev		0.00
14.30	511.80	526.10	Limestone, shaley, layered		ak, cs, es	y	14.30
3.40	526.10	529.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.50	529.50	534.00	Sandstone, gy		cs, es	y	4.50
7.00	534.00	541.00	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
2.80	541.00	543.80	Limestone, shaley, layered		ak, cs, es	y	2.80
3.75	543.80	547.55	Claystone, gy		cv, ev		0.00
0.65	547.55	548.20	**Coal, shaley, bony, pyritic**		ac, cv, ev		0.00
16.30	548.20	564.50	Limestone, shaley, layered		ak, cs, es	y	16.30
3.20	564.50	567.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.70	567.70	568.40	Limestone, shaley, layered		ak, cs, es	y	0.70
1.60	568.40	570.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.80	570.00	571.80	Claystone, dk gy		cv, ev		0.00
2.32	571.80	574.12	Shale, dk gy		cm, em		0.00
0.28	574.12	574.40	**Coal w/ pyrite, ROOF COAL**		ac, cv, ev		0.00
0.90	574.40	575.30	Shale, dk gy/ gy		cm, em		0.00
5.05	575.30	580.35	**Coal, PITTSBURGH No. 8**		ac, cv, ev		0.00
0.15	580.35	580.50	**Coal w/ bone stks**		ac, cv, ev		0.00
1.85	580.50	582.35	Shale, gy		cm, em		0.00
1.35	582.35	583.70	Limestone, shaley		ak, cs, es	y	1.35
2.70	583.70	586.40	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.10	586.40	588.50	Claystone, gy		cv, ev		0.00
1.10	588.50	589.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.50	589.60	590.10	Shale, gy, sandy		cs, es		0.00
3.40	590.10	593.50	Sandstone, gy w/ sh stks		cs, es	y	3.40
0.80	593.50	594.30	Shale, gy w/ ss stks		cs, es		0.00
1.90	594.30	596.20	Sandstone, gy w/ sh stks		cs, es	y	1.90
1.70	596.20	597.90	Shale, gy w/ ss stks		cs, es		0.00
2.10	597.90	600.00	Sandstone, gy, churned		cs, es	y	2.10
	Total Depth	600.00					299.55

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-10

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
Total Thickness of Hard Rock Overlying Mining Unit							299.55
Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit							50%

	Thickness (Ft.)	Percent (%)
Hard Rock	299.55	50%
Soft Rock	300.45	50%
	600.00	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulfur %	Pyritic Sulfur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	158.20	1.60	1.51	50.1	-108.1
Coal	4.35	5.24	3.61	165.80	160.7
Bottom, 10 ft.	186.60	2.28	2.01	71.10	-117.5

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-14

Field Engineer: Ken Cecil
Surface Elevation: 1,314.97
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 674,806
Easting: 2,425,948
Drilling Company: Keragen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
15.00	0.00	15.00	Casing				0.00
4.90	15.00	19.90	Sandstone, gy / sh stks	Yes	cs, es	y	4.90
5.10	19.90	25.00	Shale, gy	Yes	cm, em		0.00
8.70	25.00	33.70	Shale,dk gy	Yes	cm, em		0.00
1.40	33.70	35.10	Limestone		ak, cs, es	y	1.40
3.55	35.10	37.65	Shale,dk gy		cm, em		0.00
0.25	37.65	37.90	Coal		ac, cv, ev		0.00
0.20	37.90	38.10	Shale, blk		ac, cv, ev		0.00
7.50	38.10	45.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
11.40	45.60	57.00	Claystone, red w/ ls nods	Yes	ak, cv, ev		0.00
3.70	57.00	60.70	Claystone, gy, sandy, limey		ak, cm, em		0.00
4.80	60.70	65.50	Sandstone, gy / sh stks	Yes	cs, es	y	4.80
33.50	65.50	99.00	Claystone, red w/ ls nods		ak, cv, ev		0.00
2.60	99.00	101.60	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
6.80	101.60	108.40	Sandstone, gy / sh stks		cs, es	y	6.80
3.20	108.40	111.60	Shale, gy w/ ss stks		cs, es		0.00
6.40	111.60	118.00	Shale, red/ grn w/ ls nods	Yes	ak, cm, em		0.00
1.00	118.00	119.00	Claystone, gy		cv, ev		0.00
4.30	119.00	123.30	Shale, gy, sandy		cs, es		0.00
5.20	123.30	128.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
7.50	128.50	136.00	Claystone, red		cv, ev		0.00
4.00	136.00	140.00	Claystone, red/ grn, sandy w/ ls nods		ak, cm, em		0.00
1.90	140.00	141.90	Sandstone, gy / sh stks		cs, es	y	1.90
6.10	141.90	148.00	Shale, red/ grn		cm, em		0.00
1.10	148.00	149.10	Sandstone, gy, churned		cs, es	y	1.10
4.90	149.10	154.00	Sandstone, gy / sh stks		cs, es	y	4.90
7.60	154.00	161.60	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
5.40	161.60	167.00	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
2.10	167.00	169.10	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
2.00	169.10	171.10	Claystone, dk gy		cv, ev		0.00
1.90	171.10	173.00	Shale, gy, sandy w/ ls nods		ak, cm, em		0.00
12.40	173.00	185.40	Claystone, red/ grn		cv, ev		0.00
8.80	185.40	194.20	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
0.30	194.20	194.50	Claystone, blk		ac, cv, ev		0.00
8.00	194.50	202.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
27.20	202.50	229.70	Claystone, red/ grn w/ ls nods		ak, cv, ev		0.00
12.70	229.70	242.40	Shale, gy w/ ls nods		ak, cm, em		0.00
0.45	242.40	242.85	Shale, dk gy, layered		cm, em		0.00
5.15	242.85	248.00	Claystone, red/ grn		cv, ev		0.00
4.00	248.00	252.00	Limestone, shaley, layered		ak, cs, es	y	4.00
8.30	252.00	260.30	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
2.30	260.30	262.60	Claystone, gy		cv, ev		0.00
1.40	262.60	264.00	Shale, gy w/ ss stks		cs, es		0.00
5.60	264.00	269.60	Sandstone, gy / sh stks		cs, es	y	5.60
0.40	269.60	270.00	Shale, gy w/ ss stks		cs, es		0.00
7.00	270.00	277.00	Claystone, red/ grn		cv, ev		0.00
2.60	277.00	279.60	Claystone, gy, sandy		cm, em		0.00
4.20	279.60	283.80	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
1.00	283.80	284.80	Sandstone, gy, churned		cs, es	y	1.00
3.30	284.80	288.10	Sandstone, gy / sh stks		cs, es	y	3.30
2.10	288.10	290.20	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
2.50	290.20	292.70	Sandstone, gy / sh stks		cs, es	y	2.50

ORIGINAL

0042S-4

AEC 18843

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2301-14

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
3.70	292.70	296.40	Shale, gy w/ ss stks		cs, ss		0.00
3.00	296.40	299.40	Shale, gy		cm, em		0.00
0.10	299.40	299.50	Limestone, shaley, layered		ak, cs, es	y	0.10
4.40	299.50	303.90	Claystone, gy		cv, ev		0.00
1.40	303.90	305.30	Shale, blk w/ coal stks		ac, cv, ev		0.00
1.45	305.30	306.75	Coal w/ bone stks, WASHINGTON No. 12		ac, cv, ev		0.00
0.50	306.75	307.25	Shale, dk gy		ac, cv, ev		0.00
1.25	307.25	308.50	Coal w/ bone stks		ac, cv, ev		0.00
14.50	308.50	323.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
8.30	323.00	331.30	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
16.30	331.30	347.60	Sandstone, gy w/ crossbeds		cs, ss	y	16.30
4.60	347.60	352.10	Shale, gy w/ ss stks and ls nods		ak, cs, es		0.00
2.90	352.10	355.00	Shale, gy w/ ss stks		cs, es		0.00
0.35	355.00	355.35	Shale, dk gy, layered		cm, em		0.00
1.95	355.35	357.30	Shale, gy		cm, em		0.00
0.20	357.30	357.50	Shale, dk gy		cm, em		0.00
1.40	357.50	358.90	Coal w/ bone stks, LITTLE WASHINGTON		ac, cv, ev		0.00
0.10	358.90	359.00	Shale, blk		ac, cv, ev		0.00
3.50	359.00	362.50	Coal w/ sh layers		ac, cv, ev		0.00
0.20	362.50	362.70	Shale, blk		ac, cv, ev		0.00
1.40	362.70	364.10	Coal w/ bone stks, pyritic		ac, cv, ev		0.00
0.90	364.10	365.00	Claystone, blk		ac, cv, ev		0.00
2.20	365.00	367.20	Limestone, shaley, layered		ak, cs, es	y	2.20
9.90	367.20	377.10	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.20	377.10	382.30	Shale, gy w/ ss stks		cs, es		0.00
2.20	382.30	384.50	Shale, gy		cm, em		0.00
0.90	384.50	385.40	Claystone, gy		cv, ev		0.00
1.60	385.40	387.00	Limestone, shaley, layered		ak, cs, es	y	1.60
7.70	387.00	394.70	Sandstone, gy		cs, es	y	7.70
3.50	394.70	397.20	Shale, gy w/ ss stks		cs, es		0.00
1.60	397.20	398.80	Shale, dk gy		cm, em		0.00
0.70	398.80	399.50	Shale, blk		ac, cv, ev		0.00
1.05	399.50	400.55	Shale, dk gy		cm, em		0.00
5.05	400.55	405.60	Limestone, shaley, layered		ak, cs, es	y	5.05
0.30	405.60	405.90	Sandstone, gy w/ sh stks		cs, es	y	0.30
3.30	405.90	409.20	Claystone, dk gy		cv, ev		0.00
0.90	409.20	410.10	Shale, dk gy		cm, em		0.00
0.75	410.10	410.85	Shale, blk w/ coal stks		ac, cm, em		0.00
1.35	410.85	412.20	Claystone, gy		cv, ev		0.00
0.60	412.20	412.80	Shale, gy		cm, em		0.00
8.50	412.80	421.30	Shale, gy w/ ss stks		cs, es		0.00
0.70	421.30	422.00	Shale, dk gy, layered		cm, em		0.00
0.38	422.00	422.38	Shale, dk gy w/ coal stks		cm, em		0.00
0.22	422.38	422.60	Coal w/ bone stks, WAYNESBURGH No. 11		ac, cv, ev		0.00
1.10	422.60	423.70	Claystone, dk gy		cv, ev		0.00
4.50	423.70	428.20	Claystone, gy		cv, ev		0.00
0.40	428.20	428.60	Shale, dk gy w/ ss stks		cs, es		0.00
19.00	428.60	447.60	Limestone, shaley, layered		ak, cs, es	y	19.00
8.10	447.60	455.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.80	455.70	457.50	Limestone, shaley, layered		ak, cs, es	y	1.80
1.10	457.50	458.60	Claystone, grn		cv, ev		0.00
0.70	458.60	459.30	Shale, blk w/ coal stks		cm, em		0.00
0.40	459.30	459.70	Claystone, dk gy		cv, ev		0.00
2.70	459.70	462.40	Claystone, gy w/ ss stks		cm, em		0.00
1.60	462.40	464.00	Sandstone, gy, churned		cs, es	y	1.60
0.60	464.00	464.60	Shale, gy w/ ss stks		cs, es		0.00
4.60	464.60	469.20	Shale, red/ grn		cm, em		0.00
10.40	469.20	479.60	Limestone, shaley, layered		ak, cs, es	y	10.40
0.50	479.60	480.10	Claystone, gy		cv, ev		0.00
2.00	480.10	482.10	Shale, gy, sandy		cs, es		0.00
19.60	482.10	501.70	Limestone, shaley, layered		ak, cs, es	y	19.60
2.70	501.70	504.40	Shale, gy w/ ss stks		cs, es		0.00
1.30	504.40	505.70	Claystone, gy		cv, ev		0.00
10.00	505.70	515.70	Limestone, shaley, layered		ak, cs, es	y	10.00

ORIGINAL

0425-4

AEC 18844

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-14

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
3.30	515.70	519.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
17.70	519.00	536.70	Limestone, shaley, layered		ak, cs, es	y	17.70
2.70	536.70	539.40	Claystone, gy		cv, ev		0.00
5.10	539.40	544.50	Claystone, gy/ grn		cv, ev		0.00
11.40	544.50	555.90	Limestone, shaley, layered		ak, cs, es	y	11.40
4.60	555.90	560.50	Claystone, gy/ grn		cv, ev		0.00
9.50	560.50	570.00	Limestone, shaley, layered		ak, cs, es	y	9.50
1.00	570.00	571.00	Claystone, dk gy		cv, ev		0.00
1.00	571.00	572.00	Shale, blk w/ coal stks		ac, cv, ev		0.00
0.45	572.00	572.45	Sandstone, gy, churned		cs, es	y	0.45
0.45	572.45	572.90	Shale, blk/ dk gy		cm, em		0.00
5.10	572.90	578.00	Claystone, gy, sandy, w/ ls nods		al, cm, em		0.00
16.00	578.00	594.00	Shale, gy w/ ss stks		cs, es		0.00
1.70	594.00	595.70	Sandstone, gy w/ sh stks		cs, es	y	1.70
2.00	595.70	597.70	Shale, gy w/ ss stks		cs, es		0.00
3.30	597.70	601.00	Shale, dk gy		cm, em		0.00
0.40	601.00	601.40	Shale, dk gy, layered		cm, em		0.00
0.60	601.40	602.00	Shale, blk w/ coal stks		ac, cv, ev		0.00
0.75	602.00	602.75	**Coal w/ bone stks, pyritic, SEWICKLEY No. 9**		ac, cv, ev		0.00
0.55	602.75	603.30	Shale, blk w/ coal stks		ac, cv, ev		0.00
1.40	603.30	604.70	**Coal w/ sh layers**		ac, cv, ev		0.00
18.90	604.70	623.60	Limestone, shaley, layered		ak, cs, es	y	18.90
2.80	623.60	626.40	Sandstone, gy w/ sh stks		cs, es	y	2.80
6.80	626.40	633.20	Shale, gy		cm, em		0.00
0.50	633.20	633.70	Sandstone, gy w/ sh stks		cs, es	y	0.50
2.00	633.70	635.70	Shale, dk gy		cm, em		0.00
3.10	635.70	638.80	Limestone, shaley, layered		ak, cs, es	y	3.10
0.40	638.80	639.20	Shale, dk gy		cm, em		0.00
1.00	639.20	640.20	Claystone, grn		cv, ev		0.00
1.80	640.20	642.00	Shale, blk w/ coal stks		ac, cv, ev		0.00
1.20	642.00	643.20	Claystone, gy		cv, ev		0.00
0.60	643.20	643.80	Claystone, gy, sandy		cm, em		0.00
5.55	643.80	649.35	Limestone, shaley, massive		ak, cs, es	y	5.55
0.60	649.35	649.95	Claystone, dk gy w/ ls nods		ak, cm, em		0.00
4.60	649.95	654.55	Limestone, nodular		ak, cs, es	y	4.60
0.70	654.55	655.25	Shale, dk gy w/ ls nods		ak, cm, em		0.00
2.55	655.25	657.80	Limestone, nodular		ak, cs, es	y	2.55
3.10	657.80	660.90	Claystone, dk gy/ gy		cv, ev		0.00
0.25	660.90	661.15	Limestone, shaley, nodular		ak, cs, es	y	0.25
1.05	661.15	662.20	Claystone, gy		cv, ev		0.00
0.70	662.20	662.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.40	662.90	663.30	Limestone, shaley, mottled		ak, cs, es	y	0.40
1.65	663.30	664.95	Claystone, grn		cv, ev		0.00
1.95	664.95	666.90	Claystone, brn/ blk		cv, ev		0.00
0.25	666.90	667.15	Shale, blk w/ coal stks		ac, cv, ev		0.00
1.05	667.15	668.20	**Coal w/ bone, pyritic, ROOF COAL**		ac, cv, ev		0.00
0.49	668.20	668.69	Shale, blk/ dk gy		ac, cv, ev		0.00
0.25	668.69	668.94	Shale, brn/ blk		cm, em		0.00
0.15	668.94	669.09	Limestone, shaley, layered		ak, cs, es	y	0.15
4.88	669.09	673.97	**Coal w/ bone stks, PITTSBURGH No. 8**		ac, cv, ev		0.00
0.68	673.97	674.65	**Coal, pyritic**		ac, cv, ev		0.00
0.10	674.65	674.75	Shale, dk gy		cm, em		0.00
0.40	674.75	675.15	Shale, gy		cm, em		0.00
0.50	675.15	675.65	Shale, gy w/ ls nods		ak, cm, em		0.00
1.65	675.65	677.30	Limestone, nodular		ak, cs, es	y	0.00
2.30	677.30	679.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.20	679.60	680.70	Claystone, gy, sandy		cm, em		0.00
2.30	680.70	683.00	Shale, gy w/ ls nods		ak, cm, em		0.00
2.80	683.00	685.80	Sandstone, gy		cs, es	y	2.80
Total Depth		685.80					220.20

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-14

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 220.20

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 32%

	Thickness (Ft.)	Percent (%)
Hard Rock:	220.20	32%
Soft Rock:	465.60	68%
	685.80	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	193.31	1.90	1.62	99.4	-133.9
Coal	6.13	5.11	2.21	160.00	153.9
Bottom, 10 ft.	146.10	3.37	2.53	105.05	-41.1

ORIGINAL

08425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-16

Field Engineer: Kim Cecil
Surface Elevation: 1,324.59
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 681,538
Easting: 2,416,392
Drilling Company: Kerogen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
16.00	0.00	16.00	Casing				0.00
1.10	16.00	17.10	Sandstone, gy, massive	YES	cs, es	y	1.10
13.20	17.10	30.30	Claystone, red	YES	cv, ev		0.00
5.50	30.30	35.80	Shale, gy w/ ss stks		cs, es		0.00
2.40	35.80	38.20	Sandstone, gy w/ sh stks	YES	cs, es	y	2.40
9.90	38.20	48.10	Claystone, red	YES	cv, ev		0.00
5.90	48.10	54.00	Claystone, dk gy		cv, ev		0.00
2.00	54.00	56.00	Shale, red/ grn	YES	cm, em		0.00
3.00	56.00	59.00	Core loss.				0.00
12.40	59.00	71.40	Claystone, red/ grn		cv, ev		0.00
6.90	71.40	78.30	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.40	78.30	80.70	Claystone, red/ ren, sandy		cs, es		0.00
28.80	80.70	109.50	Claystone, red/ gy		cv, ev		0.00
4.70	109.50	114.20	Shale, red/ grn		cm, em		0.00
7.80	114.20	122.00	Shale, red/ grn; sandy		cs, es		0.00
3.50	122.00	125.50	Shale, red		cm, em		0.00
2.35	125.50	127.85	Shale, blk/ dk gy, layered		ac, cm, em		0.00
0.10	127.85	127.95	Coal		ac, cv, ev		0.00
1.85	127.95	129.80	Limestone		cak, cs, es	y	1.85
2.00	129.80	131.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.40	131.80	132.20	Shale, dk gy, layered		cm, em		0.00
13.80	132.20	146.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.70	146.00	148.70	Claystone, red/ grn		cv, ev		0.00
0.80	148.70	149.50	Shale, blk		ac, cm, em		0.00
2.20	149.50	151.70	**Coal w/ Sh, pyritic, WASHINGTON No. 12**		ac, cv, ev		0.00
0.75	151.70	152.45	Shale, dk gy		cm, em		0.00
15.15	152.45	167.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
6.20	167.60	173.80	Claystone, red/ grn		cv, ev		0.00
3.20	173.80	177.00	Claystone, gy		cv, ev		0.00
43.30	177.00	220.30	Sandstone, gy w/ sh stks		cs, es	y	43.30
5.60	220.30	225.90	Shale, gy, conglomerate w/ iron nods		cs, es		0.00
0.80	225.90	226.70	**Coal w/ sh layers**		ac, cv, ev		0.00
1.10	226.70	227.80	Claystone, dk gy		cv, ev		0.00
1.40	227.80	229.20	Limestone		cak, cs, es	y	1.40
0.70	229.20	229.90	Claystone, grn		cv, ev		0.00
9.10	229.90	239.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.50	239.00	240.50	Shale, gy		cm, em		0.00
1.70	240.50	242.20	Shale, gy, sandy		cs, es		0.00
1.80	242.20	244.00	Sandstone, gy w/ sh stks		cs, es	y	1.80
9.50	244.00	253.50	Shale, red/ gy		cm, em		0.00
1.10	253.50	254.60	Limestone, nodular		cak, cs, es	y	1.10
7.70	254.60	262.30	Shale, gy		cm, em		0.00
1.70	262.30	264.00	Limestone, shaley, layered		cak, cs, es	y	1.70
4.70	264.00	268.70	Claystone, gy		cv, ev		0.00
0.80	268.70	269.50	Shale, dk gy, layered		cm, em		0.00
10.20	269.50	279.70	Shale, gy, sandy		cs, es		0.00
8.60	279.70	288.30	Sandstone, gy w/ sh stks		cs, es	y	8.60
0.70	288.30	289.00	Shale, gy, sandy		cs, es		0.00
3.00	289.00	292.00	Shale, gy		cm, em		0.00
0.50	292.00	292.50	Coal w/ sh stks, WAYNESBURGH No. 11		ac, cv, ev		0.00
2.10	292.50	294.70	Claystone, gy		cv, ev		0.00
1.80	294.70	296.50	Limestone		cak, cs, es	y	1.80

ORIGINAL

B0425-4

AEC 18847

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-18

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
5.10	296.50	301.60	Claystone, gy w/ ls nods		sk, cv, ev		0.00
4.20	301.60	305.80	Limestone, shaley, layered		csk, cs, es	y	4.20
1.00	305.80	306.80	Shale, gy		cm, em		0.00
2.00	306.80	308.80	Limestone, mosaic		csk, cs, es	y	2.00
2.20	308.80	311.00	Claystone, gy		cv, ev		0.00
2.10	311.00	313.10	Limestone, sheley, layered		csk, cs, es	y	2.10
3.50	313.10	316.60	Claystone, gy w/ ls nods		sk, cv, ev		0.00
4.40	316.60	321.00	Limestone, nodular		csk, cs, es	y	4.40
1.60	321.00	322.60	Shale, gy/ grn		cm, em		0.00
3.40	322.60	326.00	Claystone, gy		cv, ev		0.00
3.60	326.00	329.60	Shale, gy, sandy		cs, es		0.00
2.30	329.60	331.90	Shale, red/ grn		cm, em		0.00
6.90	331.90	338.80	Limestone, layered		csk, cs, es	y	6.90
0.90	338.80	339.70	Claystone, grn w/ ls nods		sk, cv, ev		0.00
6.40	339.70	346.10	Sandstone, gy w/ sh stks		cs, es	y	6.40
1.50	346.10	347.60	Shale, grn		cm, em		0.00
10.70	347.60	358.30	Limestone, shaley, layered		csk, cs, es	y	10.70
7.10	358.30	365.40	Claystone, grn w/ ls nods		sk, cv, ev		0.00
10.80	365.40	376.20	Claystone, grn		cv, ev		0.00
2.20	376.20	378.40	Claystone, grn w/ ls nods		sk, cv, ev		0.00
5.70	378.40	384.10	Limestone, shaley, layered		csk, cs, es	y	5.70
5.10	384.10	389.20	Claystone, grn w/ ls nods		sk, cv, ev		0.00
1.90	389.20	391.10	Claystone, grn		cv, ev		0.00
13.70	391.10	404.80	Limestone, nodular		csk, cs, es	y	13.70
2.90	404.80	407.70	Claystone, gy w/ ls nods		sk, cv, ev		0.00
2.90	407.70	410.60	Claystone, grn		cv, ev		0.00
5.50	410.60	416.10	Limestone, massive		csk, cs, es	y	5.50
4.10	416.10	420.20	Limestone, shaley, layered		csk, cs, es	y	4.10
2.50	420.20	422.70	Shale, grn w/ ls nods		sk, cm, em		0.00
2.20	422.70	424.90	Limestone, mosaic		csk, cs, es	y	2.20
0.90	424.90	425.80	Claystone, grn w/ ls nods		sk, cv, ev		0.00
12.50	425.80	438.30	Limestone, nodular		csk, cs, es	y	12.50
3.00	438.30	440.30	Claystone, brn/ blk		ac, cv, ev		0.00
1.40	440.30	441.70	**Coal w/ bone, pyritic, SEWICKLEY No. 9**		ac, cv, ev		0.00
0.20	441.70	441.90	**Shale, blk w/ coal stks**		ac, cm, em		0.00
1.40	441.90	443.30	**Coal w/ pyrite**		ac, cv, ev		0.00
1.00	443.30	444.30	Claystone, dk gy		cv, ev		0.00
2.00	444.30	446.30	Claystone, grn w/ ls nods		sk, cv, ev		0.00
3.40	446.30	449.70	Limestone, shaley, layered		csk, cs, es	y	3.40
11.10	449.70	460.80	Claystone, gy/ grn w/ ls nods		sk, cv, ev		0.00
0.60	460.80	461.40	**Coal w/ sh stks**		ac, cv, ev		0.00
0.50	461.40	461.90	Claystone, gy w/ ls nods		sk, cv, ev		0.00
11.40	461.90	473.30	Limestone, nodular		csk, cs, es	y	11.40
0.30	473.30	473.60	Claystone, gy w/ ls nods		sk, cv, ev		0.00
6.90	473.60	480.50	Limestone, nodular		csk, cs, es	y	6.90
2.30	480.50	482.80	Claystone, grn w/ ls nods		sk, cv, ev		0.00
1.80	482.80	484.60	Limestone, shaley, layered		csk, cs, es	y	1.80
11.40	484.60	496.00	Shale, gy/ grn w/ ls nods		sk, cm, em		0.00
4.40	496.00	500.40	Limestone, shaley, layered		sk, cs, es		0.00
2.10	500.40	502.50	Claystone, grn w/ ls nods		sk, cv, ev		0.00
0.70	502.50	503.20	Claystone, blk/ dk gy		ac, cv, ev		0.00
1.40	503.20	504.60	Claystone, gy w/ ls nods		sk, cv, ev		0.00
3.10	504.60	507.70	Limestone, massive		csk, cs, es	y	3.10
3.20	507.70	510.90	Claystone, gy		cv, ev		0.00
11.90	510.90	522.80	Limestone, shaley, layered		csk, cs, es	y	11.90
2.30	522.80	525.10	Claystone, gy w/ ls nods		sk, cv, ev		0.00
0.50	525.10	525.60	Limestone		csk, cs, es	y	0.50
5.00	525.60	530.60	Claystone, gy w/ ls nods		sk, cv, ev		0.00
0.10	530.60	530.70	Shale, blk		ac, cm, em		0.00
0.55	530.70	531.25	**Coal w/ bone layers, ROOF COAL**		ac, cv, ev		0.00
0.80	531.25	532.05	Shale, dk gy		cm, em		0.00
3.24	532.05	535.29	**Coal, PITTSBURGH No.8**		ac, cv, ev		0.00
1.61	535.29	536.90	**Coal w/ bone stks**		ac, cv, ev		0.00
0.60	536.90	537.50	Claystone, dk gy		cv, ev		0.00

ORIGINAL

20-23-4

AEC 18848

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-16

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
5.20	537.50	542.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.50	542.70	544.20	Sandstone, gy, churned		cs, ss	y	1.50
1.70	544.20	545.90	Shale, gy, conglomerate w/ iron nods		cs, ss		0.00
0.60	545.90	546.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.30	546.50	547.80	Shale, gy		cm, em		0.00
0.80	547.80	548.60	Shale, dk gy, layered		cm, em		0.00
0.40	548.60	549.00	Claystone, gy		cv, ev		0.00
4.50	549.00	553.50	Shale, gy w/ ss stks		cs, ss		0.00
	Total Depth	553.50					185.95

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 185.95

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 34%

	Thickness (Ft.)	Percent (%)
Hard Rock:	185.95	34%
Soft Rock:	367.55	66%
	553.50	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as $CaCO_3$	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	339.11	1.50	1.24	46.8	-292.3
Coal	1.45	6.61	3.88	207.00	205.6
Bottom, 10 ft.	252.00	1.14	0.92	35.00	-216.4

ORIGINAL

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-24

Field Engineer: Kim Cecil
Surface Elevation: 1,140.00
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 682,935
Easting: 2,410,742
Drilling Company: Kerogen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
22.00	0.00	22.00	Casing				0.00
2.65	22.00	24.65	Shale, dk gy/ gy	YES	cm, em		0.00
0.55	24.65	25.20	Limestone, shaley	YES	ak, cs, es	y	0.55
0.30	25.20	25.50	Claystone, gy	YES	cv, ev		0.00
0.30	25.50	25.80	Limestone, shaley	YES	ak, cs, es	y	0.30
9.90	25.80	35.70	Claystone, gy	YES	cv, ev		0.00
1.60	35.70	37.30	Shale, blk w/ coal stks	YES	ac, cm, em		0.00
0.55	37.30	37.85	Coal, WASHINGTON No. 12	YES	ac, cv, ev		0.00
11.70	37.85	49.55	Claystone, gy	YES	cv, ev		0.00
2.80	49.55	52.35	Shale, gy w/ ss stks	YES	cs, es		0.00
52.85	52.35	105.20	Sandstone, gy		cs, es	y	52.85
0.50	105.20	105.70	Shale, gy, sandy		cs, es		0.00
6.20	105.70	111.90	Sandstone, gy		cs, es	y	6.20
6.60	111.90	118.50	Sandstone, gy w/ coal stks		cs, es	y	6.60
1.10	118.50	119.60	Shale, dk gy w/ coal stks		ac, cm, em		0.00
2.10	119.60	121.70	Sandstone, gy w/ coal stks		cs, es	y	2.10
19.40	121.70	141.10	Sandstone, gy w/ crossbeds		cs, es	y	19.40
1.40	141.10	142.50	Shale, gy w/ interbedded ss		cs, es		0.00
0.80	142.50	143.30	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
0.45	143.30	143.75	Sandstone, gy w/ sh stks		cs, es	y	0.45
2.15	143.75	145.90	Shale, gy w/ ls nods		ak, cm, em		0.00
2.95	145.90	148.85	Shale, gy, sandy w/ ls nods		ak, cs, es		0.00
7.15	148.85	156.00	Shale, blk/ dk gy		ac, cm, em		0.00
3.00	156.00	159.00	Shale, gy w/ ls nods		ak, cm, em		0.00
2.45	159.00	160.45	Shale, blk		ac, cm, em		0.00
3.25	160.45	163.70	Limestone, shaley, nodular		ak, cs, es	y	3.25
1.00	163.70	164.70	Shale, gy w/ ls nods		ak, cm, em		0.00
2.30	164.70	167.00	Claystone, gy/ grn		cv, ev		0.00
0.45	167.00	167.45	Shale, blk		ac, cm, em		0.00
3.05	167.45	170.50	Shale, gy		cm, em		0.00
2.40	170.50	172.90	Shale, gy w/ ss stks		cs, es		0.00
1.10	172.90	174.00	Sandstone, gy w/ sh stks		cs, es	y	1.10
3.10	174.00	177.10	Shale, gy		cm, em		0.00
1.40	177.10	178.50	Shale, gy w/ ss stks		cs, es		0.00
5.70	178.50	184.20	Claystone, gy		cv, ev		0.00
0.37	184.20	184.57	Coal, WAYNESBURGH No. 11		ac, cv, ev		0.00
0.43	184.57	185.00	Claystone, gy		cv, ev		0.00
1.20	185.00	186.20	Claystone, dk gy w/ ls nods		ak, cv, ev		0.00
0.80	186.20	187.00	Claystone, gy		cv, ev		0.00
8.05	187.00	195.05	Limestone, nodular		ak, cs, es	y	8.05
6.45	195.05	201.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.10	201.50	206.60	Claystone, gy		cv, ev		0.00
1.05	206.60	207.65	Shale, grn, sandy		cs, es		0.00
4.95	207.65	212.60	Limestone, shaley		ak, cs, es	y	4.95
3.75	212.60	216.35	Shale, dk gy/ gy/ grn		cm, em		0.00
2.80	216.35	219.15	Sandstone, gy w/ sh stks		cs, es	y	2.80
3.85	219.15	223.00	Claystone, gy/ grn		cv, ev		0.00
5.70	223.00	228.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.50	228.70	232.20	Shale, gy/ grn		cm, em		0.00
5.80	232.20	238.00	Shale, grn w/ ss stks		cs, es		0.00
8.30	238.00	246.30	Limestone, shaley, nodular		ak, cs, es	y	8.30
2.50	246.30	248.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00

ORIGINAL

00425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-3001-24

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
0.60	248.80	249.40	Claystone, red/ grn		cv, ev		0.00
9.75	249.40	259.15	Claystone, gy/ grn		cv, ev		0.00
6.85	259.15	266.00	Limestone, shaley, layered		ak, cs, es	y	6.85
2.80	266.00	268.80	Shale, gy/ grn		cm, em		0.00
2.15	268.80	270.95	Sandstone, gy w/ sh stks		cs, es	y	2.15
2.35	270.95	273.30	Shale, gy w/ ss stks		cs, es		0.00
1.20	273.30	274.50	Shale, grn, sandy, limey		ak, cs, es		0.00
1.50	274.50	276.00	Shale, grn w/ ls nods		ak, cm, em		0.00
4.70	276.00	280.70	Limestone, shaley, layered		ak, cs, es	y	4.70
4.50	280.70	285.20	Shale, grn w/ ls nods		ak, cm, em		0.00
12.30	285.20	297.50	Limestone		ak, cs, es	y	12.30
1.35	297.50	298.85	Shale, gy, limey		ak, cm, em		0.00
10.30	298.85	309.15	Limestone, nodular		ak, cs, es	y	10.30
2.35	309.15	311.50	Shale, gy/ grn		cm, em		0.00
3.15	311.50	314.65	Limestone, massive		ak, cs, es	y	3.15
1.55	314.65	316.30	Shale, gy		cm, em		0.00
7.70	316.30	324.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.45	324.00	328.45	Shale, dk gy w/ ls nods		ak, cm, em		0.00
0.70	328.45	329.15	Claystone, blk w/ ls nods		ak, cv, ev		0.00
0.30	329.15	329.45	Shale, blk w/ coal stks		ac, cm, em		0.00
3.10	329.45	332.55	**Coal w/ bone/ shale, SEWICKLEY No. 9**		ac, cv, ev		0.00
4.00	332.55	336.55	Shale, dk gy		cm, em		0.00
2.65	336.55	339.20	Shale, gy w/ interbedded ss		cs, es		0.00
4.65	339.20	343.85	Shale, gy		cm, em		0.00
3.90	343.85	347.75	Shale, gy w/ ls nods		ak, cm, em		0.00
8.00	347.75	355.75	Shale, dk gy/ gy		cm, em		0.00
0.70	355.75	356.45	Limestone, massive		ak, cs, es	y	0.70
1.43	356.45	357.88	**Coal, shaley**		ac, cv, ev		0.00
0.62	357.88	358.50	Shale, blk/ dk gy		cm, em		0.00
15.00	358.50	373.50	Limestone, nodular		ak, cs, es	y	15.00
9.15	373.50	382.65	Shale, gy/ grn w/ ls nods		ak, cm, em		0.00
0.20	382.65	382.85	Shale, gy w/ interbedded ss		cs, es		0.00
1.05	382.85	383.90	Shale, dk gy		cm, em		0.00
4.75	383.90	388.65	Shale, gy w/ ls nods		ak, cm, em		0.00
4.50	388.65	393.15	Claystone, dk gy w/ ls nods		ak, cv, ev		0.00
0.60	393.15	393.75	Shale, blk w/ coal stks		ac, cm, em		0.00
0.65	393.75	394.40	Shale, dk gy		cm, em		0.00
1.10	394.40	395.50	Claystone, gy, sandy		cm, em		0.00
0.85	395.50	396.35	Shale, dk gy, limey		ak, cm, em		0.00
6.30	396.35	402.65	Limestone, nodular		ak, cs, es	y	6.30
0.60	402.65	403.25	Claystone, gy		cv, ev		0.00
8.60	403.25	411.85	Limestone, shaley		ak, cs, es	y	8.60
4.62	411.85	416.47	Shale, gy w/ ls nods		ak, cm, em		0.00
1.15	416.47	417.62	Limestone, shaley, nodular		ak, cs, es	y	1.15
2.77	417.62	420.39	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.25	420.39	421.64	Claystone, gy		cv, ev		0.00
1.40	421.64	423.04	Claystone, blk/ tan		ac, cv, ev		0.00
0.39	423.04	423.43	**Bone w/ coal, ROOF COAL**		ac, cv, ev		0.00
0.72	423.43	424.15	Shale, dk gy		cm, em		0.00
0.65	424.15	424.80	Shale, blk w/ coal stks		ac, cm, em		0.00
3.71	424.80	428.51	**Coal, PITTSBURGH No.8**		ac, cv, ev		0.00
1.14	428.51	429.65	**Coal w/ pyrite**		ac, cv, ev		0.00
0.10	429.65	429.75	Shale, blk w/ coal stks		ac, cm, em		0.00
1.69	429.75	431.44	Shale, gy w/ ls nods		ak, cm, em		0.00
2.30	431.44	433.74	Limestone, shaley, nodular		ak, cs, es	y	2.30
3.51	433.74	437.25	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.05	437.25	440.30	Shale, gy, sandy		cs, es		0.00
1.40	440.30	441.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.95	441.70	442.65	Limestone, shaley, nodular		ak, cs, es	y	0.95
3.95	442.65	446.60	Shale, gy, sandy		cs, es		0.00
Total Depth		446.60					191.35

ORIGINAL

00428-4

AEC 18851

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-3081-34

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 191.35

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 43%

	Thickness (Ft.)	Percent (%)
Hard Rock	191.35	43%
Soft Rock	255.25	57%
	446.60	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	155.69	1.29	1.11	40.2	-115.5
Coal	1.25	5.26	2.10	164.00	162.8
Bottom, 10 ft.	443.50	1.16	1.12	36.25	-407.3

ORIGINAL

ATTACHMENT 13
DIAMOND DRILL HOLE: AEC-2001-35

Field Engineer: Kim Cecil
Surface Elevation: 1,220.00
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 682,930
Easting: 2,413,433
Drilling Company: Keragen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
28.00	0.00	28.00	Casing				0.00
1.90	28.00	29.90	Claystone, gy w/ ls nods	YES	ak, cv, ev		0.00
19.25	29.90	49.15	Claystone, red/ gy w/ ls nods	YES	ak, cv, ev		0.00
4.90	49.15	54.05	Shale, gy w/ ls nods		ak, cm, em		0.00
4.10	54.05	58.15	Shale, gy, sandy, limey		ak, cm, em		0.00
7.40	58.15	65.55	Sandstone, gy w/ crossbeds		cs, es	y	7.40
1.30	65.55	66.85	Shale, gy w/ ls nods		ak, cm, em		0.00
0.80	66.85	67.65	Shale, gy		cm, em		0.00
1.00	67.65	68.65	Shale, gy w/ ss stks		cs, es		0.00
10.10	68.65	78.75	Claystone, gy/ grn		cv, ev		0.00
2.90	78.75	81.65	Claystone, gy w/ ls nods		ak, cv, ev		0.00
8.95	81.65	90.60	Claystone, red/ gy		cv, ev		0.00
3.60	90.60	94.20	Shale, gy w/ ss stks		cs, es		0.00
9.45	94.20	103.65	Shale, gy, sandy, limey		ak, cs, es		0.00
1.75	103.65	105.40	Shale, dk gy		cm, em		0.00
0.93	105.40	106.33	Coal w/ bone stks		ac, cv, ev		0.00
0.53	106.33	106.86	Shale, dk gy		cm, em		0.00
1.15	106.86	108.01	Shale, gy w/ ls nods		ak, cm, em		0.00
0.80	108.01	108.81	Claystone, gy		cv, ev		0.00
2.00	108.81	110.81	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.05	110.81	114.86	Shale, gy w/ ss stks		cs, es		0.00
1.85	114.86	116.71	Shale, gy, sandy, limey		ak, cs, es		0.00
6.50	116.71	123.21	Shale, dk gy/ gy		cm, em		0.00
1.00	123.21	124.21	Shale, blk		ac, cm, em		0.00
1.71	124.21	125.92	Coal w/ bone and sh layers, WASHINGTON No. 12		ac, cv, ev		0.00
1.00	125.92	126.92	Shale, blk/ dk gy		ac, cm, em		0.00
8.90	126.92	135.82	Claystone, gy		cv, ev		0.00
5.00	135.82	140.82	Shale, gy w/ ss stks		cs, es		0.00
47.90	140.82	188.72	Sandstone, gy w/ sh stks		cs, es	y	47.90
1.50	188.72	190.22	Shale, gy w/ ss stks		cs, es		0.00
7.65	190.22	197.87	Sandstone, gy w/ sh stks		cs, es	y	7.65
0.60	197.87	198.47	Coal w/ bone		ac, cv, ev		0.00
0.95	198.47	199.42	Shale, dk gy/ gy		cm, em		0.00
7.05	199.42	206.47	Shale, gy w/ ls nods		ak, cm, em		0.00
3.60	206.47	210.07	Shale, gy		cm, em		0.00
11.55	210.07	221.62	Shale, gy w/ ss stks		cs, es		0.00
7.10	221.62	228.72	Sandstone, gy w/ crossbeds		cs, es	y	7.10
2.55	228.72	231.27	Shale, gy		cm, em		0.00
3.75	231.27	235.02	Shale, dk gy w/ ss stks		cs, es		0.00
7.90	235.02	242.92	Shale, gy w/ ls nods		ak, cm, em		0.00
6.25	242.92	249.17	Shale, dk gy		cm, em		0.00
0.85	249.17	250.02	Limestone, shaley, layered		sk, cs, es	y	0.85
1.05	250.02	251.07	Shale, dk gy/ gy		cm, em		0.00
3.45	251.07	254.52	Shale, gy w/ ls nods		ak, cm, em		0.00
1.15	254.52	255.67	Shale, blk		ac, cm, em		0.00
0.65	255.67	256.32	Limestone, shaley, nodular		ak, cs, es	y	0.65
8.15	256.32	264.47	Shale, gy		cm, em		0.00
4.00	264.47	268.47	Shale, gy w/ ss stks		cs, es		0.00
4.25	268.47	272.72	Shale, dk gy/ gy		cm, em		0.00
0.40	272.72	273.12	Coal w/ bone, WAYNESBURGH No. 11		ac, cv, ev		0.00
3.80	273.12	276.92	Shale, gy w/ ls nods		ak, cm, em		0.00
1.50	276.92	278.42	Limestone, shaley, nodular		ak, cs, es	y	1.50
5.90	278.42	284.32	Shale, dk gy/ gy w/ ls nods		ak, cm, em		0.00
4.05	284.32	288.37	Limestone, nodular		ak, cs, es	y	4.05
11.65	288.37	300.02	Claystone, dk gy/ gy w/ ls nods		ak, cv, ev		0.00
2.10	300.02	302.12	Limestone, shaley, nodular		ak, cs, es	y	2.10

ORIGINAL

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ATTACHMENT 13
DIAMOND DRILL HOLE: AEC-2001-35

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
2.60	302.12	304.72	Claystone, gy, limey		ak, cv, ev		0.00
1.35	304.72	306.07	Shale, gy, sandy		cs, es		0.00
1.85	306.07	307.92	Sandstone, gy, massive		ak, cs, es	y	1.85
4.25	307.92	312.17	Claystone, red/ gy		cv, ev		0.00
10.45	312.17	322.62	Shale, gy w/ ls nods		ak, cm, em		0.00
2.00	322.62	324.62	Shale, gy, sandy		cs, es		0.00
5.65	324.62	330.27	Sandstone, gy w/ sh stks		cs, es	y	5.65
1.35	330.27	331.62	Limestone, nodular		ak, cs, es	y	1.35
6.40	331.62	338.02	Shale, gy w/ ls nods		ak, cm, em		0.00
7.20	338.02	345.22	Claystone, red/ gy		cv, ev		0.00
5.75	345.22	350.97	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.60	350.97	352.57	Claystone, gy, sandy w/ ls nods		ak, cv, ev		0.00
4.75	352.57	357.32	Shale, gy w/ ss stks		cs, es		0.00
1.15	357.32	358.47	Shale, gy, sandy, limey		ak, cs, es		0.00
2.70	358.47	361.17	Shale, gy		cm, em		0.00
12.00	361.17	373.17	Claystone, gy w/ ls nods		ak, cv, ev		0.00
30.10	373.17	403.27	Limestone, layered		ak, cs, es	y	30.10
2.75	403.27	406.02	Shale, gy w/ ls nods		ak, cm, em		0.00
12.10	406.02	418.12	Limestone, Shaley, nodular		ak, cs, es	y	12.10
4.90	418.12	423.02	Shale, dk gy/ gy w/ ls nods		ak, cm, em		0.00
1.65	423.02	424.67	Shale, dk gy w/ coal stks		ac, cm, em		0.00
3.65	424.67	428.32	Coal w/ bone layers, SEWICKLEY No. 9		ac, cv, ev		0.00
4.10	428.32	432.42	Shale, gy/ grn		cm, em		0.00
8.05	432.42	440.47	Shale, gy w/ ss stks		cs, es		0.00
11.15	440.47	451.62	Claystone, dk gy/ gy w/ ls nods		ak, cv, ev		0.00
0.57	451.62	452.19	Coal w/ bone stks		ac, cv, ev		0.00
1.00	452.19	453.19	Shale, blk/ dk gy, limey		ak, cm, em		0.00
19.90	453.19	473.09	Limestone, nodular		ak, cs, es	y	19.90
1.65	473.09	474.74	Claystone, grn w/ ls nods		ak, cv, ev		0.00
2.60	474.74	477.34	Shale, gy, sandy		cs, es		0.00
2.20	477.34	479.54	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.10	479.54	481.64	Limestone, shaley, nodular		ak, cs, es	y	2.10
2.90	481.64	484.54	Claystone, gy/ grn		cv, ev		0.00
0.45	484.54	484.99	Shale, gy/ grn w/ ls nods		ak, cm, em		0.00
0.30	484.99	485.29	Shale, dk gy		cm, em		0.00
0.55	485.29	485.84	Coal w/ sh layers		ac, cv, ev		0.00
0.40	485.84	486.24	Shale, dk gy		cm, em		0.00
1.25	486.24	487.49	Shale, gy, limey, sandy		ak, cs, es		0.00
6.00	487.49	493.49	Limestone, nodular		ak, cs, es	y	6.00
0.45	493.49	493.94	Claystone, gy w/ ls nods		ak, cv, ev		0.00
7.75	493.94	501.69	Limestone, shaley, nodular		ak, cs, es	y	7.75
1.55	501.69	503.24	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.50	503.24	505.74	Claystone, gy		cv, ev		0.00
0.50	505.74	506.24	Claystone, brn/ blk		ac, cv, ev		0.00
0.15	506.24	506.39	Shale, blk		ac, cm, em		0.00
0.80	506.39	507.19	Coal w/ sh layers, ROOF COAL		ac, cv, ev		0.00
1.10	507.19	508.29	Shale, blk/ dk gy		ac, cm, em		0.00
2.10	508.29	510.39	Bone w/ coal stks, PITTSBURGH No.8		ac, cv, ev		0.00
2.74	510.39	513.13	Coal		ac, cv, ev		0.00
0.18	513.13	513.31	Coal w/ bone stks		ac, cv, ev		0.00
0.10	513.31	513.41	Shale, dk gy		cm, em		0.00
0.60	513.41	514.01	Shale, dk gy w/ ls nods		ak, cm, em		0.00
0.80	514.01	514.81	Limestone, shaley		ak, cs, es	y	0.80
2.20	514.81	517.11	Shale, gy w/ ls nods		ak, cm, em		0.00
0.50	517.11	517.61	Limestone, shaley		ak, cs, es	y	0.50
0.70	517.61	518.31	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.65	518.31	519.96	Limestone, shaley		ak, cs, es	y	1.65
3.60	519.96	523.56	Shale, gy, sandy, limey		ak, cs, es		0.00
	Total Depth	523.56					169.05

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ORIGINAL

ATTACHMENT 10
DIAMOND DRILL HOLE: AEC-2001-25

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
Total Thickness of Hard Rock Overlying Mining Unit							169.05
Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit							32%

	Thickness (Ft.)	Percent (%)
Hard Rock:	169.05	32%
Soft Rock:	354.51	68%
	523.56	

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

Stratum	Neutralization Potential, tons/1000 tons as CaCO3	Total Sulphur %	Pyritic Sulphur %	Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.)	$CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.)
Roof, 10 ft.	175.45	1.99	1.63	62.1	-113.4
Coal	4.33	5.46	2.97	171.00	166.7
Bottom, 10 ft.	493.50	1.72	1.48	53.75	-439.8

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC 2001-29

Field Engineer: Kim Cecil
Surface Elevation: 1,210.15
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 681,382
Easting: 2,419,418
Drilling Company: Kerogen Resources

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
25.00	0.00	25.00	Casing				0.00
7.00	25.00	32.00	Claystone, gy, sandy		cm, em		0.00
10.00	32.00	42.00	Shale, gy, sandy	YES	cs, es		0.00
3.30	42.00	45.30	Shale, gy	YES	cm, em		0.00
4.10	45.30	49.40	Shale, red/ grn		cm, em		0.00
0.70	49.40	50.10	Shale, dk gy		cm, em		0.00
3.40	50.10	53.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.80	53.50	54.30	Limestone		ak, cs, es	y	0.80
8.70	54.30	63.00	Claystone, red/ gy/ grn w/ ls nods		ak, cv, ev		0.00
6.80	63.00	69.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
7.60	69.80	77.40	Claystone, red w/ ls nods		ak, cv, ev		0.00
6.60	77.40	84.00	Claystone, red/ gy/ grn w/ ls nods		ak, cv, ev		0.00
11.20	84.00	95.20	Shale, gy w/ ls nods		ak, cm, em		0.00
1.40	95.20	96.60	Claystone, red/ grn		cv, ev		0.00
5.40	96.60	102.00	Shale, gy		cm, em		0.00
0.50	102.00	102.50	Limestone, shaley, layered		ak, cs, es	y	0.50
2.50	102.50	105.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.10	105.00	106.10	Limestone		ak, cs, es	y	1.10
10.20	106.10	116.30	Claystone, red/ grn/ gy w/ ls nods		ak, cv, ev		0.00
5.60	116.30	121.90	Shale, gy		cm, em		0.00
1.10	121.90	123.00	Claystone, red/ grn		cv, ev		0.00
5.20	123.00	128.20	Shale, gy, sandy		cs, es		0.00
4.20	128.20	132.40	Shale, red		cm, em		0.00
4.50	132.40	136.90	Shale, gy, sandy, slumped		cs, es		0.00
1.10	136.90	138.00	Shale, gy		cm, em		0.00
4.50	138.00	142.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.60	142.50	143.10	Shale, gy		cm, em		0.00
0.10	143.10	143.20	Shale, blk w/ coal stks		ac, cm, em		0.00
2.10	143.20	145.30	Limestone, shaley, layered		ak, cs, es	y	2.10
6.30	145.30	151.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.10	151.60	152.70	Claystone, dk gy		cv, ev		0.00
0.10	152.70	152.80	Bone		ac, cv, ev		0.00
4.20	152.80	157.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.80	157.00	157.80	Claystone, dk gy		cv, ev		0.00
0.50	157.80	158.30	Shale, blk		ac, cm, em		0.00
0.30	158.30	158.60	Coal		ac, cv, ev		0.00
0.40	158.60	159.00	Claystone, dk gy		cv, ev		0.00
2.00	159.00	161.00	Coal w/ bone stks, WASHINGTON No. 12		ac, cv, ev		0.00
8.00	161.00	169.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
6.70	169.00	175.70	Shale, gy w/ ss stks		cs, es		0.00
6.00	175.70	181.70	Shale, gy		cm, em		0.00
4.70	181.70	186.40	Shale, gy w/ ss stks		cs, es		0.00
2.00	186.40	188.40	Shale, gy, sandy, slumped		cs, es		0.00
28.40	188.40	216.80	Sandstone, gy, massive		cs, es	y	28.40
6.70	216.80	223.50	Shale, dk gy w/ ss stks		cs, es		0.00
0.50	223.50	224.00	Sandstone, gy w/ coal stains		cs, es	y	0.50
1.60	224.00	225.60	Shale, gy		cm, em		0.00
0.90	225.60	226.70	Coal w/ bone stks, WAYNESBURG "A"		ac, cv, ev		0.00
0.80	226.70	227.50	Limestone, shaley, layered		ak, cs, es	y	0.80
0.90	227.50	228.40	Claystone, dk gy w/ ls nods		ak, cv, ev		0.00
2.10	228.40	230.50	Limestone		ak, cs, es	y	2.10
6.70	230.50	237.20	Claystone, gy w/ ls nods		ak, cv, ev		0.00

ORIGINAL

00425-4

AEC 18856

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC 2001-39

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
1.60	239.20	240.80	Sandstone, gy w/ sh stks		cs, ss	y	1.60
7.40	240.80	248.20	Shale, gy w/ ss stks		cs, ss		0.00
0.60	248.20	248.80	Sandstone, gy w/ sh stks		cs, ss	y	0.60
3.10	248.80	251.90	Shale, red/ grn/ gy		cm, em		0.00
5.90	251.90	257.80	Shale, gy w/ ss stks		cs, ss		0.00
3.50	257.80	261.30	Shale, dk gy/ gy		cm, em		0.00
1.20	261.30	262.50	Limestone, shaley, layered		ak, cs, es	y	1.20
5.10	262.50	267.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.30	267.60	267.90	Shale, blk		ac, cm, em		0.00
1.60	267.90	269.50	Shale, gy, sandy		cs, es		0.00
18.50	269.50	288.00	Sandstone, gy w/ sh stks		cs, es	y	18.50
4.70	288.00	292.70	Shale, gy w/ ss stks		cs, es		0.00
0.60	292.70	293.30	Shale, dk gy		cm, em		0.00
1.70	293.30	295.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.60	295.00	296.60	Limestone		ak, cs, es	y	1.60
3.70	296.60	300.30	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.50	300.30	302.80	Limestone, shaley, layered		ak, cs, es	y	2.50
1.60	302.80	304.40	Limestone, massive		ak, cs, es	y	1.60
1.00	304.40	305.40	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.90	305.40	307.30	Limestone, mosaic		ak, cs, es	y	1.90
3.70	307.30	311.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.90	311.00	312.90	Limestone, shaley, layered		ak, cs, es	y	1.90
0.70	312.90	313.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.40	313.60	314.00	Limestone, shaley		ak, cs, es	y	0.40
3.40	314.00	317.40	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.60	317.40	319.00	Limestone, massive		ak, cs, es	y	1.60
2.90	319.00	321.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
2.00	321.90	323.90	Claystone, gy/ grn		cv, ev		0.00
1.40	323.90	325.30	Shale, gy w/ ss stks		cs, es		0.00
1.20	325.30	326.50	Sandstone, gy w/ sh stks		cs, es	y	1.20
0.70	326.50	327.20	Shale, gy w/ ss stks		cs, es		0.00
2.00	327.20	329.20	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.50	329.20	330.70	Shale, red/ gy/ grn		cm, em		0.00
3.20	330.70	333.90	Claystone, gy w/ ls nods		ak, cv, ev		0.00
0.80	333.90	334.70	Limestone		ak, cs, es	y	0.80
3.30	334.70	338.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.30	338.00	341.30	Claystone, gy, sandy w/ ls nods		ak, cm, em		0.00
3.10	341.30	344.40	Shale, gy w/ ss stks		cs, es		0.00
1.50	344.40	345.90	Sandstone, gy w/ sh stks		cs, es	y	1.50
1.00	345.90	346.90	Claystone, gy		cv, ev		0.00
1.60	346.90	348.50	Limestone, shaley, layered		ak, cs, es	y	1.60
0.30	348.50	350.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
7.10	350.80	357.90	Limestone, nodular		ak, cs, es	y	7.10
0.90	357.90	358.80	Claystone, gy w/ ls nods		ak, cv, ev		0.00
1.20	358.80	360.00	Limestone, massive		ak, cs, es	y	1.20
1.30	360.00	361.30	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.00	361.30	366.30	Limestone, shaley, layered		ak, cs, es	y	5.00
1.00	366.30	367.30	Sandstone, gy w/ sh stks		cs, es	y	1.00
2.40	367.30	369.70	Shale, gy w/ ss stks		cs, es		0.00
1.40	369.70	371.10	Limestone		ak, cs, es	y	1.40
2.30	371.10	373.40	Claystone, gy/ grn w/ ls nods		ak, cv, ev		0.00
0.20	373.40	373.60	Shale, dk gy, layered		cm, em		0.00
2.40	373.60	376.00	Claystone, gy w/ ls nods		ak, cv, ev		0.00
5.70	376.00	381.70	Limestone, massive		ak, cs, es	y	5.70
8.60	381.70	390.30	Claystone, gy/ grn w/ ls nods		ak, cv, ev		0.00
3.20	390.30	393.50	Limestone, massive		ak, cs, es	y	3.20
7.10	393.50	400.60	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.60	400.60	405.20	Limestone, shaley, layered		ak, cs, es	y	4.60
4.30	405.20	409.50	Claystone, gy w/ ls nods		ak, cv, ev		0.00
9.50	409.50	419.00	Limestone, shaley, layered		ak, cs, es	y	9.50
1.20	419.00	420.20	Claystone, dk gy/ gy w/ ls nods		ak, cv, ev		0.00
16.20	420.20	436.40	Limestone, shaley, layered		ak, cs, es	y	16.20
4.45	436.40	440.85	Claystone, gy/ grn		cv, ev		0.00
3.00	440.85	443.85	Coal w/ bone and sh layers, SEWICKLEY No. 3		ac, cv, ev		0.00

ORIGINAL

D0425-4

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC 2001-29

Thickness (ft.)	Depth From (ft.)	To (ft.)	Strata	Water Bearing	Physical Properties	HR	Thickness of Hard Rock (ft.)
3.65	443.85	447.70	Claystone, gy w/ ls nods		ak, cv, ev		0.00
3.40	447.70	451.10	Sandstone, gy, slumped		cs, es	y	3.40
4.90	451.10	456.00	Shale, gy, sandy		cs, es		0.00
8.10	456.00	464.10	Shale, gy		cm, em		0.00
0.45	464.10	464.55	Shale, dk gy, layered		cm, em		0.00
3.20	464.55	467.75	**Coal w/ sh layers**		ac, cv, ev		0.00
0.85	467.75	468.60	Claystone, dk gy		cv, ev		0.00
17.20	468.60	485.80	Limestone, shaley, layered		ak, cs, es	y	17.20
1.10	485.80	486.90	Claystone, grn w/ ls nods		ak, cv, ev		0.00
5.90	486.90	492.80	Sandstone, gy, churned		cs, es	y	5.90
3.60	492.80	496.40	Shale, gy w/ interbedded ss		cs, es		0.00
1.90	496.40	498.30	Shale, gy, w/ ls nods		ak, cm, em		0.00
1.80	498.30	500.10	Limestone, massive		ak, cs, es	y	1.80
6.50	500.10	506.60	Claystone, grn		cv, ev		0.00
0.30	506.60	506.90	Shale, blk		ac, cm, em		0.00
0.40	506.90	507.30	Limestone, nodular		ak, cs, es	y	0.40
1.40	507.30	508.70	Claystone, gy		cv, ev		0.00
2.00	508.70	510.70	Claystone, grn w/ ls nods		ak, cv, ev		0.00
3.50	510.70	514.20	Claystone, gy/ grn		cv, ev		0.00
0.40	514.20	514.60	Shale, blk		ac, cm, em		0.00
1.28	514.60	515.88	**Coal w/ pyrite, ROOF COAL**		ac, cv, ev		0.00
0.87	515.88	516.75	Claystone, dk gy/ gy		cv, ev		0.00
2.00	516.75	518.75	**Coal w/ pyrite, PITTSBURGH No. 8**		ac, cv, ev		0.00
3.70	518.75	522.45	**Coal w/ bone**		ac, cv, ev		0.00
0.15	522.45	522.60	Claystone, blk		ac, cv, ev		0.00
2.10	522.60	524.70	Claystone, dk gy/ gy		cv, ev		0.00
1.10	524.70	525.80	Limestone		ak, cs, es	y	1.10
1.40	525.80	527.20	Claystone, gy w/ ls nods		ak, cv, ev		0.00
4.10	527.20	531.30	Claystone, gy		cv, ev		0.00
1.00	531.30	532.30	Shale, gy, sandy		cs, es		0.00
1.90	532.30	534.20	Sandstone, gy w/ sh stks		cs, es	y	1.90
0.80	534.20	535.00	Shale, gy, sandy		cs, es		0.00
0.70	535.00	535.70	Sandstone, gy w/ sh stks		cs, es	y	0.70
	Total Depth	535.70					162.10

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 162.10

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 30%

	Thickness (Ft.)	Percent (%)
Hard Rock	162.10	30%
Soft Rock	373.60	70%
	535.70	

ORIGINAL

00425-4

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	U-1	U-1	U-1	U-1	U-1	U-1
2	Identification Number 98-	09029	09279	10117	11252	12198	99-02151
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	955	955	955	955	955	955
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0.11 CFS	0.06 CFS	0.06 CFS	0.25 CFS	0.27 CFS	2.95 CFS
8	Date Above Measurements Made	8-30-98	9-24-98	10-6-98	11-12-98	12-9-98	1-30-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	8.30	7.80	8.00	7.80	8.30	8.20
	Total Acidity (mg/l CaCO3)	0.00	17.00	<1.0	15.00	0.00	<1.0
12	Total Alkalinity (mg/l CaCO3)	140.00	142.00	150.00	140.00	140.0	57.0
13	Specific Conductivity (umhos/cm at 25° C)	360.0	430.0	390.0	380.0	410.0	220.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
16	Total Sulfates (mg/l)	53.00	76.00	68.00	74.00	73.0	44.0
17	Total Iron (mg/l)	0.12	1.00	<0.05	<0.05	<0.05	0.05
18	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0	<1.0	4.0	<1.0
19	Total Hardness (mg/l as CaCO3)	170.0	180.0	210.0	180.0	170.0	120.0
20	Nitrates	<0.10	0.12	<0.09	<0.09	<0.09	0.24
21	Date Sampled for Analysis	8-30-98	9-24-98	10-6-98	11-12-98	12-9-98	1-30-99
22	Date Last Precipitation Event Occurred	8-26-98	9-22-98	10-4-98	11-10-98	12-9-98	1-23-99

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.

NOTE: For each sample provide data for either item 13 or 14. ORIGINAL 0425-4

AEC 18859

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT Cecil 241374 689094 American Energy Corporation (D-0426-3)

1	Identification No. of Sampling Station from Hydrology Map	U-1A	U-1A	U-1A	U-1A	U-1A	U-1A
2	Identification Number 98-						99-02154
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	1030	1030	1030	1030	1030	1030
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0	0	0	0	0	0.93 CFS
8	Date Above Measurements Made	8-30-98	9-24-98	10-6-98	11-12-98	12-9-98	1-30-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	DRY	DRY	DRY	DRY	DRY	7.80
11	Total Acidity (mg/l CaCO3)						11.0
12	Total Alkalinity (mg/l CaCO3)						63.0
13	Specific Conductivity (umhos/cm at 25° C)						170.0
14	Total Dissolved Solids (mg/l)						---
15	Total Manganese (mg/l)						<0.02
16	Total Sulfates (mg/l)						29.0
17	Total Iron (mg/l)						<0.05
18	Total Suspended Solids (mg/l)						<1.0
19	Total Hardness (mg/l as CaCO3)						60.0
20	Nitrates						0.35
21	Date Sampled for Analysis						1-30-99
22	Date Last Precipitation Event Occurred						1-23-99

Laboratory Name IRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.

NOTE: For each sample provide data for either item 13 or 14.

ORIGINAL 0042S-8

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT ___ 2/1/91 American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	U-2	U-2	U-2	U-2	U-2	U-2
2	Identification Number 98-	08310	10060		12042	12361	99-01388
3	High (H)/Low (L) Designation (if applicable)	L	L		L	L	L
4	Surface Elevation for Sampling Station (msl)	1010	1010	1010	1010	1010	1010
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	1.20 CFS	0.34 CFS	0.43 CFS	1.0 CFS	0.76 CFS	10.3 CFS
8	Date Above Measurements Made	8-28-98	9-30-98		11-28-98	12-17-98	1-27-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	7.60	7.30		8.10	7.50	7.80
11	Total Acidity (mg/l CaCO3)	4.00	3.30		2.80	12.0	5.70
12	Total Alkalinity (mg/l CaCO3)	99.00	110.00		90.00	110.0	45.0
13	Specific Conductivity (umhos/cm at 25° C)	250.0	270.0		270.0	280.0	130.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	0.03	0.06		<0.02	<0.02	0.03
16	Total Sulfates (mg/l)	22.00	18.00		35.00	29.0	20.0
17	Total Iron (mg/l)	0.52	0.16		0.05	0.83	0.51
18	Total Suspended Solids (mg/l)	6.0	<1.0		<1.0	<1.0	15.0
19	Total Hardness (mg/l as CaCO3)	100.0	100.0		110.0	100.0	60.0
20	Nitrates	0.25	0.19		<0.09	<0.09	0.48
21	Date Sampled for Analysis	8-28-98	9-30-98		11-28-98	12-17-98	1-27-99
22	Date Last Precipitation Event Occurred	8-26-98	9-29-98		11-25-98	12-17-98	1-23-99

Laboratory Name TRA-DET INC
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

ORIGINAL

AEC 18861

IIO DEPARTMENT OF NATURAL RESOU :S
DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2421731.3		682256.59	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	U1-01	U1-01	U1-01			
2.	Lab Identification Number	0110327	0112360	0202314			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	980	980	980			
5.	Depth of Well below Land Surface (msl)	NA	NA	NA			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	161.05	NA *	118.44			
8.	Date Above Measurements Made	10/22/2001	12/18/2001	2/19/2002			
9.	Aquifer/Zone Identification for Well/Spring	NA	NA	NA			
10.	pH(Standard Units)	7.9	8	8.2			
11.	Total Acidity (mg/l $CaCO_3$)	<1.0	5.7	<1.0			
12.	Total Alkalinity (mg/l $CaCO_3$)	170	88	110			
13.	Specific Conductivity (umhos/cm at 25 C)	360	230	230			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	0.04	0.02	<0.01			
16.	Total Sulfates (mg/l)	55	30	39			
17.	Total Iron (mg/l)	0.11	1.7	0.06			
18.	Total Suspended Solids (mg/l)	<1.0	8	<1.0			
19.	Total Hardness (mg/l $CACO_3$)	200	100	130			
20.	Nitrates (mg/l)	0.11	0.39	0.19			
21.	Date Sampled for Analysis	10/22/2001	12/18/2001	2/19/2002			
22.	Date Last Precipitation Event Occurred	10/16/2001	12/17/2001	2/19/2002			

* No stream flow measurement was collected on 12/18/01 due to hazardous conditions. A total of 1.58 inches of precipitation fell on 12/16/01 and 12/17/01 and the stream was in flood stage.

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DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2415442.1	684988.60		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	U1-02A					
2.	Lab Identification Number	210124					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1060					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (cfs)	0.002					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	S					
10.	pH(Standard Units)	7.3					
11.	Total Acidity (mg/l $CaCO_3$)	8.7					
12.	Total Alkalinity (mg/l $CaCO_3$)	160					
13.	Specific Conductivity (umhos/cm at 25 C)	440					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	<0.01					
16.	Total Sulfates (mg/l)	54					
17.	Total Iron (mg/l)	0.54					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	190					
20.	Nitrates (mg/l)	0.5					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred	10/10/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2421309.8		682495.53	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	U1-02	U1-02	U1-02			
2.	Lab Identification Number	0110328	0112361	0202313			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	970	970	970			
5.	Depth of Well below Land Surface (msl)	NA	NA	NA			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	60.6	NA *	412.44			
8.	Date Above Measurements Made	10/22/2001	12/18/2001	2/19/2002			
9.	Aquifer/Zone Identification for Well/Spring	NA	NA	NA			
10.	pH(Standard Units)	7.8	7.9	8.3			
11.	Total Acidity (mg/l $CaCO_3$)	4.2	3.8	1.8			
12.	Total Alkalinity (mg/l $CaCO_3$)	120	48	92			
13.	Specific Conductivity (umhos/cm at 25 C)	320	160	180			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	51	23	33			
17.	Total Iron (mg/l)	<0.05	0.76	0.07			
18.	Total Suspended Solids (mg/l)	<1.0	8.7	<1.0			
19.	Total Hardness (mg/l $CACO_3$)	160	70	140			
20.	Nitrates (mg/l)	0.18	<0.09	0.13			
21.	Date Sampled for Analysis	10/22/2001	12/18/2001	2/19/2002			
22.	Date Last Precipitation Event Occurred	10/16/2001	12/17/2001	2/19/2002			

* No stream flow measurement was collected on 12/18/01 due to hazardous conditions. A total of 1.58 inches of precipitation fell on 12/16/01 and 12/17/01 and the stream was in flood stage.

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2421530.8		682096.67	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	U1-03	U1-03	U1-03			
2.	Lab Identification Number	110329	112362	202315			
3	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	980	980	980			
5.	Depth of Well below Land Surface (msl)	NA	NA	NA			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	145.43	NA *	84.42			
8.	Date Above Measurements Made	10/22/2001	12/18/2001	2/19/2002			
9.	Aquifer/Zone Identification for Well/Spring	NA	NA	NA			
10.	pH(Standard Units)	7.6	7.9	8.4			
11.	Total Acidity (mg/l $CaCO_3$)	6.8	7.6	1.7			
12.	Total Alkalinity (mg/l $CaCO_3$)	150	68	100			
13.	Specific Conductivity (umhos/cm at 25 C)	370	210	230			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	43	27	36			
17.	Total Iron (mg/l)	<0.05	0.78	0.06			
18.	Total Suspended Solids (mg/l)	<1.0	24	<1.0			
19	Total Hardness (mg/l $CACO_3$)	190	90	120			
20.	Nitrates (mg/l)	2.6	0.26	0.14			
21.	Date Sampled for Analysis	10/22/2001	12/18/2001	2/19/2002			
22.	Date Last Precipitation Event Occurred	10/16/2001	12/17/2001	2/19/2002			

* No stream flow measurement was collected on 12/18/01 due to hazardous conditions. A total of 1.58 inches of precipitation fell on 12/18/01 and 12/17/01 and the stream was in flood stage.

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(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:	2421035.4		679872.36	LOCATION	ADJ
1.	Identification No. Of Sampling Station From Hydrology Map	U1-07	U1-07	U1-07		
2.	Lab Identification Number	0111054	0112367	0202312		
3.	High (H)/Low (L) Designation (if applicable)	L	I	H		
4.	Surface Elevation for Sampling Station (msl)	1010	1010	1010		
5.	Depth of Well below Land Surface (msl)	NA	NA	NA		
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA		
7.	Flow for Spring/Stream (gpm)	135.33	308.4	169.91		
8.	Date Above Measurements Made	10/31/2001	12/18/2001	2/19/2002		
9.	Aquifer/Zone Identification for Well/Spring	NA	NA	NA		
10.	pH(Standard Units)	7.8	8.1	8.3		
11.	Total Acidity (mg/l $CaCO_3$)	1.5	<1.0	1.8		
12.	Total Alkalinity (mg/l $CaCO_3$)	160	66	100		
13.	Specific Conductivity (umhos/cm at 25 C)	400	190	200		
14.	Total Dissolved Solids (mg/l)	ND	ND	ND		
15.	Total Maganese (mg/l)	0.03	<0.02	0.01		
16.	Total Sulfates (mg/l)	33	26	34		
17.	Total Iron (mg/l)	0.11	0.71	0.11		
18.	Total Suspended Solids (mg/l)	<1.0	13	<1.0		
19.	Total Hardness (mg/l $CACO_3$)	160	80	110		
20.	Nitrates (mg/l)	<0.09	0.24	0.18		
21.	Date Sampled for Analysis	10/31/2001	12/18/2001	2/19/2002		
22.	Date Last Precipitation Event Occurred	10/26/2001	12/17/2001	2/19/2002		

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(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2412703.3		682858.5	LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	U2-07					
2.	Lab Identification Number	0204043					
3.	High (H)/Low (L) Designation (if applicable)	H					
4.	Surface Elevation for Sampling Station (msl)	1210					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	3.6					
8.	Date Above Measurements Made	3/29/2002					
9.	Aquifer/Zone Identification for Well/Spring	B					
10.	pH(Standard Units)	7					
11.	Total Acidity (mg/l $CaCO_3$)	5.7					
12.	Total Alkalinity (mg/l $CaCO_3$)	81					
13.	Specific Conductivity (umhos/cm at 25 C)	540					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.1					
16.	Total Sulfates (mg/l)	26					
17.	Total Iron (mg/l)	0.41					
18.	Total Suspended Solids (mg/l)	11					
19.	Total Hardness (mg/l $CACO_3$)	200					
20.	Nitrates (mg/l)	0.53					
21.	Date Sampled for Analysis	3/29/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2409188.3		683169.1	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	Piney Creek Upper					
2.	Lab Identification Number	210122					
3	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1050					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (cfs)	0.2					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7.8					
11.	Total Acidity (mg/l $CaCO_3$)	2.0					
12.	Total Alkalinity (mg/l $CaCO_3$)	110					
13.	Specific Conductivity (umhos/cm at 25 C)	300					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.03					
16.	Total Sulfates (mg/l)	15					
17.	Total Iron (mg/l)	0.15					
18.	Total Suspended Solids (mg/l)	<1.0					
19	Total Hardness (mg/l $CACO_3$)	120					
20.	Nitrates (mg/l)	0.12					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred						

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2411909		685550.1	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	Piney Creek Lower					
2.	Lab Identification Number	210123					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	995					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (cfs)	0.24					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7.8					
11.	Total Acidity (mg/l $CaCO_3$)	4.3					
12.	Total Alkalinity (mg/l $CaCO_3$)	110					
13.	Specific Conductivity (umhos/cm at 25 C)	290					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.03					
16.	Total Sulfates (mg/l)	25					
17.	Total Iron (mg/l)	0.06					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	130					
20.	Nitrates (mg/l)	<0.07					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred						

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DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2421730.5		685821.4	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	Crabapple Creek Lower					
2.	Lab Identification Number	210127					
3	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	940					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (cfs)	0.06					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7.9					
11.	Total Acidity (mg/l $CaCO_3$)	3.6					
12.	Total Alkalinity (mg/l $CaCO_3$)	200					
13.	Specific Conductivity (umhos/cm at 25 C)	550					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	<0.01					
16.	Total Sulfates (mg/l)	88					
17.	Total Iron (mg/l)	0.06					
18.	Total Suspended Solids (mg/l)	<1.0					
19	Total Hardness (mg/l $CACO_3$)	200					
20.	Nitrates (mg/l)	0.07					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred						

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT [illegible] American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	D-11	D-11
2	Identification Number 99-	05-786	08-527
3	High (H)/Low (L) Designation (if applicable)	H	L
4	Surface Elevation for Sampling Station (msl)	955 /	955
5	Depth of Well Below Land Surface (feet)	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---
7	Flow for Spring and Stream (gpm or cfs)	3.0 CFS	.08 CFS
8	Date Above Measurements Made	5-24-99	8-17-99
9	Aquifer/Zone Identification For Well/Spring	---	---
10	pH (Standard Units)	7.89	7.73
11	Total Acidity (mg/l CaCO3)	4.40	10.00
12	Total Alkalinity (mg/l CaCO3)	105.00	130.00
13	Specific Conductivity (umhos/cm at 25° C)	322.0	400
14	Total Dissolved Solids (mg/l)	---	---
15	Total Manganese (mg/l)	0.10	<0.02
16	Total Sulfates (mg/l)	25.0	41.0
17	Total Iron (mg/l)	0.26	0.14
18	Total Suspended Solids (mg/l)	10.0	14.0
19	Total Hardness (mg/l as CaCO3)	134.0	151.0
20	Nitrates	0.36	0.64
21	Date Sampled for Analysis	5-24-99	8-17-99
22	Date Last Precipitation Event Occurred	5-24-99	8-15-99

Laboratory Name TRA-DET, INC.
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NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.

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NOTE: For each sample provide data for either item 13 or 14. ORIGINAL

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT Page 2 of 9 of 66 53 American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	D-21	D-21	D-21	D-21	D-21	D-21
2	Identification Number 98-	08288			12026	12360	99-01389
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	1088	1088	1088	1088	1088	1088
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0.0006 CFS	0	0	0.003 CFS	0.01 CFS	0.18 CFS
8	Date Above Measurements Made	8-26-98	9-30-98	10-29-98	11-28-98	12-17-98	1-27-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	7.10	DRY	DRY	7.60	7.30	7.30
11	Total Acidity (mg/l CaCO3)	5.30			1.30	12.0	3.70
12	Total Alkalinity (mg/l CaCO3)	59.00			43.00	49.0	28.0
13	Specific Conductivity (umhos/cm at 25° C)	210.0			170.0	180.0	93.0
14	Total Dissolved Solids (mg/l)	---			---	---	---
15	Total Manganese (mg/l)	0.10			0.03	<0.02	<0.02
16	Total Sulfates (mg/l)	43.00			27.0	34.0	21.0
17	Total Iron (mg/l)	0.27			0.29	0.15	0.17
18	Total Suspended Solids (mg/l)	4.7			<1.0	<1.0	2.70
19	Total Hardness (mg/l as CaCO3)	90.0			70.0	80.0	40.0
20	Nitrates	0.21			<0.09	<0.09	<0.09
21	Date Sampled for Analysis	8-26-98			11-28-98	12-17-98	1-27-99
22	Date Last Precipitation Event Occurred	8-26-98			11-25-98	12-17-98	1-23-99

Laboratory Name TRA-DET, INC.
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NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

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DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	W-23	W-23	W-23	W-23	W-23	W-23
2	Identification Number 98-	08194	09285	10188	11413	12266	99-01170
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	1039	1039	1039	1039	1039	1039
5	Depth of Well Below Land Surface (feet)	REPORTED 60'	REPORTED 60'	REPORTED 60'	REPORTED 60'	REPORTED 60'	REPORTED 60'
6	Static Water Level of Well Below Land Surface (feet)	BURIED	BURIED	BURIED	BURIED	BURIED	BURIED
7	Flow for Spring and Stream (gpm or cfs)	---	---	---	---	---	---
8	Date Above Measurements Made	8-15-98	9-25-98	10-9-98	11-25-98	12-14-98	1-22-99
9	Aquifer/Zone Identification For Well/Spring	C	C	C	C	C	C
10	pH (Standard Units)	6.90	7.10	7.20	7.60	7.10	7.60
	Total Acidity (mg/l CaCO3)	30.00	34.00	18.00	13.0	6.10	8.60
12	Total Alkalinity (mg/l CaCO3)	270.00	280.00	270.00	260.00	270.0	89.0
13	Specific Conductivity (umhos/cm at 25° C)	500.0	620.0	580.0	620.0	620.0	240.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	<0.02	0.26	0.16	0.07	0.14	0.10
16	Total Sulfates (mg/l)	73.00	110.00	110.0	110.0	110.0	110.0
17	Total Iron (mg/l)	0.22	0.75	0.37	0.23	0.84	0.34
18	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0	<1.0	8.0	<1.0
19	Total Hardness (mg/l as CaCO3)	320.0	330.0	280.0	320.0	330.0	10.0
20	Nitrates	0.56	0.15	0.13	<0.09	<0.09	0.98
21	Date Sampled for Analysis	8-12-98	9-22-98	10-7-98	11-25-98	12-14-98	1-22-99
22	Date Last Precipitation Event Occurred	8-12-98	9-22-98	10-7-98	11-25-98	12-9-98	1-22-99

Laboratory Name TRA-DET, INC.
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NOTE: For each sample provide data for either item 13 or 14.

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT Crooks Quarry 68857 American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	DW-132	DW-132	DW-132	DW-132	DW-132	DW-132
2	Identification Number 98-	10456	11325	12203	99-02153	99-02251	
3	High (H)/Low (L) Designation (if applicable)	L	I	I	I	I	
4	Surface Elevation for Sampling Station (msl)	1044	1044	1044	1044	1044	1044
5	Depth of Well Below Land Surface (feet)	9'	9'	9'	9'	9'	9'
6	Static Water Level of Well Below Land Surface (feet)	7'	6'	6'	3'	3'	2'
7	Flow for Spring and Stream (gpm or cfs)	---	---	---	---	---	---
8	Date Above Measurements Made	10-24-98	11-23-98	12-9-98	1-30-99	2-10-99	
9	Aquifer/Zone Identification For Well/Spring	A	A	A	A	A	A
10	pH (Standard Units)	7.40	7.30	7.30	6.70	6.10	
11	Total Acidity (mg/l CaCO3)	25.00	51.0	<1.0	5.80	4.30	
12	Total Alkalinity (mg/l CaCO3)	140.00	160.0	160.0	26.0	28.0	
13	Specific Conductivity (umhos/cm at 25° C)	280.00	370.0	400.0	100.0	120.0	
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	0.91	1.00	0.97	0.02	0.02	
16	Total Sulfates (mg/l)	24.0	46.0	56.0	24.0	24.0	
17	Total Iron (mg/l)	0.65	0.85	0.47	0.43	0.65	
18	Total Suspended Solids (mg/l)	<1.0	6.7	<1.0	3.3	<1.0	
19	Total Hardness (mg/l as CaCO3)	150.0	170.0	190.0	40.0	40.0	
20	Nitrates	0.28	0.91	0.72	0.60	0.42	
21	Date Sampled for Analysis	10-24-98	11-23-98	12-9-98	1-30-99	2-10-99	
22	Date Last Precipitation Event Occurred	10-18-98	11-23-98	12-9-98	1-23-99	2-7-99	

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NOTE: For each sample provide data for either item 13 or 14.

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2412969.3		683011.21	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W 194	W 194	W 194			
2.	Lab Identification Number	0110106	0201216	0203002			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	1220	1220	1220			
5.	Depth of Well below Land Surface (msl)	90	90	90			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	NA	NA	NA			
8.	Date Above Measurements Made	10/11/2001	1/10/2002	2/28/2002			
9.	Aquifer/Zone Identification for Well/Spring	B	B	B			
10.	pH(Standard Units)	7.32	7.3	7.8			
11.	Total Acidity (mg/l $CaCO_3$)	13	3.8	12			
12.	Total Alkalinity (mg/l $CaCO_3$)	190	190	170			
13.	Specific Conductivity (umhos/cm at 25 C)	1200	1100	1100			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	27	32	32			
17.	Total Iron (mg/l)	0.06	<0.05	<0.04			
18.	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0			
19.	Total Hardness (mg/l $CACO_3$)	400	400	370			
20.	Nitrates (mg/l)	0.22	0.3	0.39			
21.	Date Sampled for Analysis	10/11/2001	1/10/2002	2/28/2002			
22.	Date Last Precipitation Event Occurred	10/5/2001	1/7/2002	2/27/2002			

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2413151.2		682365.1	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W 196	W 196	W 196			
2.	Lab Identification Number	0110108	0201342	0203021			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	1240	1240	1240			
5.	Depth of Well below Land Surface (msl)	130	130	130			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpM)	NA	NA	NA			
8.	Date Above Measurements Made	10/11/2001	1/23/2002	3/1/2002			
9.	Aquifer/Zone Identification for Well/Spring	B	B	B			
10.	pH(Standard Units)	7.84	7.5	8			
11.	Total Acidity (mg/l $CaCO_3$)	2.7	13	9			
12.	Total Alkalinity (mg/l $CaCO_3$)	230	210	200			
13.	Specific Conductivity (umhos/cm at 25 C)	550	820	570			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	62	58	50			
17.	Total Iron (mg/l)	0.17	<0.05	<0.04			
18.	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0			
19.	Total Hardness (mg/l $CACO_3$)	230	250	210			
20.	Nitrates (mg/l)	1.2	1.7	2.2			
21.	Date Sampled for Analysis	10/11/2001	1/23/2002	3/1/2002			
22.	Date Last Precipitation Event Occurred	10/5/2001	1/21/2002	2/27/2002			

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2413005.9		682318.85	LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W 197	W 197	W 197			
2.	Lab Identification Number	0110116	0201296	0203164			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	1220	1220	1220			
5.	Depth of Well below Land Surface (msl)	80	80	80			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	NA	NA	NA			
8.	Date Above Measurements Made	10/9/2001	1/18/2002	3/15/2002			
9.	Aquifer/Zone Identification for Well/Spring	B	B	B			
10.	pH(Standard Units)	7.43	8.2	8			
11.	Total Acidity (mg/l $CaCO_3$)	8.4	15	9.3			
12.	Total Alkalinity (mg/l $CaCO_3$)	160	160	160			
13.	Specific Conductivity (umhos/cm at 25 C)	1300	1400	1400			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	71	89	71			
17.	Total Iron (mg/l)	0.05	<0.05	0.04			
18.	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0			
19.	Total Hardness (mg/l $CACO_3$)	460	390	230			
20.	Nitrates (mg/l)	0.63	0.83	0.68			
21.	Date Sampled for Analysis	10/9/2001	1/18/2002	3/15/2002			
22.	Date Last Precipitation Event Occurred	10/5/2001	1/14/2002	3/13/2002			

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:	2416136.6	683346.1			LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W-435					
2.	Lab Identification Number	0204010					
3.	High (H)/Low (L) Designation (if applicable)	H					
4.	Surface Elevation for Sampling Station (msl)	1070					
5.	Depth of Well below Land Surface (msl)	66					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	3/26/2002					
9.	Aquifer/Zone Identification for Well/Spring	C					
10.	pH(Standard Units)	6.7					
11.	Total Acidity (mg/l $CaCO_3$)	7.9					
12.	Total Alkalinity (mg/l $CaCO_3$)	170					
13.	Specific Conductivity (umhos/cm at 25 C)	420					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.09					
16.	Total Sulfates (mg/l)	92					
17.	Total Iron (mg/l)	<0.04					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	220					
20.	Nitrates (mg/l)	0.49					
21.	Date Sampled for Analysis	3/26/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2422003.3		682821.4	LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W-436					
2.	Lab Identification Number	0204009					
3.	High (H)/Low (L) Designation (if applicable)	N					
4.	Surface Elevation for Sampling Station (msl)	1020					
5.	Depth of Well below Land Surface (msl)	85					
6.	Static Water Level of Well below Land Surface (feet)	30					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	3/26/2002					
9.	Aquifer/Zone Identification for Well/Spring	C					
10.	pH(Standard Units)	7					
11.	Total Acidity (mg/l $CaCO_3$)	16					
12.	Total Alkalinity (mg/l $CaCO_3$)	290					
13.	Specific Conductivity (umhos/cm at 25 C)	760					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.08					
16.	Total Sulfates (mg/l)	220					
17.	Total Iron (mg/l)	0.04					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	440					
20.	Nitrates (mg/l)	2.4					
21.	Date Sampled for Analysis	3/26/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2418144.2	684064.1		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W-590					
2.	Lab Identification Number	210126					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1080					
5.	Depth of Well below Land Surface (msl)	85					
6.	Static Water Level of Well below Land Surface (feet)	57.5					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	C					
10.	pH(Standard Units)	6					
11.	Total Acidity (mg/l $CaCO_3$)	34					
12.	Total Alkalinity (mg/l $CaCO_3$)	110					
13.	Specific Conductivity (umhos/cm at 25 C)	450					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	<0.01					
16.	Total Sulfates (mg/l)	100					
17.	Total Iron (mg/l)	0.1					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	220					
20.	Nitrates (mg/l)	1.4					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred	10/10/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2418261.5	684159.50		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	W 591					
2.	Lab Identification Number	210128					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1065					
5.	Depth of Well below Land Surface (msl)	82					
6.	Static Water Level of Well below Land Surface (feet)	72.5					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	C					
10.	pH(Standard Units)	7.4					
11.	Total Acidity (mg/l $CaCO_3$)	15					
12.	Total Alkalinity (mg/l $CaCO_3$)	240					
13.	Specific Conductivity (umhos/cm at 25 C)	550					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	<0.01					
16.	Total Sulfates (mg/l)	56					
17.	Total Iron (mg/l)	0.1					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	270					
20.	Nitrates (mg/l)	<0.07					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred	10/10/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2415442.1	684988.60		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	S-1					
2.	Lab Identification Number	210121					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1165					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	0.13					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	B					
10.	pH(Standard Units)	8.1					
11.	Total Acidity (mg/l $CaCO_3$)	25					
12.	Total Alkalinity (mg/l $CaCO_3$)	220					
13.	Specific Conductivity (umhos/cm at 25 C)	550					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	3.7					
16.	Total Sulfates (mg/l)	5.5 ??					
17.	Total Iron (mg/l)	41					
18.	Total Suspended Solids (mg/l)	1600 ??					
19.	Total Hardness (mg/l $CACO_3$)	400					
20.	Nitrates (mg/l)	<0.07					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred	10/10/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2415442.1	684988.60		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	S-3					
2.	Lab Identification Number	210125					
3.	High (H)/Low (L) Designation (if applicable)	L					
4.	Surface Elevation for Sampling Station (msl)	1100					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	0.31					
8.	Date Above Measurements Made	10/10/2002					
9.	Aquifer/Zone Identification for Well/Spring	B					
10.	pH(Standard Units)	8.0					
11.	Total Acidity (mg/l $CaCO_3$)	2.8					
12.	Total Alkalinity (mg/l $CaCO_3$)	250					
13.	Specific Conductivity (umhos/cm at 25 C)	550					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.06					
16.	Total Sulfates (mg/l)	31					
17.	Total Iron (mg/l)	1.9					
18.	Total Suspended Solids (mg/l)	28					
19.	Total Hardness (mg/l $CACO_3$)	290					
20.	Nitrates (mg/l)	<0.07					
21.	Date Sampled for Analysis	10/10/2002					
22.	Date Last Precipitation Event Occurred	10/10/2002					

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (D-0425-1)

1	Identification No. of Sampling Station from Hydrology Map	DS-32	DS-32	DS-32	DS-32	DS-32	DS-32
2	Identification Number 98-	10034	10489	11465	12292	99-01340	99-02256
3	High (H)/Low (L) Designation (if applicable)		SIX	MONTH	SAMPLING		
4	Surface Elevation for Sampling Station (msl)	1158	1158	1158	1158	1158	1158
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0.06 GPM	0.03 GPM	0.16 GPM	0.14 GPM	1.9 GPM	.54 GPM
8	Date Above Measurements Made	9-29-98	10-16-98	11-27-98	12-15-98	1-23-99	2-10-99
9	Aquifer/Zone Identification For Well/Spring	B	B	B	B	B	B
10	pH (Standard Units)	7.30	7.70	7.60	7.90	7.30	7.70
11	Total Acidity (mg/l CaCO3)	13.0	7.00	5.30	3.20	9.60	13.0
12	Total Alkalinity (mg/l CaCO3)	210.0	220.0	200.0	220.0	110.0	140.0
13	Specific Conductivity (umhos/cm at 25° C)	410.0	440.0	440.0	400.0	220.0	330.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	0.05	0.03	0.08	0.04	0.02	<0.02
16	Total Sulfates (mg/l)	30.0	28.0	28.0	29.0	27.0	31.0
17	Total Iron (mg/l)	<0.02	0.07	0.18	0.07	0.22	0.46
18	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0	<1.0	7.3	<1.0
19	Total Hardness (mg/l as CaCO3)	170.0	200.0	180.0	200.0	110.0	140.0
20	Nitrates	<0.10	<0.09	0.09	<0.09	0.38	0.10
21	Date Sampled for Analysis	9-29-98	10-16-98	11-27-98	12-15-98	1-23-99	2-10-99
22	Date Last Precipitation Event Occurred	9-29-98	10-7-98	11-25-98	12-9-98	1-23-99	2-7-99

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

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AEC 18884

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ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:		2412646.3	683965.98		LOCATION	Room & Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	DS 145	DS 145	DS 145			
2.	Lab Identification Number	0110107	0201225	0203001			
3.	High (H)/Low (L) Designation (if applicable)	L	I	H			
4.	Surface Elevation for Sampling Station (msl)	1120	1120	1120			
5.	Depth of Well below Land Surface (msl)	NA	NA	NA			
6.	Static Water Level of Well below Land Surface (feet)	NA	NA	NA			
7.	Flow for Spring/Stream (gpm)	NA	NA	NA			
8.	Date Above Measurements Made	10/11/2001	1/10/2002	2/28/2002			
9.	Aquifer/Zone Identification for Well/Spring	B	B	B			
10.	pH(Standard Units)	7.95	8	8.3			
11.	Total Acidity (mg/l $CaCO_3$)	<1.0	5.8	7.6			
12.	Total Alkalinity (mg/l $CaCO_3$)	180	150	100			
13.	Specific Conductivity (umhos/cm at 25 C)	550	410	340			
14.	Total Dissolved Solids (mg/l)	ND	ND	ND			
15.	Total Maganese (mg/l)	<0.02	<0.02	<0.01			
16.	Total Sulfates (mg/l)	23	22	26			
17.	Total Iron (mg/l)	0.06	0.12	0.43			
18.	Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0			
19	Total Hardness (mg/l $CACO_3$)	250	200	130	*The flow from DS – 145 is piped directly into a holding tank and there is no location from which a spring flow can be determined.*		
20.	Nitrates (mg/l)	0.18	0.47	0.75			
21.	Date Sampled for Analysis	10/11/2001	1/10/2002	2/28/2002			
22.	Date Last Precipitation Event Occurred	10/5/2001	1/7/2002	2/27/2002			

Laboratory Name **Tra-Det Inc.**
Address **P.O. Box 2019 Wheeling**
State **West Virginia** Zip **26003-0219**

ORIGINAL

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D-0425-4

AEC 18885

	STATE PLANE COORDINATES:	2424371.6	663851.0			LOCATION	Room & Pillar
1.	Identification No. Of Sampling	DS 414					
2.	Lab Identification Number	0202405					
3.	High (H)/Low (L) Designation (if	H					
4.	Surface Elevation for Sampling	1140					
5.	Depth of Well below Land	NA					
6.	Static Water Level of Well below Land	NA					
7.	Flow for Spring/Stream	NA					
8.	Date Above Measurements	2/26/2002					
9.	Aquifer/Zone Identification for	B					
10.	pH(Standard Units)	7.9					
11.	Total Acidity (mg/l $CaCO_3$)	2.2					
12.	Total Alkalinity (mg/l $CaCO_3$)	180					
13.	Specific Conductivity	480					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.02					
16.	Total Sulfates (mg/l)	34					
17.	Total Iron (mg/l)	<0.04					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	200			*The flow from DS -- 414 is piped directly into a holding tank and there is no location from which a spring flow can be determined.*		
20.	Nitrates (mg/l)	11					
21.	Date Sampled for Analysis	2/26/2002					
22.	Date Last Precipitation Event	2/26/2002					

ORIGINAL

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. Order: 24/3/04 6/4/06 (D-0425-1)

1	Identification No. of Sampling Station from Hydrology Map	P-1	P-1	P-1	P-1	P-1	P-1
2	Identification Number 98-		09299	10470	11419	12241	99-01176
3	High (H)/Low (L) Designation (if applicable)	L	L	L	I	I	I
4	Surface Elevation for Sampling Station (msl)	1220	1220	1220	1220	1220	1220
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0	0	0	0	0	0.04 CFS
8	Date Above Measurements Made	8-25-98	9-25-98	10-26-98	11-25-98	12-14-98	1-22-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	DRY	8.60	8.00	8.20	7.00	6.70
	Total Acidity (mg/l CaCO3)		0.00	14.00	6.20	3.90	5.30
12	Total Alkalinity (mg/l CaCO3)		73.00	74.00	67.00	62.0	15.0
13	Specific Conductivity (umhos/cm at 25° C)		200.0	160.0	160.0	190.0	97.0
14	Total Dissolved Solids (mg/l)		---	---	---	---	---
15	Total Manganese (mg/l)		0.73	0.46	0.19	0.26	0.07
16	Total Sulfates (mg/l)		3.10	6.80	8.20	10.0	5.20
17	Total Iron (mg/l)		2.10	2.80	1.60	1.30	1.10
18	Total Suspended Solids (mg/l)		17.0	19.0	10.0	16.0	15.0
19	Total Hardness (mg/l as CaCO3)		90.0	70.0	40.0	50.0	40.0
20	Nitrates		0.15	<0.09	<0.09	0.00	0.54
21	Date Sampled for Analysis		9-25-98	10-26-98	11-25-98	12-14-98	1-22-99
22	Date Last Precipitation Event Occurred		9-22-98	10-18-98	11-25-98	12-9-98	1-22-99

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

ORIGINAL

D0425-4

AEC 18887

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT [illegible] American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	P-4	P-4	P-4	P-4	P-4	P-4
2	Identification Number 98-	08248	10026	10468	11421	12244	99-01180
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	1160	1160	1160	1160	1160	1160
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0.001	0	0	0	0	0
8	Date Above Measurements Made	8-22-98	9-28-98	10-26-98	11-25-98	12-14-98	1-22-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
11	pH (Standard Units)	6.40	7.60	6.90	6.90	7.50	6.20
	Total Acidity (mg/l CaCO3)	18.00	4.50	9.10	2.20	3.30	9.00
12	Total Alkalinity (mg/l CaCO3)	66.00	40.00	52.00	48.00	47.0	12.0
13	Specific Conductivity (umhos/cm at 25° C)	180.0	140.0	240.0	230.0	260.0	160.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	1.00	0.07	0.05	0.02	0.06	0.34
16	Total Sulfates (mg/l)	12.00	10.00	6.20	7.10	9.50	18.0
17	Total Iron (mg/l)	5.10	0.28	0.36	0.15	0.22	0.48
18	Total Suspended Solids (mg/l)	140.0	<1.0	6.7	1.3	<1.0	5.0
19	Total Hardness (mg/l as CaCO3)	90.0	20.0	80.0	50.0	80.0	60.0
20	Nitrates	0.39	<0.10	0.10	<0.09	<0.09	<0.09
21	Date Sampled for Analysis	8-22-98	9-28-98	10-26-98	11-25-98	12-14-98	1-22-99
22	Date Last Precipitation Event Occurred	8-17-98	9-27-98	10-18-98	11-25-98	12-9-98	1-22-99
23							

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.

NOTE: For each sample provide data for either item 13 or 14.

ORIGINAL D0425-4

AEC 18888

9/88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT coord: 2412122 684732 American Energy Corporation (D-0425-3)

1	Identification No. of Sampling Station from Hydrology Map	P-5	P-5	P-5	P-5	P-5	P-5
2	Identification Number 98-	08247	10027	10469	11422	12243	99-01179
3	High (H)/Low (L) Designation (if applicable)	L	L	L	L	L	L
4	Surface Elevation for Sampling Station (msl)	1160	1160	1160	1160	1160	1160
5	Depth of Well Below Land Surface (feet)	---	---	---	---	---	---
6	Static Water Level of Well Below Land Surface (feet)	---	---	---	---	---	---
7	Flow for Spring and Stream (gpm or cfs)	0.002	0	0	0	0	0
8	Date Above Measurements Made	8-22-98	9-28-98	10-26-98	11-25-98	12-14-98	1-22-99
9	Aquifer/Zone Identification For Well/Spring	---	---	---	---	---	---
10	pH (Standard Units)	7.50	7.10	6.80	7.20	7.90	6.20
11	Total Acidity (mg/l CaCO3)	8.10	5.50	3.00	2.80	2.60	<1.0
12	Total Alkalinity (mg/l CaCO3)	180.00	51.00	39.00	33.00	35.0	8.40
13	Specific Conductivity (umhos/cm at 25° C)	460.0	240.0	120.0	99.0	120.0	66.0
14	Total Dissolved Solids (mg/l)	---	---	---	---	---	---
15	Total Manganese (mg/l)	0.14	0.14	<0.02	<0.02	0.02	0.19
16	Total Sulfates (mg/l)	21.00	7.90	8.30	8.20	11.0	15.0
17	Total Iron (mg/l)	0.49	0.72	0.26	0.10	0.18	0.29
18	Total Suspended Solids (mg/l)	40.0	<1.0	1.3	<1.0	6.0	2.0
19	Total Hardness (mg/l as CaCO3)	210.0	70.0	40.0	30.0	50.0	10.0
20	Nitrates	0.43	<0.10	<0.09	<0.09	0.11	<0.09
21	Date Sampled for Analysis	8-22-98	9-28-98	10-26-98	11-25-98	12-14-98	1-22-99
22	Date Last Precipitation Event Occurred	8-17-98	9-27-98	10-18-98	11-25-98	12-9-98	1-22-99

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

D425-4

AEC 18889

) DEPARTMENT OF NATURAL RESOUI ;
DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:	2412787.8			683553.7	LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	P57					
2.	Lab Identification Number	0204047					
3.	High (H)/Low (L) Designation (if applicable)	H					
4.	Surface Elevation for Sampling Station (msl)	1170					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	3/29/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7.5					
11.	Total Acidity (mg/l $CaCO_3$)	4.3					
12.	Total Alkalinity (mg/l $CaCO_3$)	18					
13.	Specific Conductivity (umhos/cm at 25 C)	100					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.08					
16.	Total Sulfates (mg/l)	22					
17.	Total Iron (mg/l)	0.71					
18.	Total Suspended Solids (mg/l)	4.7					
19.	Total Hardness (mg/l $CACO_3$)	40					
20.	Nitrates (mg/l)	0.09					
21.	Date Sampled for Analysis	3/29/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

Laboratory Name **Tra-Det Inc.**
Address **P.O. Box 2019 Wheeling**
State **West Virginia** Zip **26003-0219**

ORIGINAL

D-425-4

D DEPARTMENT OF NATURAL RESOUI S
DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:	2412497.7			684127.3	LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	P58					
2.	Lab Identification Number	0204045					
3.	High (H)/Low (L) Designation (if applicable)	H					
4.	Surface Elevation for Sampling Station (msl)	1100					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	3/29/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7					
11.	Total Acidity (mg/l $CaCO_3$)	2.5					
12.	Total Alkalinity (mg/l $CaCO_3$)	54					
13.	Specific Conductivity (umhos/cm at 25 C)	120					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.06					
16.	Total Sulfates (mg/l)	21					
17.	Total Iron (mg/l)	0.49					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	130					
20.	Nitrates (mg/l)	0.26					
21.	Date Sampled for Analysis	3/29/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

Laboratory Name **Tra-Det Inc.**
Address **P.O. Box 2019 Wheeling**
State **West Virginia** Zip **26003-0219**

ORIGINAL

425-4

AEC 18891

) DEPARTMENT OF NATURAL RESOUF)
DIVISION OF RECLAMATION
ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-4)

	STATE PLANE COORDINATES:	2413546			682839.3	LOCATION	Room and Pillar
1.	Identification No. Of Sampling Station From Hydrology Map	P59					
2.	Lab Identification Number	0204009					
3.	High (H)/Low (L) Designation (if applicable)	H					
4.	Surface Elevation for Sampling Station (msl)	1180					
5.	Depth of Well below Land Surface (msl)	NA					
6.	Static Water Level of Well below Land Surface (feet)	NA					
7.	Flow for Spring/Stream (gpm)	NA					
8.	Date Above Measurements Made	3/29/2002					
9.	Aquifer/Zone Identification for Well/Spring	NA					
10.	pH(Standard Units)	7					
11.	Total Acidity (mg/l $CaCO_3$)	5.5					
12.	Total Alkalinity (mg/l $CaCO_3$)	42					
13.	Specific Conductivity (umhos/cm at 25 C)	140					
14.	Total Dissolved Solids (mg/l)	ND					
15.	Total Maganese (mg/l)	0.03					
16.	Total Sulfates (mg/l)	26					
17.	Total Iron (mg/l)	0.6					
18.	Total Suspended Solids (mg/l)	<1.0					
19.	Total Hardness (mg/l $CACO_3$)	60					
20.	Nitrates (mg/l)	0.11					
21.	Date Sampled for Analysis	3/29/2002					
22.	Date Last Precipitation Event Occurred	3/19/2002					

Laboratory Name **Tra-Det Inc.**
Address **P.O. Box 2019 Wheeling**
State **West Virginia** Zip **26003-0219**

ORIGINAL D-0425-4

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND RECLAMATION

ATTACHMENT 14B
(GROUND WATER HYDROLOGY DESCRIPTION)

RECEIVED
OCT 18 2007

APPLICANT'S NAME American Energy Corporation. – Century Mine Permit Number D-0425-4

Aquifer/Zone Identification	Aquifer/Zone Lithology	Aquifer/Zone Thickness	Aquifer/Zone Elevation (msl)	Aquifer/Zone Horiz. Extent	Aquifer/Zone Known Uses	Approx. Rate of Discharge/Usage of Aquifer/Zone (gpm or cfs)
(A) Unconsolidated Material	Silt, Sand & Gravel Weathered Bedrock	Up to 30 feet	910 to 1260 msl	Local-Primarily along stream valleys	Domestic Livestock	Variable-Generally <2 to >20 gpm
(B) Washington No. 12 Cyclothem	Silt, Sandstone, Limestone, Coal	Approximately 70 feet	1020 to 1220 msl	Local-Primarily where less than 100 feet deep	Domestic Livestock	Variable-Generally less than 2 gpm
(C) Waynesburg No. 11 Cyclothem	Silt, Sandstone, Limestone, Coal	Approximately 100 feet	920 to 1070 msl	Local-Primarily where less than 100 feet deep	Domestic Livestock	Variable-Generally less than 2 gpm

00425-4
AEC 18893

Ohio Department of Natural Resources

BOB TAFT, GOVERNOR SAMUEL W. SPECK, DIRECTOR

James R. Morris • Chief

Division of Water

Date: March 1, 2002

ANALYSIS OF EXISTING GROUND WATER FILE DATA

Prepared By: Dennis Crist, Geology Program Supervisor

Operator: The American Energy Corporation

County: Belmont, Monroe

Township: Belmont-Washington Sec. 13, 14, 19, 20, 25, 26, 31
Belmont-Wayne Sec. 1, 7
Monroe, Sunbury Sec. 5, 6, 23, 24, 29, 30, 35, 36
Monroe, Switzerland Sec. 18

Number of water well logs within 1,000 foot radius of site (copies attached) : Field located: 43

General description of local hydrology:

Ground water supplies are very limited and often inadequate. Yields generally range from 0 to 20 gpm at depths from 28 to 114 feet. Supplies are obtained from thin beds of sandstone, shale, and limestone.

Areas of Particular concern:

Mining the Pittsburgh No. 8 Coal seam at elevation ranges from 725 to 615 feet may result in quantity and/or dewatering of wells located in the area. All wells should be located and monitored before, during, and after mining operations to determine if subsidence resulting from longwall mining of the area causes any negative effects.

ORIGINAL

1939 Fountain Square Court, Columbus, Ohio 43224-1385 (614-265-6717)

D0425-4

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 213033

County BELMONT Township WASHINGTON Section of Township 14

Owner GLEN PERKINS Address BEALSVILLE

Location of property 4 MILES NORTH WEST OF BEALSVILLE

CONSTRUCTION DETAILS

Casing diameter 6 ¼ Length of casing 19 ft - 6 in

Type of screen N Length of screen N

Type of pump N

Capacity of pump N

Depth of pump setting N

Date of completion 4-11-59

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 46 ft.

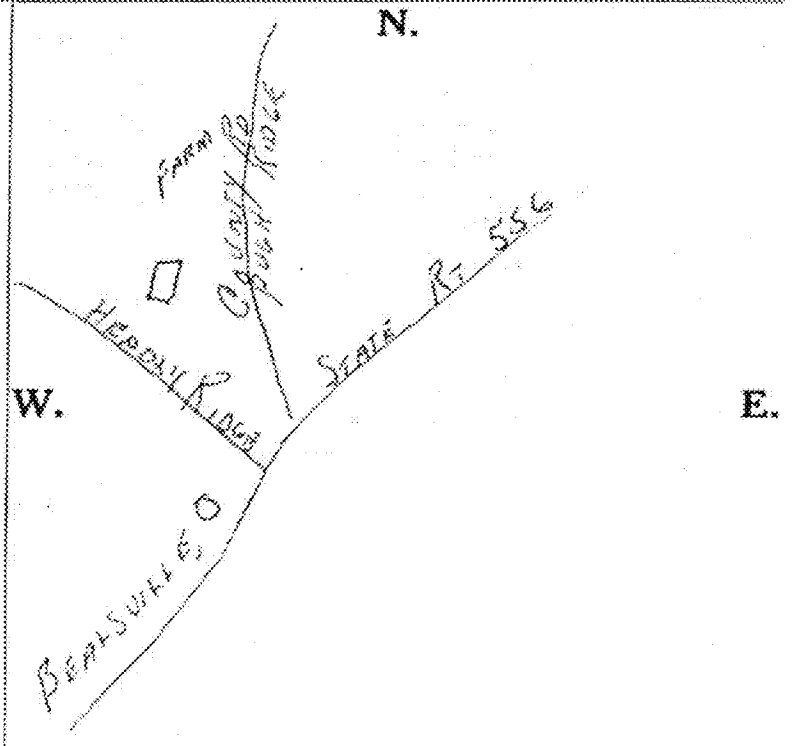
Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
TOP SOIL	0 Feet	8 Ft.
GRAY SHALE	8 FT	17 FT
SANDSTONE	17 FT	41 FT
BLUE SHALE	41 FT	57 FT
WHITE SAND	57 FT	61 FT
GRAY SHALE	61 FT	66 FT
LIMESTONE	66 FT	68 FT
GRAY SHALE	68 FT	73 FT
RED ROCK	73 FT	81 FT
GRAY SHALE	81 FT	85 FT
WATER 61 FT		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm H. H. BILLMAN Date APRIL 13, 1959

Address 416 E. MARIETTA, WOODSFIELD, O Signed Harlan H. Billman

ORIGINAL TR 107

D0425-4

36

AEC 18895

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

unknown

№ 356320

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

County Belmont Township Kirkwood Section of Township 32

Owner Harry Taylor Address Alledonia Ohio

Location of property 3 miles above Alledonia on Ohio River on old Crabapple School property

CONSTRUCTION DETAILS

Casing diameter 10 Length of casing 12 ft

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion Oct 5/61

BAILING OR PUMPING TEST

Pumping Rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Static level-depth to water ..... ft.

Quality (clear, cloudy, taste, odor) .....

3 gal min

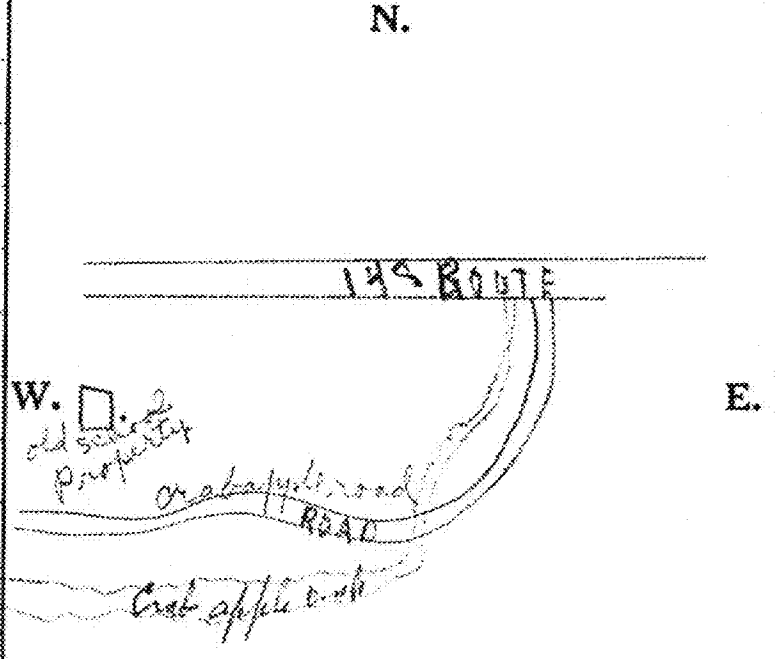
Pump installed by .....

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam	0 Feet	12 Ft.
Sand	12	25
Opened at 12 ft		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Edward H. Geyer Date Oct 5 1961

Address Bridgeport, Ohio Signed Edward H. Geyer

ORIGINAL

*If additional space is needed to complete well log, use next consecutive numbered form.

TR 103 (34)

AEC 18896

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

Nº 356333

County Belmont Township Washington Section of Township 26

Owner Oscar Perkins Address

Location of property on 86 between Adaena & 145 SR

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 21

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 11/25/68

BAILING OR PUMPING TEST

Pumping Rate 25 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 23 ft.

Quality (clear, cloudy, taste, odor) Clear

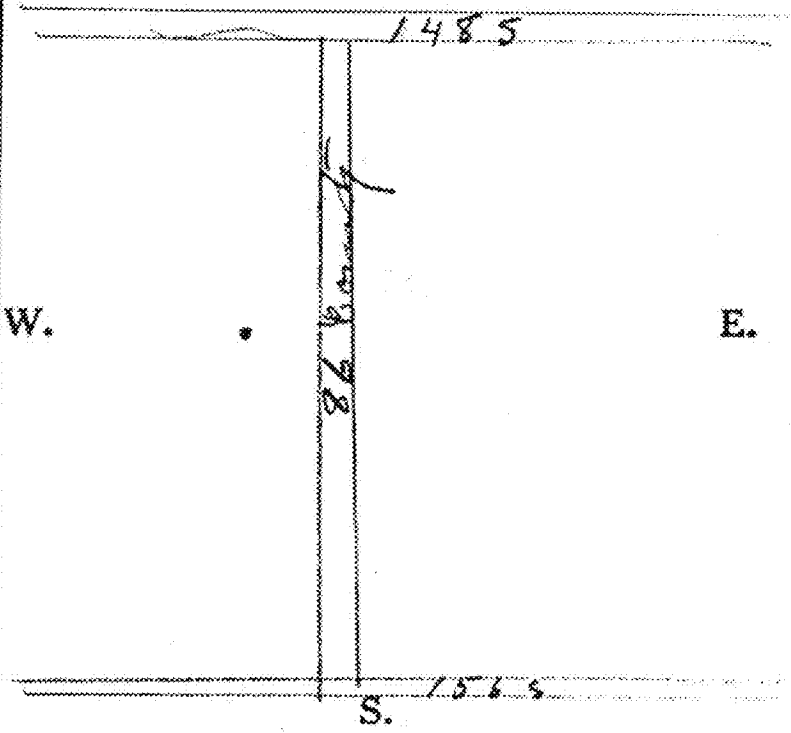
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam	0 Feet	4 Ft.
Sand Stone	4	64

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Gus Hess Date 11-25-68

Address Powhatan P.O. Signed Gus Hess

*If additional space is needed to complete well log, use next consecutive numbered form.

80425-4

1R 86 73

AEC 18897

WF LOG AND DRILLING RI ORT

ORIGINAL

OK 126

426083 unknown

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

County Monroe Township Summerfield Section of Township 24

Owner John Hearko Address Box 20 Powhatan

Location of property On Co. 23

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 23

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion March 22, 72

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 20 G.P.M. Duration of test hrs

Drawdown ft. Date

Static level-depth to water 20 ft.

Quality (clear, cloudy, taste, odor)

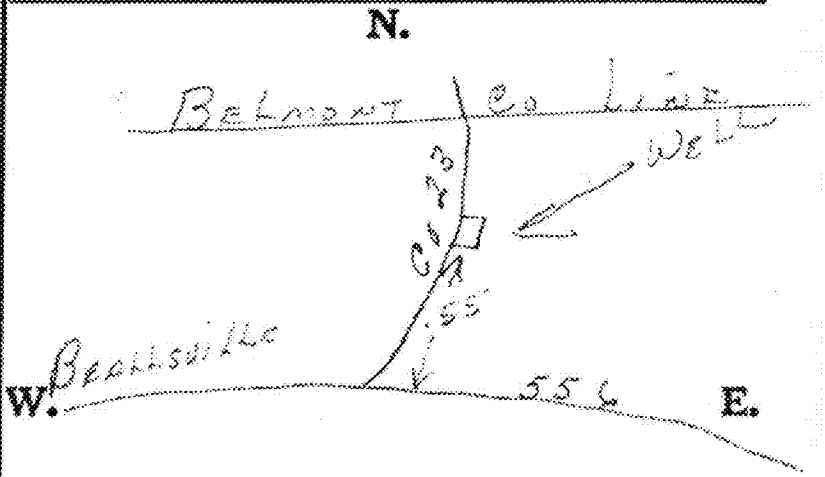
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Red Clay	0 Feet	2 Ft.
Sand Stone	2	27
Gray Shale	27	46
Sand Stone	46	52
Red Clay	52	70
Water 44		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm Bluman Drilling Date 3-22-72

Address Waterford, Ohio Signed H. L. Bluman

00425-4

*If additional space is needed to complete well log, use next consecutive numbered form.

29

AEC 18898

WE' LOG AND DRILLING RE RT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

ORIGINAL

504858

COUNTY Monroe TOWNSHIP Summerfield SECTION OF TOWNSHIP

OWNER Ralph Perkins ADDRESS Rt. 3 Beallsville

LOCATION OF PROPERTY 1/4 mi from St. Rt. 556 on County Rd. 38

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 20'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 1/2 gpm Duration of test 24 hrs

Drawdown ft Date

Static level (depth to water) ft

Quality (clear, cloudy, taste, odor) Cloudy

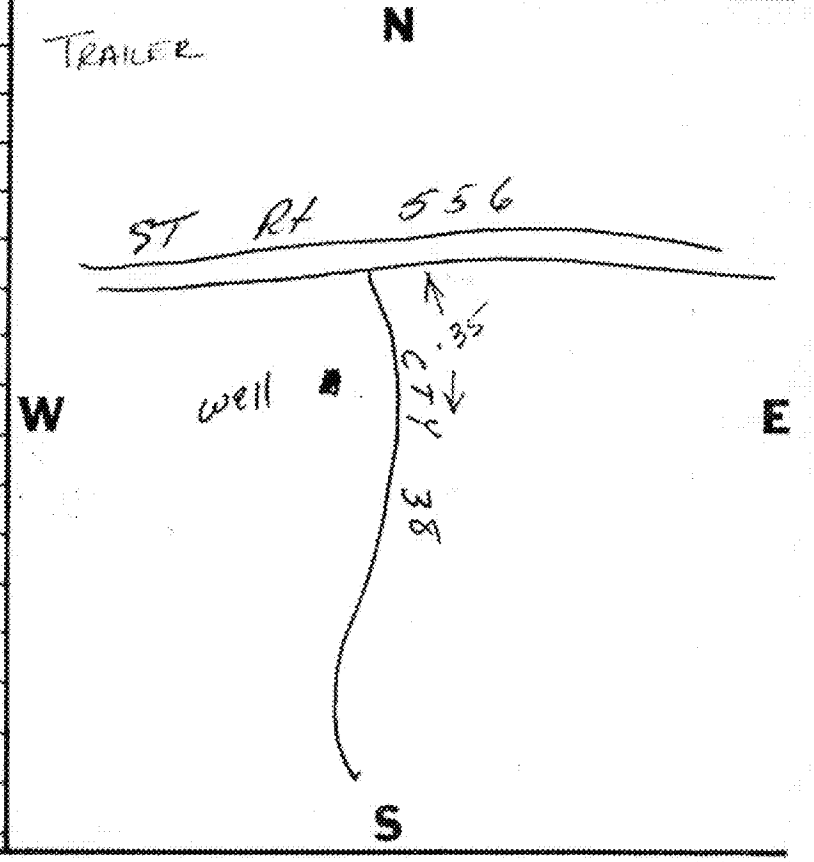
Pump installed by

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Top	0 ft	14 ft
Red Rock	14	19
Red Clay	19	27
Large Clay	27	36
Limestone	36	38
Limestone Clay	38	44
Sandstone	44	48
Sandy - Clay	48	54
Sandstone	54	60
Sandy - Clay	60	70
Limestone	70	80
Sandy - Clay	80	85
Red Rock	85	90
Vein @ 70'		

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM Mann Drilling DATE 8-9-76

ADDRESS Rt. 3 Woodsfield O. SIGNED Rick Mann

ORIGINAL

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18899

W LOG AND DRILLING RF RT

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

№ 316359

County MONROE Township SUNSBURY Section of Township 24

Owner CARL CHADWELL Address RED BEALLSVILLE, OHIO

Location of property ON ST RT 556 4 MILES

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 22.7

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion 10-28-65

BAILING OR PUMPING TEST

Pumping Rate 31 G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Static level-depth to water 26 ft.

Quality (clear, cloudy, taste, odor) .....

Pump installed by .....

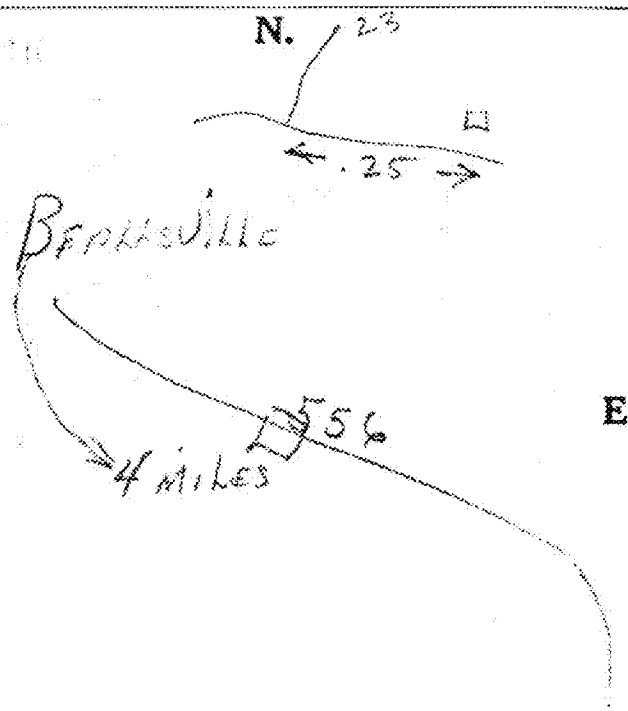
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
RED CLAY	0 Feet	1 Ft.
SAND STONE	1	7
GRAY SHALE	7	11
SAND STONE	11	24
GRAY SHALE	24	41
RED CLAY	41	53
WHITE SAND	53	84
GRAY SHALE	84	90

WATER 37

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Bellman Drilling Date 10-28-65

Address 211 Green St Signed H. H. Bellman

Wood Sfield, Ohio

ORIGINAL

31

AEC 18900

ORIGINAL

LL LOG AND DRILLING RE RT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

(32) Ohio

No. 210326
WL-178

County Monroe Township Lundsbury Section of Township 24

Owner Bill Ward Address Beallsville Ohio

Location of property (3) miles East of Beallsville Ohio along State R. T556

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 18

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 20 ft.

Pump installed by .....

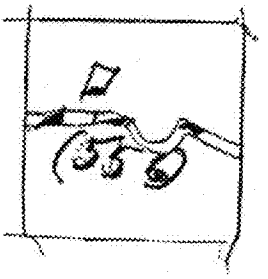
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	7 Ft.
Sandstone	7	19
Shale	19	40
Lime	40	52
Red	52	60
Water 24		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. 

E.

S.

See reverse side for instructions

Drilling Firm L. A. Mate Date 4/11/59

Address Hanoverton O. Signed L. A. Mate

ORIGINAL

00429-4 32

AEC 18901

ORIGINAL

W L LOG AND DRILLING REP T

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

(15) OH

No. 245930

County Monroe Township Lurefington Section of Township 24

Owner Bill Mullett Address Beallsville O.

Location of property 3 Miles East of Beallsville O. on State Route 55. on South side of Road.

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 16

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 50 ft.

Pump installed by .....

WELL LOG

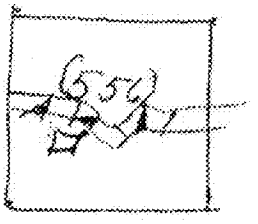
Formations Sandstone, shale, limestone, gravel and clay	From	To
clay	0 Feet	5 Ft.
Sandstone	5	19
Clay	19	31
Shale	31	50
Sandstone	50	56
Red	56	65
Shale	65	80
Water 55		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W.



E.

S.

See reverse side for instructions

Drilling Firm J. A. Mace Date 1/13/61

Address Wheelersburg O. Signed J. A. Mace

ORIGINAL

00429-4 33

AEC 18902

WF LOG AND DRILLING R ORT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 413082

County Monroe Township Sunsbury Section of Township 6

Owner Robert Morley Address Rt # Beallsville

Location of property On St Rt 145

CONSTRUCTION DETAILS

Casing diameter 6-4 Length of casing 23

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5-10-71

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 2 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 52 ft.

Quality (clear, cloudy, taste, odor)

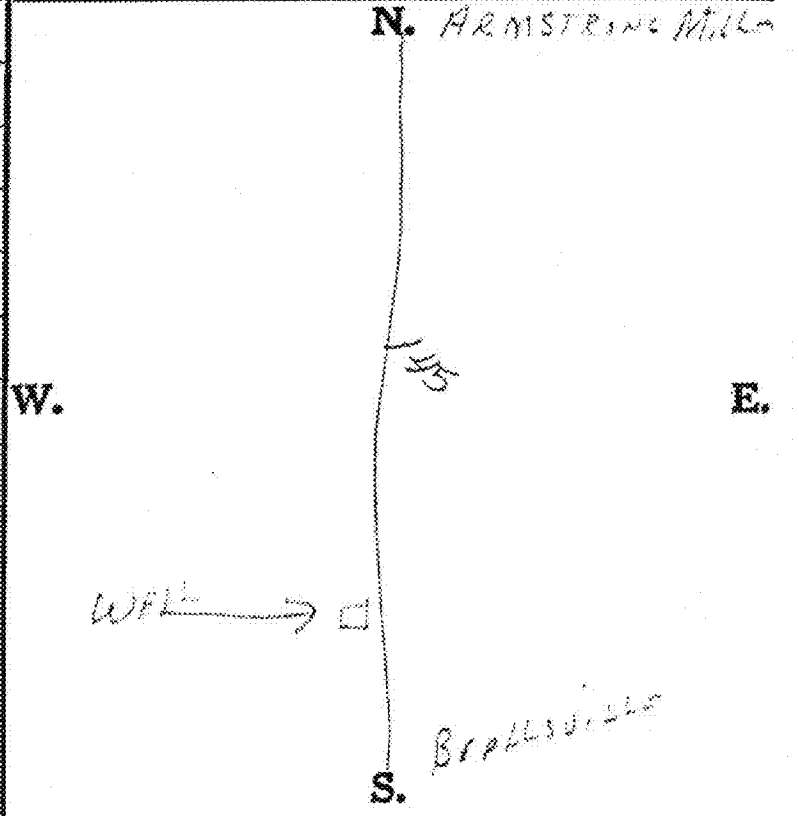
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Red Clay	0 Feet	9 Ft.
Sand Stone	9	34
Gray Shale	34	47
Lime Stone	47	66
Gray Shale	66	85
(1) Water 56		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm Billman Drilling Date 5-10-71

Address Woodsfield Signed H. H. Billman

*If additional space is needed to complete well log, use next consecutive numbered form. D0428-4

AEC 18903

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 367254

County Morrow Township Shoshoney Section of Township 6

Owner E. Milhorn Address Berlsville, Ohio

Location of property On St Rt 556 North End Of Berlsville

CONSTRUCTION DETAILS

Casing diameter 6 in Length of casing 17

Type of screen — Length of screen —

Type of pump —

Capacity of pump —

Depth of pump setting —

Date of completion 7-24-67

BAILING OR PUMPING TEST

Pumping Rate 3 G.P.M. Duration of test — hrs.

Drawdown — ft. Date —

Static level-depth to water 36 ft.

Quality (clear, cloudy, taste, odor) Clear

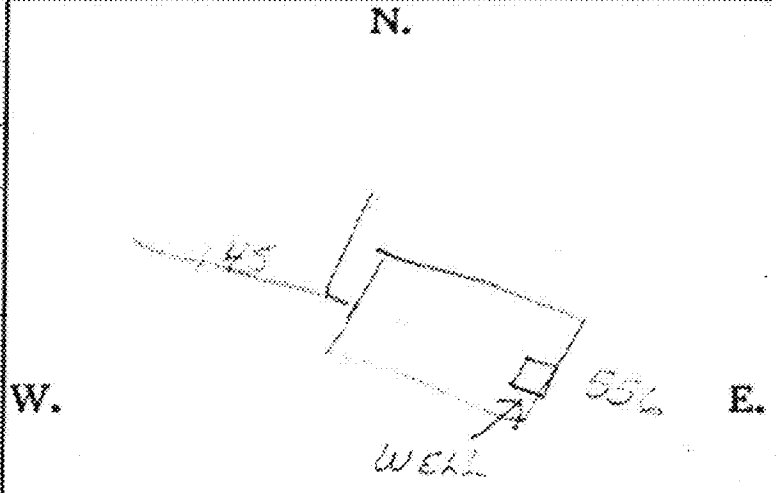
Pump installed by —

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Soil	0 Feet	1 Ft.
Sand Stone	1	27
Gray Shale	27	56
Lime Stone	56	61
Gray Shale	61	90
Water 48		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Williams Drilling Date 7-24-67

Address Mt Gilead Mansfield Signed [illegible]

ORIGINAL

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18904

ORIGINAL

W L LOG AND DRILLING REP T

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 213022

County [illegible] Township [illegible] Section of Township 6

Owner [illegible] Address [illegible]

Location of property [illegible]

CONSTRUCTION DETAILS

Casing diameter 6 3/4 Length of casing 18

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 24 ft.

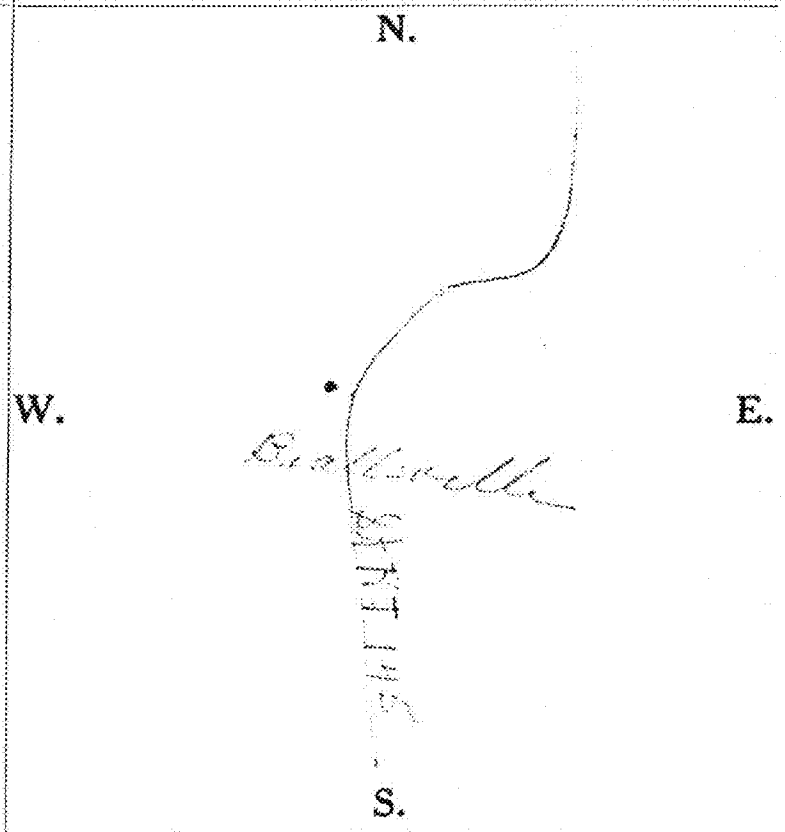
Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top Soil	0 Feet	4 Ft.
Blue Mud	4	14
Sand Stone	14	20
Lime	20	22
Red Rock	22	26
Lime	26	35
Black Shale	35	60
Shale Gray	60	70
Water 24		
" 42		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm [illegible] Date [illegible]

Address [illegible] Signed [illegible]

ORIGINAL 00425-4 D

AEC 18905

WELL LOG AND DRILLING REPORT

ORIGINAL

See gen'l DC 2 on back

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

No. 238143

County MONROE Township SUNSBURY Section of Township 6

Owner RALPH WALTMIRE Address OHIO ST BEALSVILLE, OHIO

Location of property EDGE OF CORP LIMIT 556 BEALSVILLE, OHIO

CONSTRUCTION DETAILS

Casing diameter 6 1/2 Length of casing 24

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion 11-4-60

BAILING OR PUMPING TEST

Pumping rate 5 1/2 G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 30 ft.

Pump installed by .....

WELL LOG

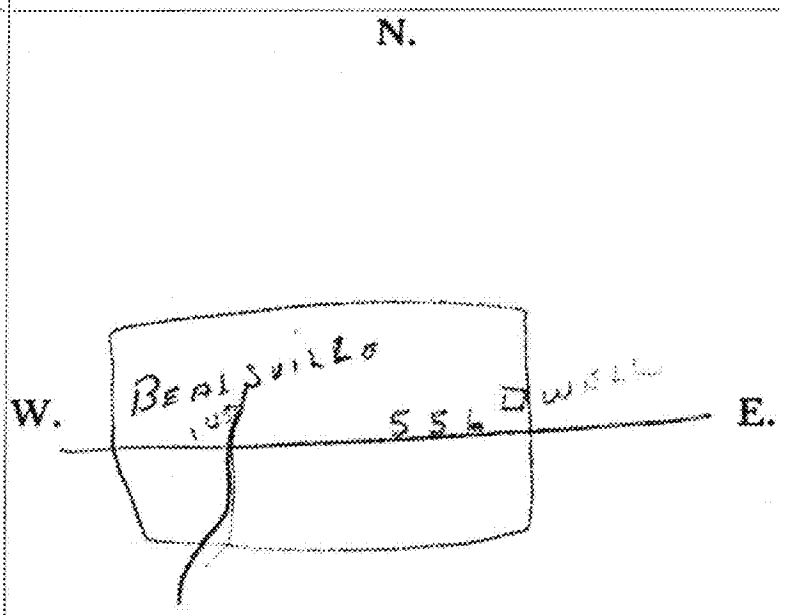
Formations Sandstone, shale, limestone, gravel and clay	From	To
SOIL	0 Feet	1 Ft.
RED ROCK	1	11
SANDSTONE	11	26
GRAY SHALE	26	35
LIME STONE	35	37
GRAY SHALE	37	50

WATER 32 D.P.M

4 1/2 G.P.M WATER RY

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm H. B. Bilhamer Date 11-4-60

Address 416 E. MARIETTA ST Signed H. B. Bilhamer

WOODSFIELD, OHIO

ORIGINAL

00425-4 D

AEC 18906

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 325699

County [illegible] Township [illegible] Section of Township 12 TWP 5

Owner [illegible] Address [illegible]

Location of property [illegible]

CONSTRUCTION DETAILS

Casing diameter 2" Length of casing [illegible]

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping Rate 3 G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date [illegible]

Static level-depth to water ..... ft.

Quality (clear, cloudy, taste, odor) [illegible]

Pump installed by .....

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
[illegible]	[illegible]	[illegible]
[illegible]	18	107
[illegible]		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. E.

[illegible]

S.

See reverse side for instructions

Drilling Firm [illegible] Date [illegible]

Address [illegible] Signed [illegible]

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18907

WI LOG AND DRILLING RE RT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

No 281039

County Monroe Township Lewisburg Section of Township 145

Owner Ronnie Lucas Address Beallsville Ohio

Location of property in town of Beallsville Ohio

CONSTRUCTION DETAILS

Casing diameter 6 5/8 Length of casing 22 ft

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion March 6, 1964

BAILING OR PUMPING TEST

Pumping Rate 8 G.P.M. Duration of test 8 hrs.

Drawdown 6 Ton ft. Date March 6 64

Static level-depth to water 30 ft.

Quality (clear, cloudy, taste, odor) Clear

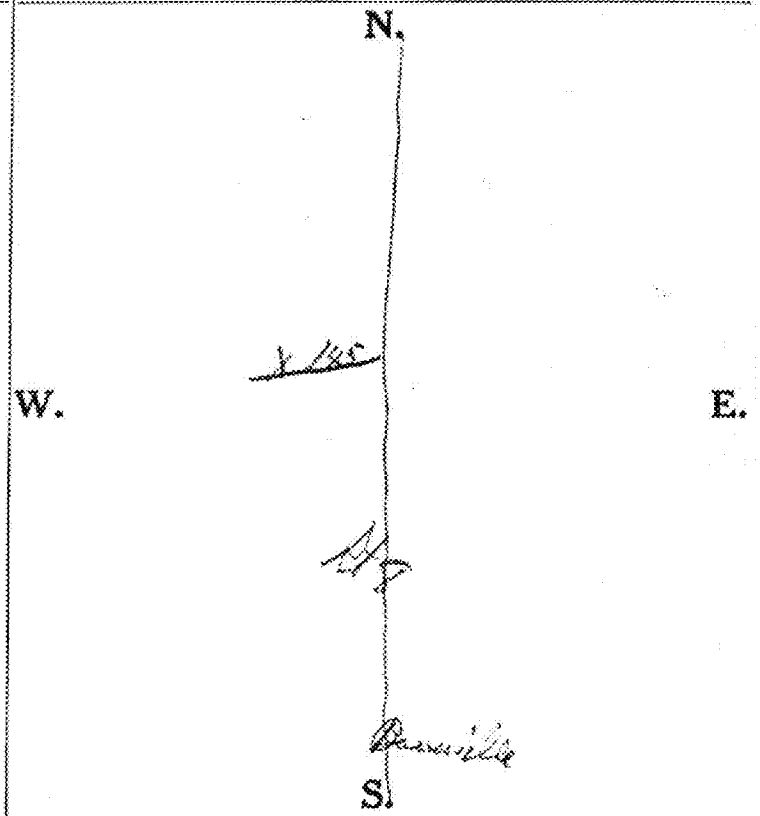
Pump installed by Owner

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Yellow sand	0 Feet	20 Ft.
Blue Slate	20	40
Gray Slate	40	65
Water at 30 ft		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Flem E Marick Date March 6 1964

Address 502 North Lincoln Beallsville Ohio Signed Flem E Marick

ORIGINAL

00425-4

AEC 18908

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

No. 259288

County Monroe Township Sunsbury Section of Township 6

Owner Glen Gardens Inc Address Beallsville, Ohio

Location of property On St Rt 556 In Beallsville,

CONSTRUCTION DETAILS

Casing diameter 6 5/8 Length of casing 17

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5-30-63

BAILING OR PUMPING TEST

Pumping rate 20 G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 35 ft.

Pump installed by

WELL LOG

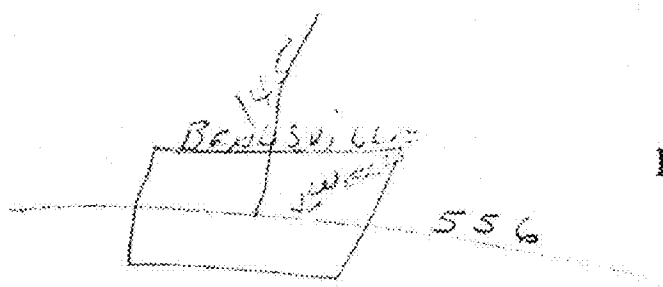
Formations Sandstone, shale, limestone, gravel and clay	From	To
Soil	0 Feet	2 Ft.
Red Rock	2	11
Limestone	11	13
Water 25 Sandstone	13	24
Gray Shale	24	33
White Sand	33	40
Water 47 Gray Shale	40	51
Red Rock	51	63
Gray Shale	63	70

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. E.



S.

See reverse side for instructions

Drilling Firm H.H. Robertson Date 5-30-63

Address 211 Lincoln St Barnesville Signed H.H. Robertson

ORIGINAL

D0425-4

AEC 18909

LL LOG AND DRILLING RE RT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

OK see Page 54

No. 259271

County MONROE Township SUNSBURY Section of Township 27 Acres

Owner [illegible] BRAIN Address CRUM RD - BEALSVILLE

Location of property ON CRUM RD 1 MILE OF ST RT 145 IN BEALSVILLE

CONSTRUCTION DETAILS

Casing diameter 6 IN Length of casing 31 FT

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion 5-23-63

BAILING OR PUMPING TEST

Pumping rate 14 G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 40 ft.

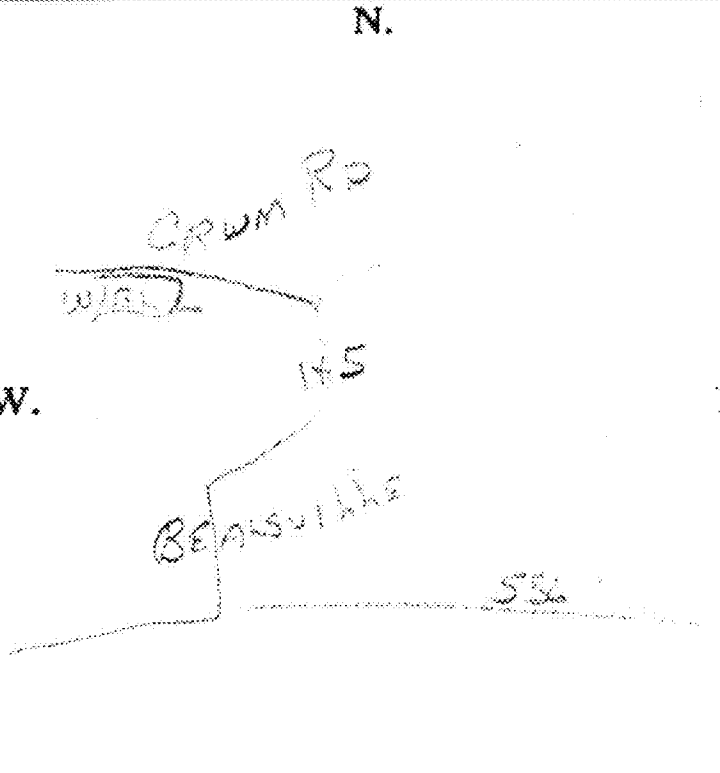
Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
FILL	0 Feet	2 Ft.
SOIL	2	3
RED ROCK	3	16
32 SANDSTONE	16	30
47 GRAY SHALE	30	48
RED ROCK	48	59
WHITE SAND	59	64
GRAY SHALE	64	71
BLUE ROCK	71	80

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm [illegible] Date 5-29-63

Address [illegible] Signed [illegible]

ORIGINAL

D0425-4 D

AEC 18910

2412100

680 4005

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No 117352

County Monroe Township Sunsbury Section of Township or Lot Number 6

Owner Don Hendrickson Address Beallsville O

Location of property Beallsville O on 145

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 21 ft

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 6/11/53

Developed capacity 1 gal min

Static level—depth to water 24 ft.

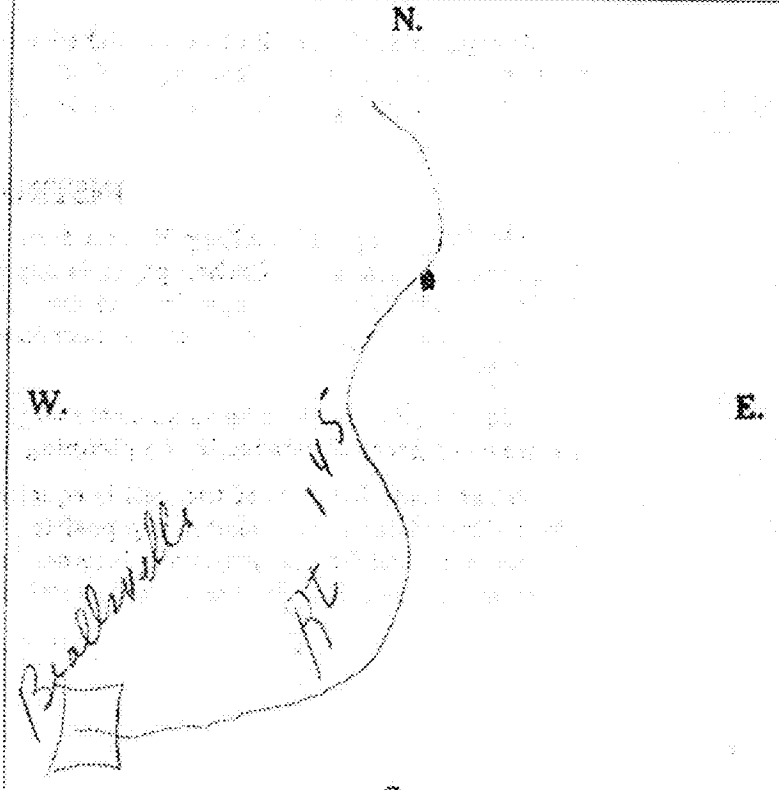
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	13 Ft.
Sand Shale	13	15
Coal		
Soap stone	15	25
Sand Rock	28	30
Soap stone	30	39
Sand Rock	39	45
Soap stone	45	50
Sand Rock	50	60

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Warnock & Son Date 11/27/53

Address Barnesville O Signed H. Tracy

ORIGINAL

AEC 18911

ORIGINAL

W L LOG AND DRILLING REP T

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 213014

County Monroe Township Lundsberg Section of Township 6

Owner Ruth Anderson Address Beallsville O

Location of property ½ mile N of Beallsville 6 on St RT 145

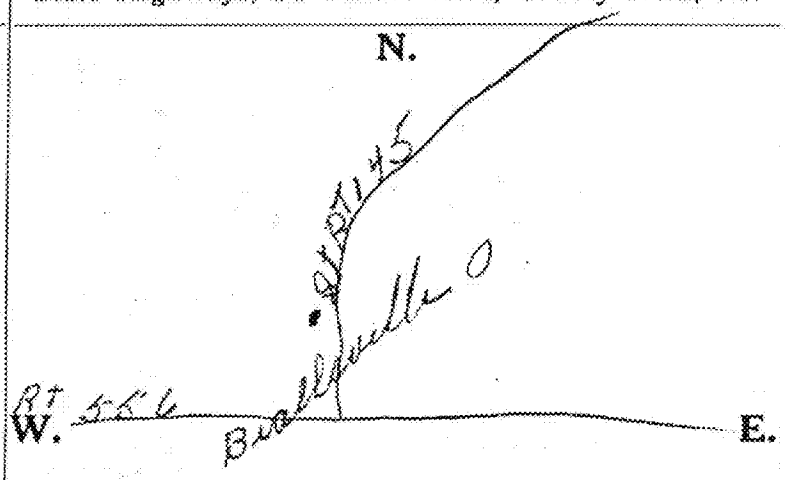
CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 6 1/4 Length of casing 24 1/2	Pumping rate ..... G.P.M. Duration of test ..... hrs.
Type of screen ..... Length of screen	Drawdown ..... ft. Date .....
Type of pump	Developed capacity .....
Capacity of pump	Static level—depth to water 18 ft.
Depth of pump setting	Pump installed by .....
Date of completion	

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top Soil	0 Feet	4 Ft.
Red Rock	4	12
Shaly Gray	12	18
Sand Stone	18	26
Shale Blue	26	34
Red Rock	34	42
Shale Gray	42	45
Red Rock	45	51
Shale Gray	51	60
Water 26		
" 32		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Bellaire Drilling Co. Date Aug 16-62

Address Woodfield O Signed Chas S Bellaire

ORIGINAL

20-28-4 E

AEC 18912

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

No. 259251

County Monroe Township Sunsbury Section of Township 6

Owner Malcom Williams Address Beallsville, Ohio

Location of property On St Rt 556 ½ mile East Of Beallsville

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 12-6

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 8-17-61

BAILING OR PUMPING TEST

Pumping rate 7 G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 19 ft.

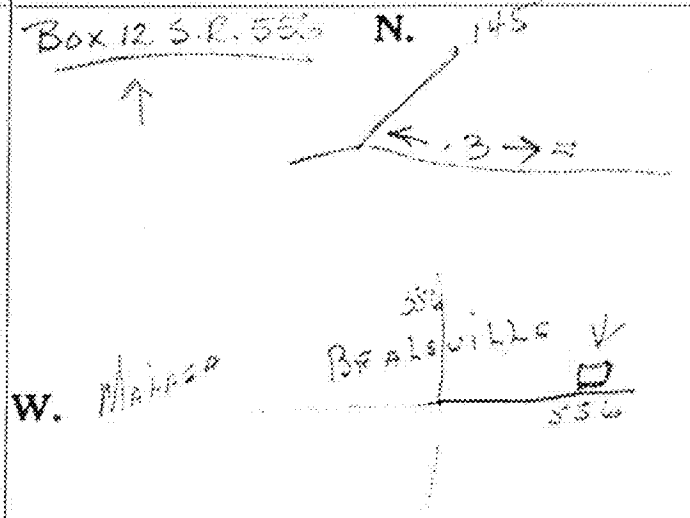
Pump installed by

WELL LOG

	Formations Sandstone, shale, limestone, gravel and clay	From	To
	FILL	0 Feet	6 Ft.
	SOIL	6	8
WATER 11	SANDSTONE	8	22
WATER 26	GRAY SHALE	22	27
34	RED ROCK	27	30
WATER	GRAY SHALE	30	41
	RED ROCK	41	54
	GRAY SHALE	54	60

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm H. H. Bishop

Address 412 S. Marietta Woodsfield Ohio

Date 8-17-61

Signed H. H. Bishop

ORIGINAL

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AEC 18913

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No. 142985

County Muskingum Township Salem Section of Township or Lot Number 6

Owner Lloyd Powell Address Beallsville

Location of property Beallsville, Ohio

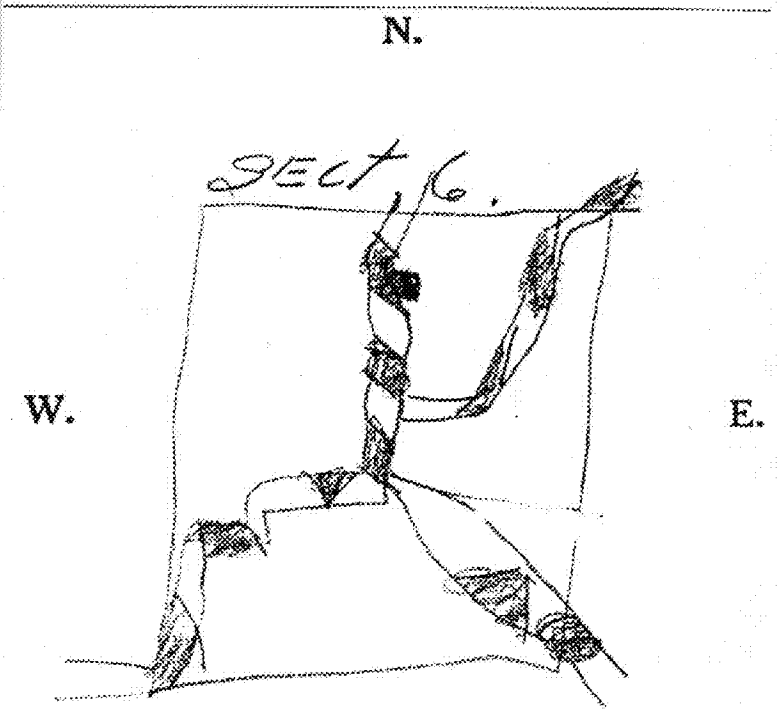
CONSTRUCTION DETAILS	PUMPING TEST
Casing diameter 8" Length of casing 90'	Pumping rate 1 G.P.M. Duration of test 7 hrs.
Type of screen None Length of screen —	Drawdown 0.5 ft. Date Jan. 25, 1955
Type of pump	Developed capacity
Capacity of pump	Static level—depth to water 25 ft.
Depth of pump setting	Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Surface	0 Feet	3 Ft.
Sandy shale	3	15
Hard soft stone	15	20
Sandy gray	20	32
Hard soft stone	32	41
Red soft stone	41	53
Hard sandrock	53	65
Red soft stone	65	71
Hard sandy	71	

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm E. J. Chappell Sons Date Feb. 3, 1955

Address [illegible] Signed [illegible]

ORIGINAL

00425-8

AEC 18914

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ELL LOG AND DRILLING RI RT

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ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

Nº 142984

County MONROE Township SUNSBURY Section of Township or Lot Number 6

Owner LOWELL HICKMAN Address BELLSVILLE

Location of property BELLSVILLE, OHIO

CONSTRUCTION DETAILS

Casing diameter 6 1/4" Length of casing

Type of screen NONE Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate 2 G.P.M. Duration of test 4 hrs.

Drawdown 24 ft. Date JAN 1956

Developed capacity

Static level—depth to water 53 ft.

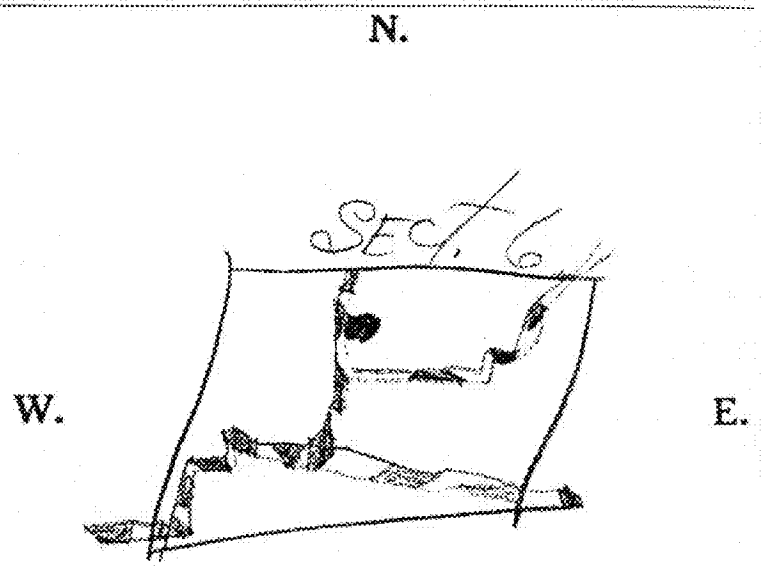
Pump installed by DRILLER

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SURFACE	0 Feet	3 Ft.
SANDROCK & SHALE	3	15
RED BOTTOM	15	18
GRAY SOAPSTONE	18	22
GRAY SANDSTONE	22	32
GRAY SOAPSTONE	32	38
RED SOAPSTONE	38	41
GRAY SANDROCK	41	53
WHITE SOAPSTONE	53	65
RED SOAPSTONE	65	70
GRAY SANDROCK	70	75
RED SOAPSTONE	75	97
GRAY SANDROCK	97	105
RED SOAPSTONE	105	114

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm EDWARD KLUNS Date FEB. 4, 1956

Address 749 E. MAIN ST. Signed [illegible]

ORIGINAL

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AEC 18915

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676 2005

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

Ok - Sal

ORIGINAL

№ 117376

County Monroe Township Lindsey Section of Township or Lot Number 6

Owner Eugene Hickman Address Beallsville O

Location of property Beallsville O

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 19 1/2 ft

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 10/24/53

Developed capacity 4 gal min

Static level—depth to water 25 ft.

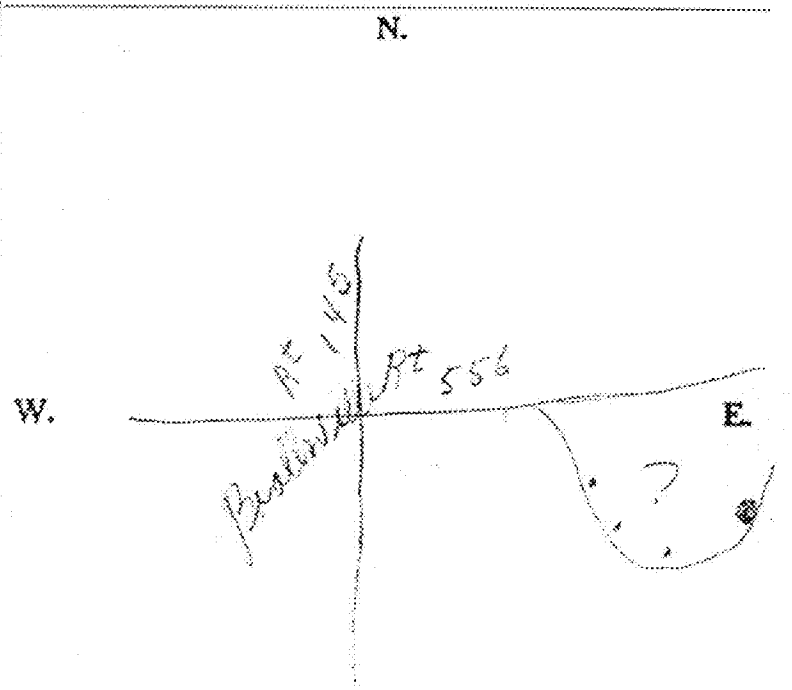
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Shale	0 Feet	4 Ft.
Red Rock	4	12
Sand Rock	12	18
Blue Soapy	18	40
Red Rock	40	50

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Marsh & Sons Date 12/15/53

Address Barnesville Signed H. Lucas

ORIGINAL 00425-4 D

AEC 18916

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

№ 316351

County MONROE Township SUNSBURY Section of Township 45

Owner WARREN PENNELL Address BEALLSVILLE, OHIO

Location of property ON RT 556 EAST END OF BEALLSVILLE

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 22

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 8-16-65

BAILING OR PUMPING TEST

Pumping Rate 40 G.P.M. Duration of test 6 hrs.

Drawdown ft. Date

Static level-depth to water 42 ft.

Quality (clear, cloudy, taste, odor)

CLEAR

Pump installed by OWNER

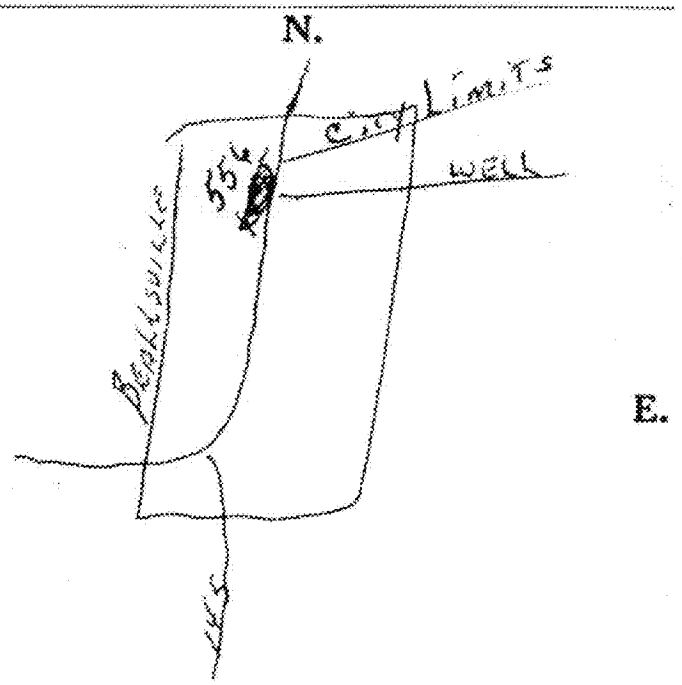
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SOIL	0 Feet	2 Ft.
CLAY	2	9
SANDSTONE	9	31
GRAY SHALE	31	62
RED CLAY	62	74
COAL	74	76
GREEN SHALE	76	83
LIME STONE	83	87
RED ROCK	87	94
GRAY SHALE	94	102

WATER 56

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm BILLMAN DRILLING Date 8-24-65

Address 211 GREEN ST. WOODSFIELD, OHIO Signed H. H. Billman

ORIGINAL

BC425-4

AEC 18917

WF LOG AND DRILLING R ORT

Check W352 ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 413073

County Monroe Township Summerfield Section of Township 6

Owner Harold Carpenter Address Beallsville, Ohio

Location of property On St Rt 556

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 22

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 3-10-71

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 3 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 30 ft.

Quality (clear, cloudy, taste, odor)

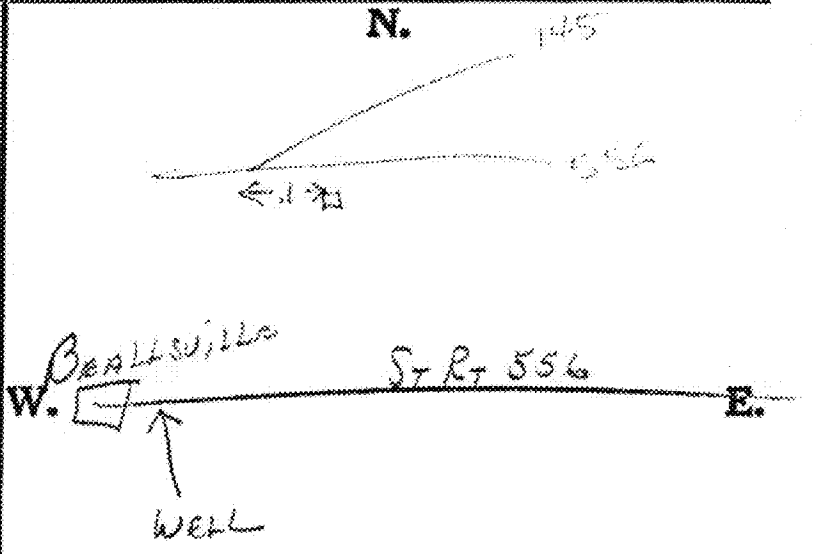
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Sandstone	0 Feet	9 Ft.
Red Clay	9	12
Sand Stone	12	24
Gray Shale	24	53
White Sand	53	75
Water 42		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm Billman Drilling Date 3-10-71

Address Woodsfield, Ohio Signed H. H. Billman

*If additional space is needed to complete well log, use next consecutive numbered form.

BD 423-4

AEC 18918

ORIGINAL

V L LOG AND DRILLING REI T

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 210306

County Monroe Township Summerfield Section of Township 6

Owner Grant Hamilton Address Belleville Ohio

Location of property on the North side of Cambridge State Rt. Rt 145 or the South side of 145 State Rt.

CONSTRUCTION DETAILS

Casing diameter 7 Length of casing 20

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 14 ft.

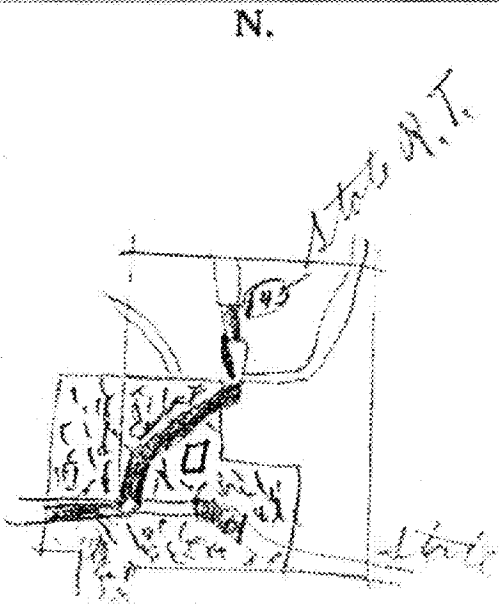
Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
clay	0 Feet	12 Ft.
Shale	12	24
Lime	24	30
Shale	30	44
Red	44	49
Shale	49	65
Water 24		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm L. L. Mat Date 5/5/56

Address Macksville O Signed L. L. Mat

D

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AEC 18919

W LOG AND DRILLING RE RT

ORIGINAL

PLEASE USE PENCIL OR TYPEWRITER DO NOT USE INK.

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus 12, Ohio

Nº 316353

County MONROE Township SUNSBURY Section of Township 24

Owner SHERMAN MULLETT Address RD 1 BEALLSVILLE, OHIO

Location of property ON 556 5 MILES EAST OF BEALLSVILLE

CONSTRUCTION DETAILS

Casing diameter NONE Length of casing

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 8-31-65

BAILING OR PUMPING TEST

Pumping Rate 1 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

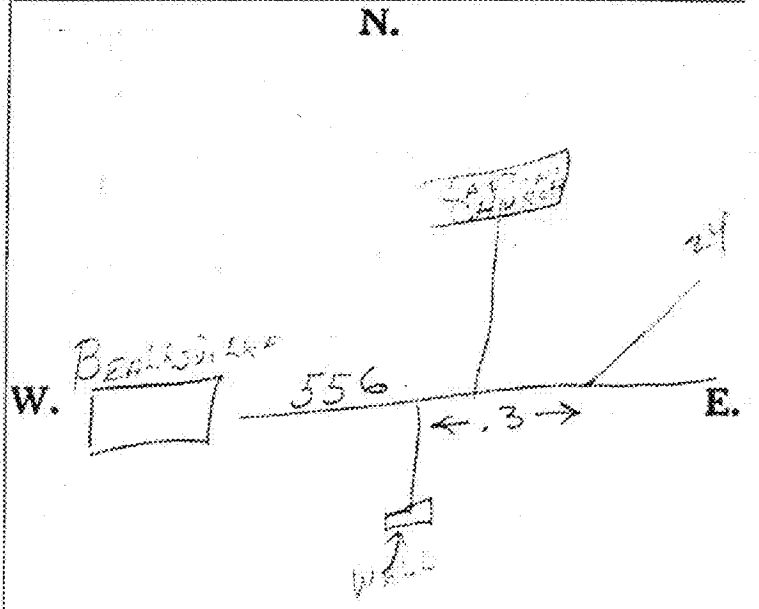
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SOIL	0 Feet	2 Ft.
BROWN SANDSTONE	2	9
WHITE SANDSTONE	9	53
GRAY SHALE	53	71
LIME STONE	71	75
RED CLAY	75	94
GRAY SHALE	94	106
RED CLAY	106	120
COAL	120	123
RED ROCK	123	144
GRAY SHALE	144	154

WELL PLUGGED BY OWNER, 1 GPH WATER DEPTH UNKNOWN.

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Bittman Drilling Date 8-31-65

Address 211 Green St. Woodfield OHIO Signed H. A. Bittman

ORIGINAL

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AEC 18920

WE' LOG AND DRILLING RF RT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 413062

County MONROE Township SUNSBURY Section of Township 9

Owner RICHARD PERKINS Address BEALLSVILLE, OHIO

Location of property ON ST RT 145

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 19

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 10-12-70

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 3 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 22 ft.

Quality (clear, cloudy, taste, odor)

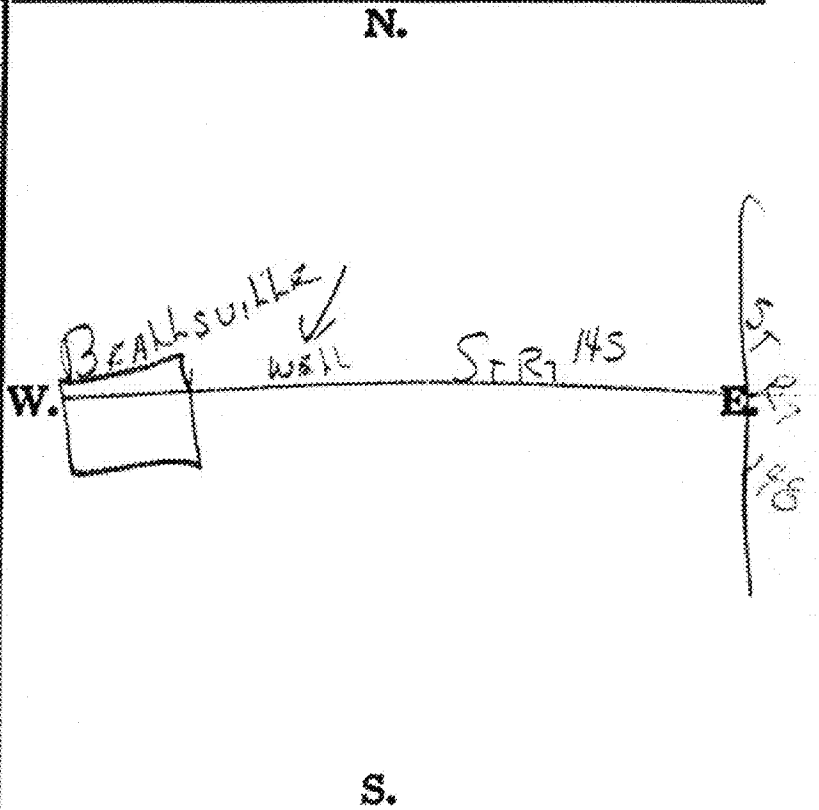
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
SOIL	0 Feet	3 Ft.
RED CLAY	3	11
SAND STONE	11	19
GRAY SHALE	19	33
WHITE SAND	33	49
LIME STONE	49	65
WATER 19		
11 30		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm BILLMAN DRILLING Date 10-12-70

Address WOODSFIELD Signed H. H. Billman

*If additional space is needed to complete well log, use next consecutive numbered form.

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WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

ORIGINAL

№ 117354

County Monroe Township Sunsbury Section of Township or Lot Number 6

Owner Emerson Earlywine Address Beallsville O

Location of property Beallsville O

CONSTRUCTION DETAILS

Casing diameter 6 1/4 Length of casing 21

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date 6/25/53

Developed capacity 5 gal min

Static level—depth to water ft.

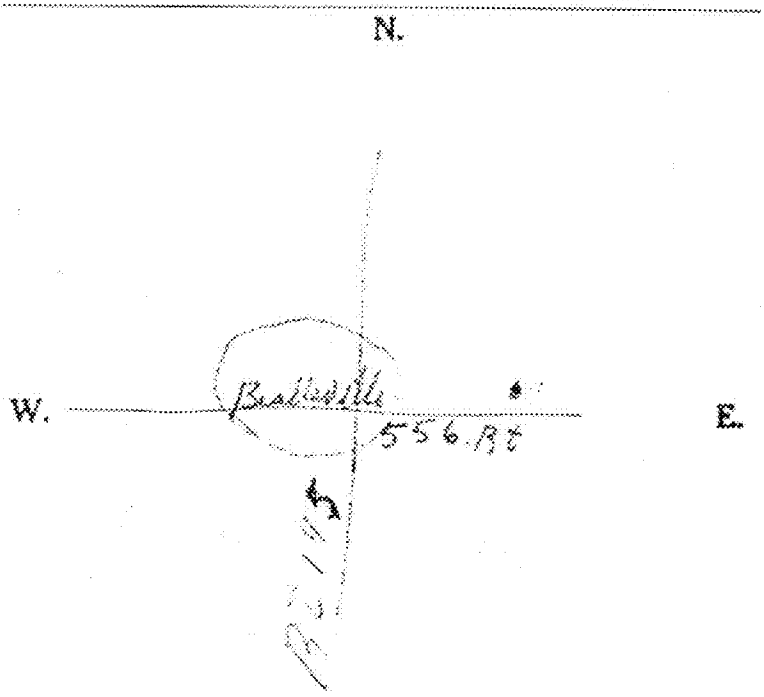
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Top Soil	0 Feet	1 Ft.
yellow Clay	1	15
Sand Rock	15	30
Soap Stone	30	40

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Warrick & Sons Date 11/27/53

Address Beallsville O Signed H. Warrick

ORIGINAL

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AEC 18922

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

57

No. 245949

County Monroe Township Sunsbury Section of Township 24

Owner Arley Johnson Address Beallsville O.

Location of property 2 mile East of Beallsville, O. on the South side of State Road #556

CONSTRUCTION DETAILS

Casing diameter 5 Length of casing 29

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 40 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	3 Ft.
Sandy	3	16
Shale	16	28
Sandy	28	31
Shale	31	64
Red Rock	64	70
Water 32		
1 " 50		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

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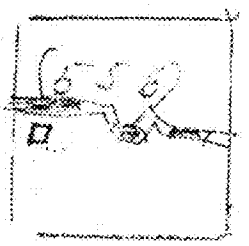


E.

S.

See reverse side for instructions

Drilling Firm L. A. Mast Date 9/21/62

Address Woodsfield Signed L. A. Mast

ORIGINAL

30

AEC 18923

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

No. 245931

County Monroe Township Lurtsburg Section of Township 24

Owner Arley Johnson Address Beallsville Ohio

Location of property 2 miles east of Beallsville, O. on the north side of State Route (556)

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 20

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 47 ft.

Pump installed by

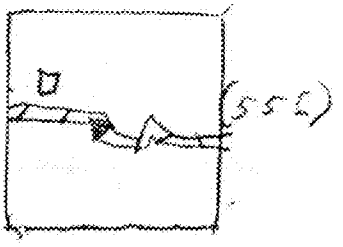
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	8 Ft.
Shale	8	16
Sandstone	16	21
Shale	21	36
Sandstone	36	44
Shale	44	80
Water 21		
Water 55		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W.  E.

S.

See reverse side for instructions

Drilling Firm L. A. Mez Date 10/24/6

Address Woodsfield Signed L. A. Mez

AEC 18924

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

ORIGINAL

(49) OK

No. 272585

County Monroe Township Lawrence Section of Township 30

Owner James Riley Address Beallsville O.R.R. Route

Location of property 2½ Miles from 556 east of Beallsville

CONSTRUCTION DETAILS

Casing diameter 10 Length of casing 12

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion Sept 22/47

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity 25 gals

Static level—depth to water ft.

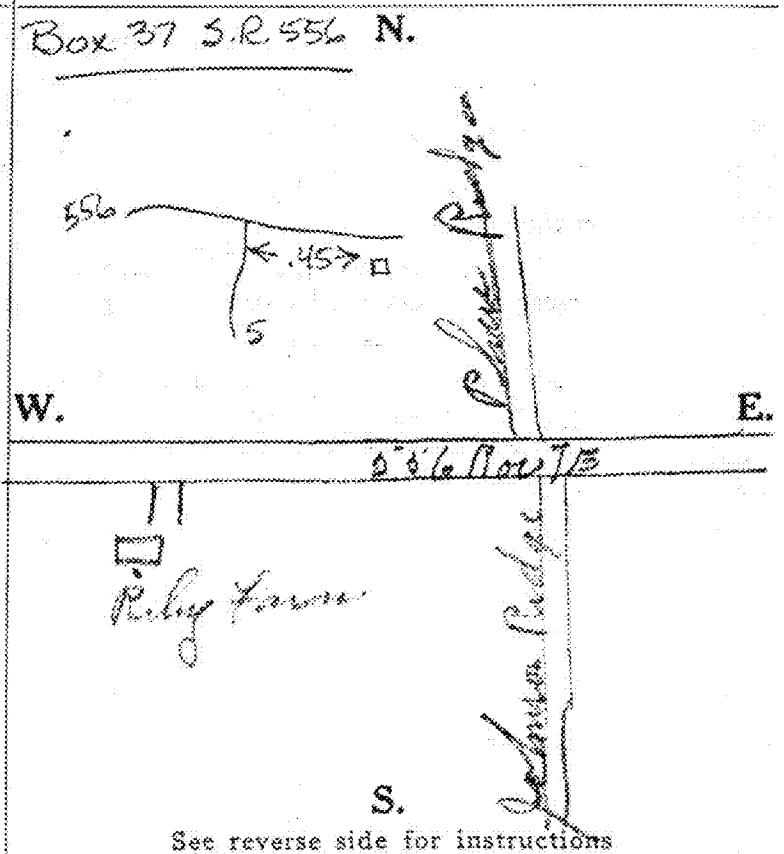
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam & shale	0 Feet	12 Ft.
Sand & Stg	12	35
Clay & sand	35	105
Water 21ft		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Geo. McGuire Date Sept 22/47

Address Beallsville O. Signed Geo. McGuire

D0425-8

AEC 18925

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

OK see Card (17) W-204

No. 245929

County Monroe Township Summerfield Section of Township 3 6

Owner Glenn Mellott Address Beallsville O.

Location of property 2 Miles East of Beallsville, O. along State Route 53 on the North side of road

CONSTRUCTION DETAILS

Casing diameter 7 Length of casing 20

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion .....

BAILING OR PUMPING TEST

Pumping rate ..... G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 45 ft.

Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	19 Ft.
Shale	19	20
Lime	20	26
Red	26	30
Shale	30	55
Lime	55	58
Shale	58	90

Water 24
Water 55

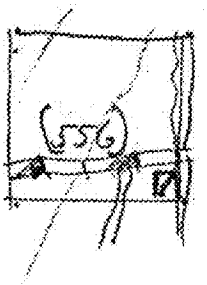
SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

Corner of S & 556

W.



E.

S.

See reverse side for instructions

Drilling Firm J. A. Moss Date 10-7-61

Address Jewett O. Signed J. A. Moss

ORIGINAL

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AEC 18926

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V L LOG AND DRILLING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 210324

County Monroe Township Lunsbury Section of Township 3 6

Owner Earl Mullett Address Beallsville Ohio

Location of property 1 Mile East of Beallsville O. State Rout 556

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 14

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 70 ft.

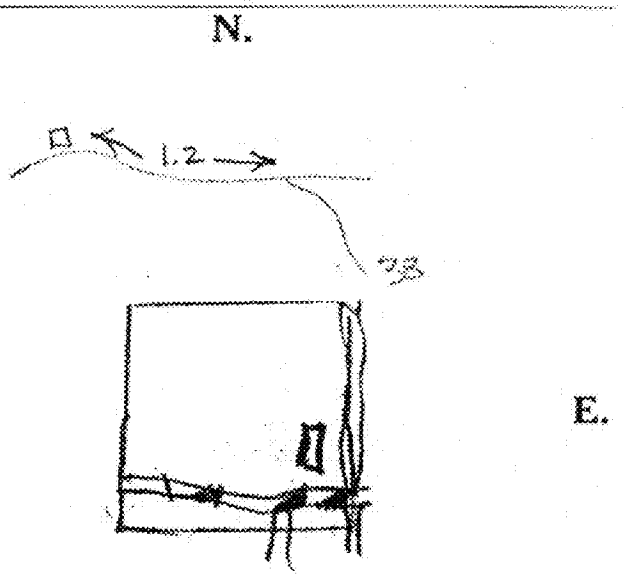
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
clay	0 Feet	10 Ft.
Sandy	10	16
Red	16	25
Shale	25	41
Sandy	41	47
Red	47	71
Sand	71	77
Shale	77	88
Red	88	95
Water 71		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm J. A. Mills

Address Woodsfield O.

Date 4/25/59

Signed J. A. Mills

ORIGINAL

D0625-4 24

AEC 18927

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

No. 238107

County MONROE Township SUNSBURY Section of Township 36

Owner FRA STAPP Address BEALLSVILLE RFD4

Location of property ONE MILE NORTH OF BEALLSVILLE ON RT 556

CONSTRUCTION DETAILS

Casing diameter 6 5/8 Length of casing 81.6

Type of screen ..... Length of screen .....

Type of pump .....

Capacity of pump .....

Depth of pump setting .....

Date of completion OCT 4, 1959

BAILING OR PUMPING TEST

Pumping rate 9 G.P. HOUR G.P.M. Duration of test ..... hrs.

Drawdown ..... ft. Date .....

Developed capacity .....

Static level—depth to water 33 ft.

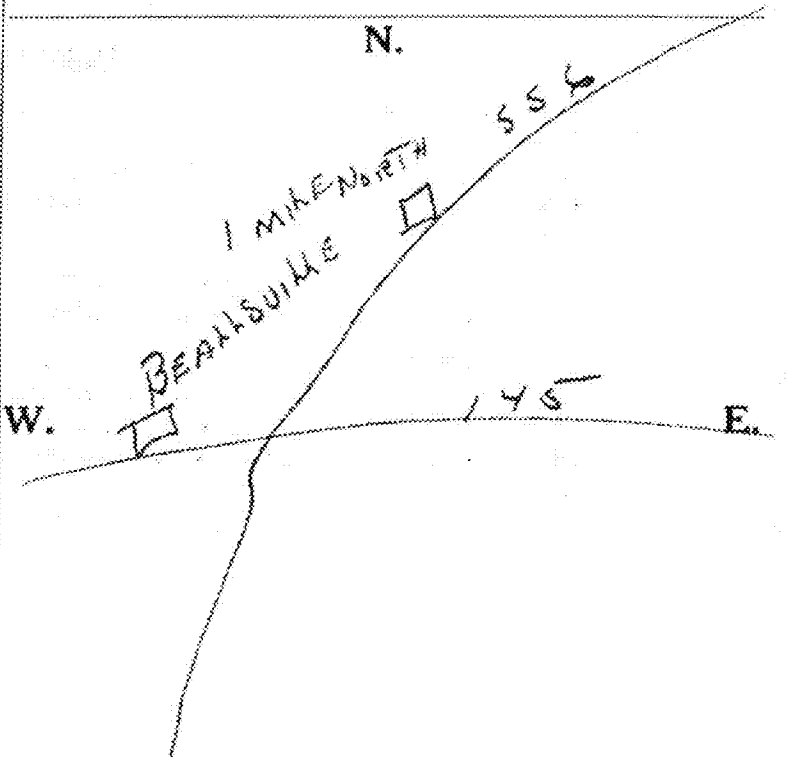
Pump installed by .....

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	2 Ft.
SANDSTONE	2	24
GRAY SHALE	24	31
RED ROCK	31	35
SAND STONE	35	39
16 WATER GRAY SHALE	39	52
COAL	52	53
GRAY SHALE	53	67
SAND STONE	67	88
LIME STONE	88	93
RED ROCK	93	100

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm H. H. BILLMAN Date OCT 4, 1959

Address 416 E. MARIETTA Signed Harlan Billman

WOODSFIELD, OHIO

ORIGINAL

D0425-4 23

AEC 18928

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

№ 366703

County Monroe Township Lewisburg Section of Township 3 6

Owner John Ensley Address Beallsville, O.

Location of property 1 mi. N. East of Beallsville on State Rt. 26

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 16 ft.

Quality (clear, cloudy, taste, odor)

Pump installed by

WELL LOG*

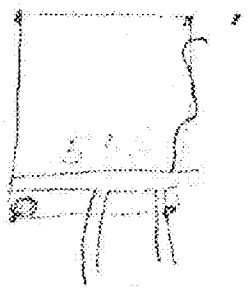
Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	11 Ft.
Sandstone	11	27
Lime	27	50
Water 19		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. E.



S.

See reverse side for instructions

Drilling Firm L. A. Miller Date 4/25/66

Address Beallsville, O. Signed L. A. Miller

*If additional space is needed to complete well log, use next consecutive numbered form.

20

AEC 18929

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

ORIGINAL

No. 259287

County MONROE Township SUNSBURY Section of Township 30

Owner IRA STAPP Address RFD BEALSVILLE, OHIO

Location of property 2 MILES EAST OF BEALSVILLE ON ST RT 556

CONSTRUCTION DETAILS

Casing diameter 6 5/8 Length of casing 20

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion MAY 25, 1963

BAILING OR PUMPING TEST

Pumping rate 1 1/4 G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 35 ft.

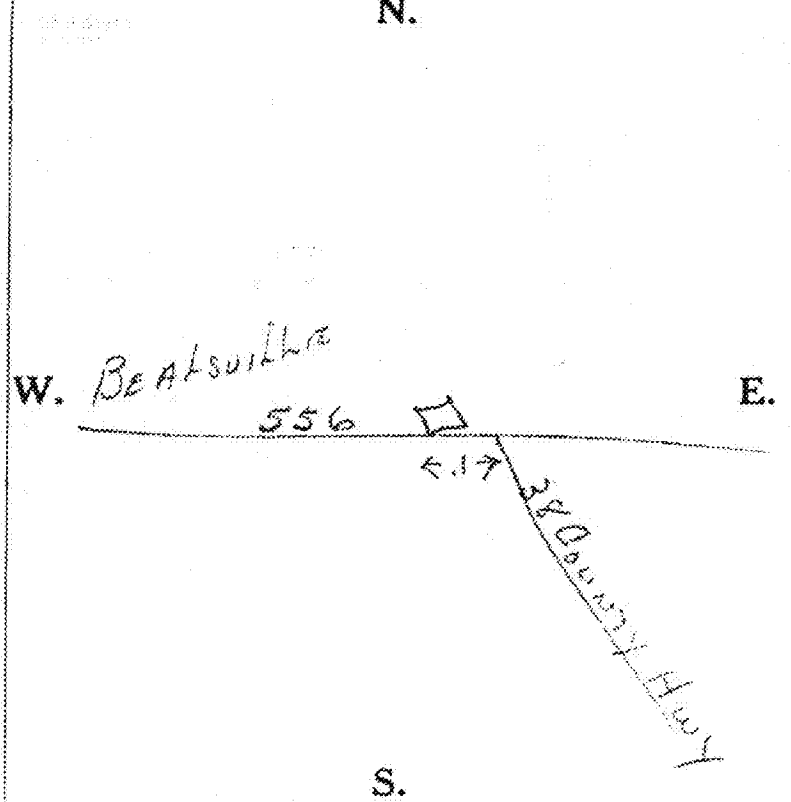
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
SOIL	0 Feet	2 Ft.
SANDSTONE	2	14
GRAY SHALE	14	17
WATER 28 RED ROCK	17	24
GRAY SHALE	24	31
LIME STONE	31	33
WATER 42 GRAY SHALE	33	47
RED ROCK	47	62

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm H.H. BILLMAN Date 5-25-63

Address 211 GREEN ST WOODSFIELD Signed H. H. Billman

30-25-4

AEC 18930

ORIGINAL

V L LOG AND DRILLING REI T

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 210304

County Monroe Township Sunsbury Section of Township 3 6

Owner Carlos Mellott Address Beallsville, Ohio

Location of property approx 2 miles East of Beallsville, O. South side of R.T. State 556

CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 21

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity

Static level—depth to water 14 ft.

Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	16 Ft.
Shale	16	30
Red	30	39
Shale	39	48
Red	48	57
Shale	57	60

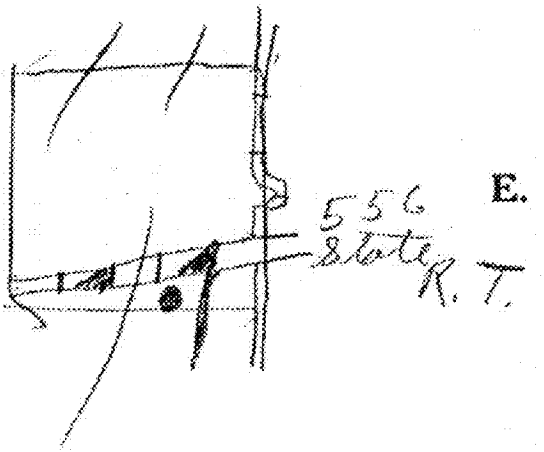
Water 28

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

Corner of 31/556 N.

W. E.



S.

See reverse side for instructions

Drilling Firm E. A. Mills Date 4/7/58

Address Beallsville Signed E. A. Mills

ORIGINAL

AEC 18931

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

Check well Depth 90 ft - Monitor

ORIGINAL

No. 196545

County Belmont Township Wayne Section of Township 1

Owner Ward McCall Address Bellaire R.R.

Location of property 2½ Miles north of Bellaire on Rt 145

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 20

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion Oct. 3, 1958

BAILING OR PUMPING TEST

Pumping rate 1 G.P.M. Duration of test 4 hrs.

Drawdown ft. Date Oct 3

Developed capacity 1 G.P.M.

Static level—depth to water 30 ft.

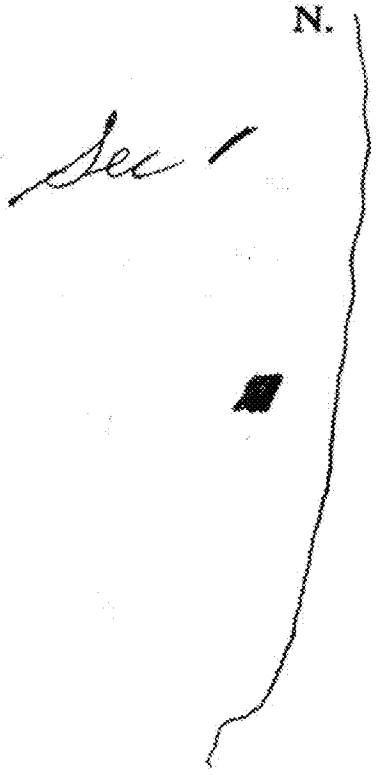
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
top soil	0 Feet	4 Ft.
Shale	4	15
Sand Rock	15	30
Gray shale	30	45
Red rock	45	50
blue Coal	50	55
Gray Shale	55	68
Red Rock	68	90
Fresh water	90	ff

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Lasuich Bros. Date Oct 3, 1958

Address 190 Bethesda St. Barnesville Ohio

Signed Lasuich Bros

ORIGINAL 20-25-8

35

AEC 18932

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio

PLEASE USE PENCIL OR TYPEWRITER. DO NOT USE INK.

2W-196
Check with map & locate with depth

No. 272576

County Belmont Township Wayne Section of Township 1

Owner Ezra Fowler Address Bellaire R.R. 1 O.

Location of property on Rt 145 north of Bellaire 1/4 mile

CONSTRUCTION DETAILS

Casing diameter 1 Length of casing 22

Type of screen Length of screen

Type of pump Jet

Capacity of pump

Depth of pump setting

Date of completion 4/14/64

BAILING OR PUMPING TEST

Pumping rate G.P.M. Duration of test hrs.

Drawdown ft. Date

Developed capacity 5 gal per min

Static level—depth to water 12 ft. ft.

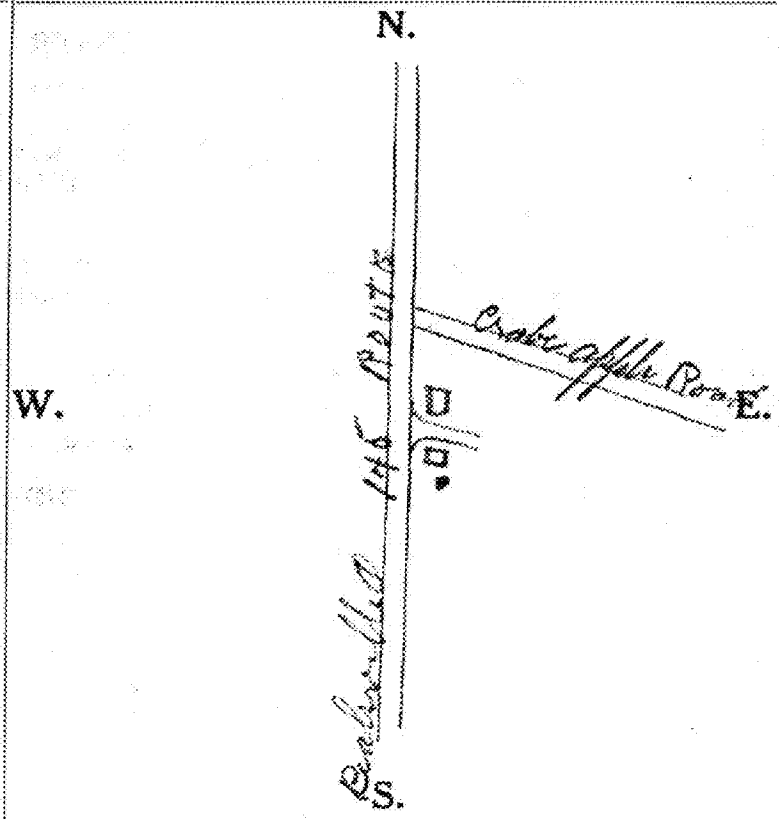
Pump installed by

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Loam	0 Feet	20 Ft.
Shale & Clay	24	75
Water 26-40 gpm		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm [illegible] Date 4/14/64

Address [illegible] Signed [illegible]

ORIGINAL 425-4

(36)

AEC 18933

WI LOG AND DRILLING R ORT

ORIGINAL

Check w-22

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 402984

County BELMONT Township WASHINGTON Section of Township

Owner ARNOLD WILES Address ALEDONIA

Location of property 5 MILES S.W. OF ALEDONIA

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 27'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 4-23-75

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 2 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water ft.

Quality (clear, cloudy, taste, odor)

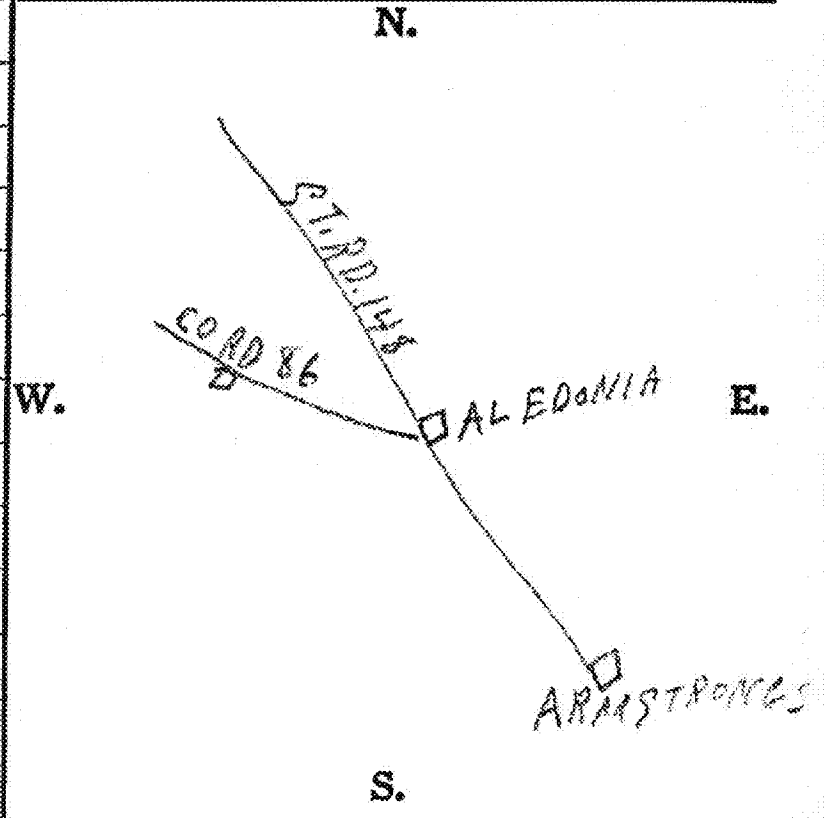
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
CLAY	0 Feet	8 Ft.
RED CLAY	8	14
DARK CLAY	14	20
SANDSTONE	20	22
GREY SHALE	22	33
LIMESTONE	33	35
GREYSHALE	35	75
WATER AT 45'		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm KRIECHBAUM DRILLING Date 4-2-75

Address JACOBSBURG OHIO Signed Lawrence Kriechbaum

*If additional space is needed to complete well log, use next consecutive numbered form.

20-25-8 (35)

AEC 18934

WE' LOG AND DRILLING RE RT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 413083

County Monroe Township Sunsbury Section of Township 6

Owner Roger Hoover Address 140 Ohio St Barnesville

Location of property Cherry Ridge Rennsville

CONSTRUCTION DETAILS

Casing diameter 2 Length of casing 21

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5-17-71

BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 4 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 36 ft.

Quality (clear, cloudy, taste, odor)

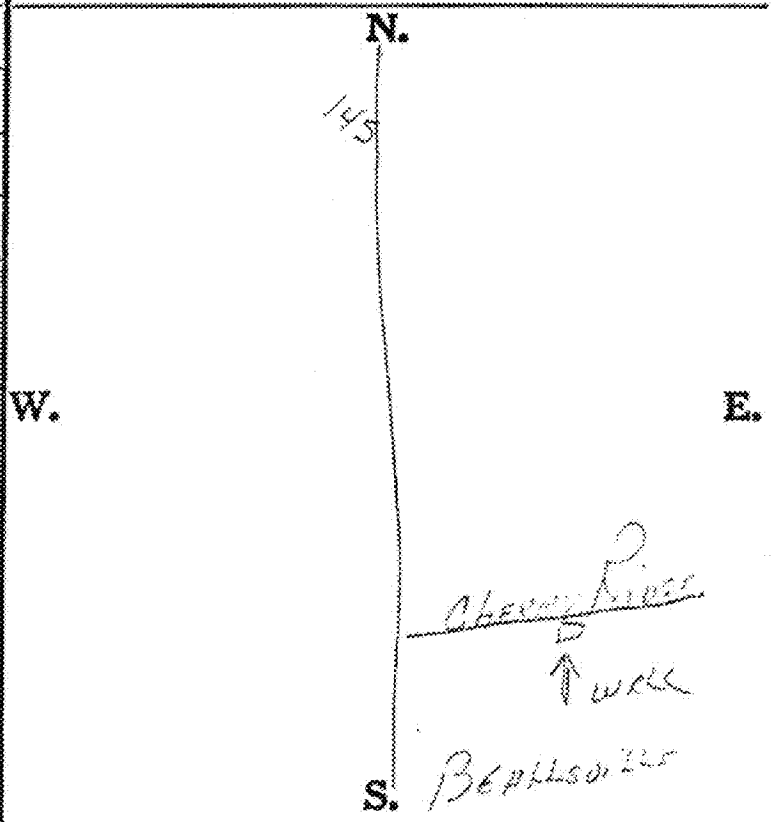
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Soil	0 Feet	1 Ft.
Sand Stone	1	37
Gray Shale	37	39
Lime Stone	39	85
Water 48		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm Billman Drilling Date 5-17-71

Address Woodsfield Signed [illegible]

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18935

WE[illegible] LOG AND DRILLING R[illegible]ORT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 413094

County Belmont Township ~~[illegible]~~ Wayne Section of Township 17

Owner Cyril Louden Address Sr Rt 145 Bellaire

Location of property On Sr Rt 145 North of Bellaire

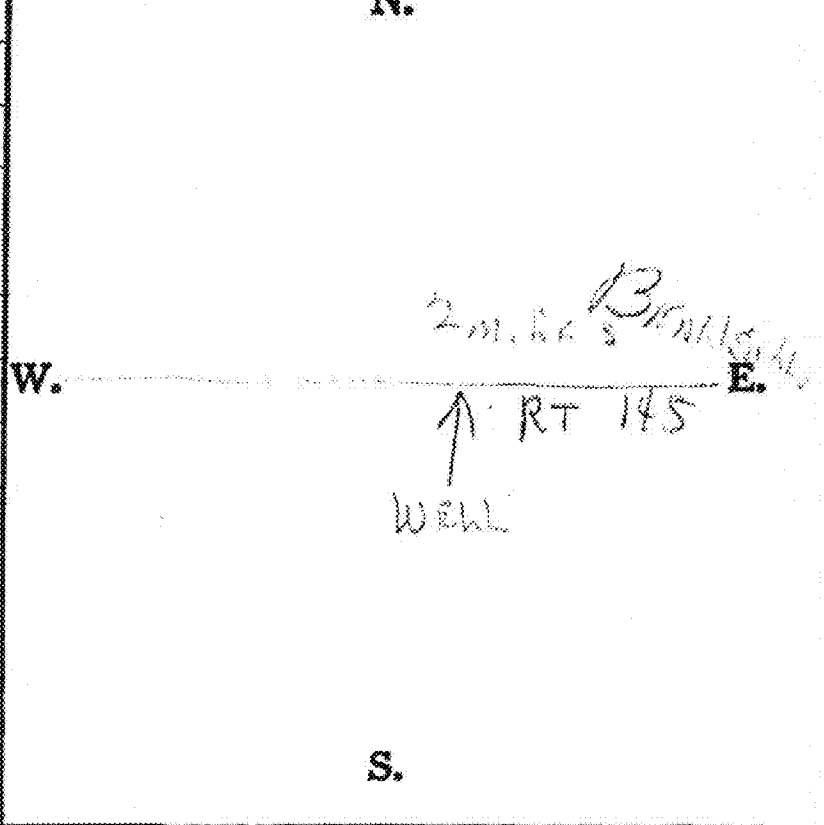
CONSTRUCTION DETAILS	BAILING OR PUMPING TEST (Specify one by circling)
Casing diameter 5 Length of casing 18	Test Rate 3 G.P.M. Duration of test ____ hrs.
Type of screen ____ Length of screen ____	Drawdown ____ ft. Date ____
Type of pump ____	Static level-depth to water 18 ft.
Capacity of pump ____	Quality (clear, cloudy, taste, odor) ____
Depth of pump setting ____	
Date of completion 7-1-71	Pump installed by ____

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Soil	0 Feet	1 Ft.
Sand Sand	1	19
Red Clay	19	20
WATER 20		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



Drilling Firm Billows Drilling Date 7-1-71

Address Wadsworth, Ohio Signed N. H. Billows

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18936

WE' 'LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER
DO NOT USE INK.

№ 326312

WC-161

County Belmont Township Washington Section of Township 19

Owner WILLIAM PIERCE Address BEALLISVILLE RD# 1

Location of property County Rd. of State Rt. 556

CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 18'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 1/2 G.P.M. Duration of test 1 hrs.

Drawdown 20' ft. Date 9-1-65

Static level-depth to water 12' ft.

Quality (clear, cloudy, taste, odor) Clear

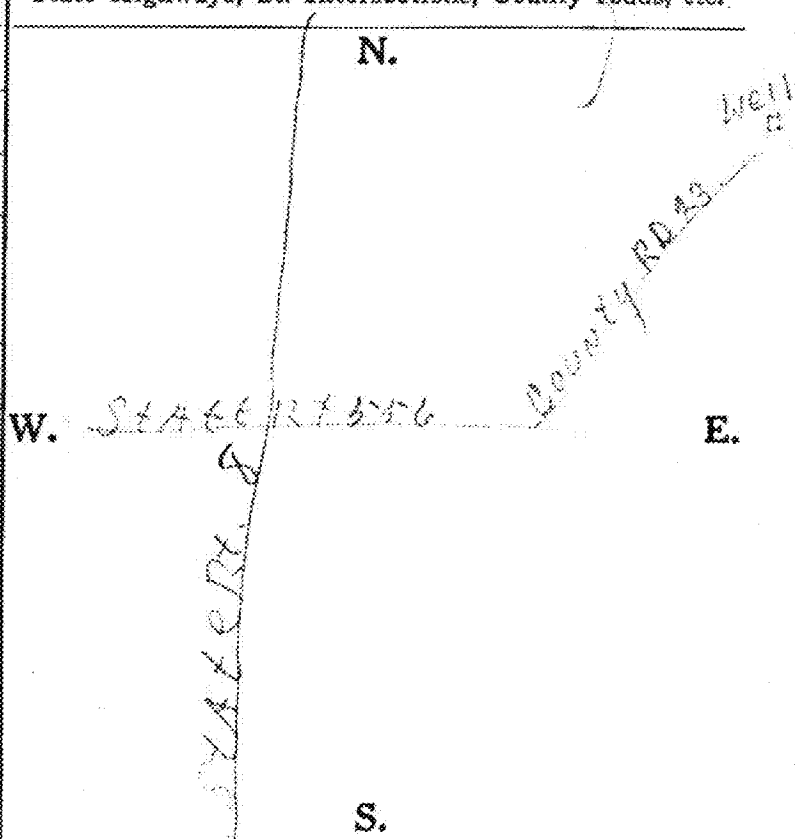
Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Rock & Clay	0	21
Shale Gray	21	26
Shale Red	26	33
Shale Gray	33	52
Rock	52	65
Shale & Rock	65	80
Water at	52'	

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Hogue Date

Address Rt #3 Wheeling Signed R. E. Hogue

ORIGINAL

72107

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 18937

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14C
(WELL/SPRING INVENTORY)

Applicant's Name - AMERICAN ENERGY CORPORATION D-0425-4

Well/Spring Identification Number		Name of Owner of Well/Spring	Surface Elevation of Well/Spring	Depth of Well in Feet Below Land Surface	Static Water Level in Feet Below Land Surface	Lithology of Supplying Aquifer/ Waterbearing Zone (see attch. 14B)	Known Uses of Well/Spring (if spring give discharge rate)
		(feet)	(feet)	(feet)	(feet)	(feet)	
S	1	R & C Mobley	1185	NA	NA	B	Unused
S	2	R & C Mobley	1185	NA	NA	B	Unused
S	3	F. Walker	1100	NA	NA	B	Unused
DS	145	J and M Ward	1120	NA	NA	B	Domestic
DS	414	N and D Moore	1140	NA	NA	B	L, See Attach. 14A
DS	442	M. Louden	1180	NA	NA	B	Domestic
WL	9	M and C Beckett	980	28	See Attach. 14A	A	L, Domestic
DW	10	M and C Beckett	980	30	See Attach. 14A	A	Unused
W	12	D. Taylor	976	36	See Attach. 14A	C	Unused
DW	13	D. Taylor	972	15	See Attach. 14A	A	Unused
DW	14	J. And T Edge	957	13	See Attach. 14A	A	Unused
W	16	R Thomas	1240	Unknown	Dry	Unknown	Unused
W	17	T and P Otto	1240	76	See Attach. 14A	B	Domestic
W	18	R and C Mobley	1262	104	See Attach. 14A	B	Unused
DW	19	R and C Mobley	1260	28	See Attach. 14A	A	Unused
W	22	C and K Brown	1060	51	See Attach. 14A	C	Domestic
W	23	C. Bondy	1040	60	Buried	C	Domestic
DW	35	Raven Rocks Inc.	1240	31	See Attach. 14A	A	Unused
W	36	Raven Rocks Inc.	1240	Buried	Buried	Unknown	Unused
W	85	D. Taylor	1000	41	See Attach. 14A	C	Domestic
DW	132	F. Rote	1044	9	See Attach. 14A	A	Unused
W	194	M and A Perkins	1220	90, R	Sealed	B	Domestic
W	196	G Louden	1240	130	Sealed	B	Domestic
W	197	R and C. Louden	1220	80	Sealed	B	Domestic
W	435	L and L. Boan	1070	65	Sealed	C	Domestic
W	436	T and T. Littleton	1020	65	30	C	Domestic
W	590	J and M Bondy	1080	85	57.5	C	Domestic
W	591	J and M Bondy	1065	82	72.5	C	Domestic
W	23A	C. Bondy	1040	NA	NA	Unknown	Unused
W	592	20 Buckhorn Club	1060	45, R	Dry	B	Domestic
W	593	B. Fisher	1160	Buried	Buried	Unknown	unused
DS	32*	Raven Rocks Inc.	1160	NA	NA	B	L, See Attach. 14A
DW	50*	F. Lucas	1141	16	See Attach. 14A	A	Domestic
DW	83*	Raven Rocks Inc.	1140	5	See Attach. 14A	A	Unused
W	583*	M. Meyer	1230	NA	NA	Unknown	Unused
W	11*	D. Taylor	976	25	See Attach. 14A	C	Domestic

L denotes well/spring is used for livestock
*denotes well/spring outside of the hydro boundary
R denotes a reported depth

ORIGINAL

0425-4

AEC 18938

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14D
(SURFACE WATER BODIES/PUBLIC WATER SUPPLIES)

Applicant's Name American Energy Corporation (D-0425-4)

Surface Water/ Public Supply Identification	Type of Surface Water/Public Supply	Name of Owner of Surface Water/ Public Supply	Known Uses of Surface Water/ Public Supply
U-21 to D-21	Intermittent	See Application Map	Livestock
U-22 to D-22	Intermittent	See Application Map	U22 - Unused D22 - Livestock
P-1	Pond	R. Thomas	Recreation
P-4	Pond	Raven Rocks	Recreational
P-5	Pond	Raven Rocks	Recreational
P-26	Pond	R&T Jarrett	Unused
P-57	Pond	J and M Ward	Recreation
P-58	Pond	J and M Ward	Recreation
P-59	Pond	G. Louden	Recreation
U1-01	Perennial	See Application Map	Livestock
U-1A/D-11	Intermittent	See Application Map	Livestock
U-2/Piney Creek Upper/ Piney Creek Lower	Perennial	See Application Map	Unused
U2-07	Intermittent	See Application Map	Livestock
U1A-02/U1A-01	Intermittent	See Application Map	Livestock
U1-11/U1-10/U1-08/U1-09/U1-01/U1-05/U1-06/U1-04/U1-12/U1-13	Intermittent	See Application Map	Livestock
U1-02	Perennial	See Application Map	Livestock
U1-02B/U1-02C/U1-02D	Intermittent	See Application Map	Unused
U-100	Intermittent	See Application Map	Unused
U1-01A/U1-01B/U-11C/U-11B	Intermittent	See Application Map	Unused
U1-07/U1-03/U-1/U1-02A/Crabapple Lower	Perennial	See Application Map	Livestock
D-P2/D-20/U2-07	Intermittent	See Application Map	Livestock
S-1/S-2/S-3	Intermittent	See Application Map	Unused

ORIGINAL

0425-4

AEC 18939

ADDENDUM TO ATTACHMENT 14C AND 14D
AEC - Century Mine D-0425-4

Ground Water / Surface Water Site Index

SITE ID		Location / Section	SITE ID		Location / Section
DS	145	NW QTR 1	P	4	NE QTR 1
DS	414	NW QTR 25	P	5	NE QTR 1
DS	442	SW QTR 1	P	26	SW QTR 1
WL	9	SE QTR 32	P	57	NW QTR 1
DW	10	SE QTR 32	P	58	NW QTR 1
W	12	SE QTR 32	P	59	SW QTR 1
DW	13	SE QTR 32	D	11	NE QTR 31
DW	14	SW QTR 26	D	21	NE QTR 7
W	16	NE QTR 1	D	22	NE QTR 7
W	17	NE QTR 1	U1	1	SW QTR 25
W	18	NE QTR 1	U1	2	SE QTR 31
DW	19	NE QTR 1	U1	3	SE QTR 31
W	22	NW QTR 31	U1	7	NE QTR 36
W	23	NW QTR 31	U1		NW QTR 25
W	23A	NW QTR 31	U	1A	NW QTR 31
DW	35	NE QTR 1	U2	7	SW QTR 1
W	36	NE QTR 1	U21		NE QTR 7
W	85	NW QTR 25	U22		NE QTR 7
DW	132	NE QTR 31	U1	02D	NE QTR 31
W	194	SW QTR 1	U1	02C	NE QTR 31
W	196	SW QTR 1	U1	02B	NE QTR 31
W	197	SW QTR 1	U1	01A	NE QTR 1
W	435	SE QTR 1	U1	01B	NE QTR 1
W	436	NW QTR 25	S	1	NE QTR 1
W	590	NW QTR 31	S	2	NE QTR 1
W	591	NW QTR 31	S	3	NE QTR 31
W	592	NW QTR 31	U	100	NW QTR 25
W	593	NW QTR 31	U1	02A	NE QTR 31
P	1	NE QTR 1			

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Addendum to Part 2, Page 18(D)(2)
American Energy Corporation
Century Mine

2001 RAINFALL (IN.)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1	0.00	0.01	0.00	0.11	0.00	1.50	1.51	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.06	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.44	0.00	
3	0.02	0.00	0.00	0.00	0.00	T	0.02	0.00	0.00	0.00	0.00	0.00	
4	0.04	T	0.75	0.00	0.00	0.00	0.28	T	0.00	0.00	0.00	0.02	
5	0.01	0.01	0.07	0.33	0.00	0.43	0.16	0.00	0.00	0.28	0.00	0.00	
6	0.01	0.05	0.01	0.75	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.15	
7	0.00	0.00	0.00	T	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	
8	0.01	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.09	0.35	
9	0.00	0.20	T	0.06	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	
10	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.03	0.04	0.00	0.00	0.00	
11	0.00	0.00	0.00	0.25	0.00	0.02	0.00	0.00	0.01	0.02	0.00	0.00	
12	0.00	0.00	0.35	0.00	0.86	0.00	0.00	2.28	0.00	0.50	0.00	0.00	
13	0.00	0.02	0.29	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00	
14	0.04	0.70	0.00	T	0.00	0.00	0.00	0.00	0.33	0.37	0.00	0.10	
15	T	0.15	0.15	0.59	0.48	0.00	0.00	0.00	0.00	0.01	0.00	0.13	
16	T	0.31	0.50	0.03	0.13	0.72	0.00	0.00	0.00	0.44	0.00	1.20	
17	T	0.00	0.05	0.00	0.14	0.00	0.57	0.00	0.00	0.00	0.00	0.38	
18	0.18	0.00	0.00	0.00	0.00	0.00	T	0.02	0.00	0.00	0.00	0.01	
19	0.00	T	0.00	0.00	0.44	0.00	0.00	0.03	0.02	0.00	0.00	0.01	
20	0.41	T	0.41	0.78	0.00	0.53	0.00	0.00	0.46	0.00	0.70	0.01	
21	0.00	0.00	0.94	0.14	0.74	0.20	0.00	0.00	0.02	0.00	0.00	0.00	
22	0.00	0.08	0.00	0.00	0.55	1.05	0.00	0.16	0.00	0.00	0.00	0.00	
23	0.00	0.00	0.19	0.01	0.13	0.00	0.00	0.05	T	0.65	0.00	0.20	
24	0.01	0.00	0.04	T	0.40	0.07	0.02	0.00	0.57	0.37	0.73	0.00	
25	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.02	0.00	0.00	0.01	
26	0.34	0.00	0.00	0.00	0.10	0.00	0.13	0.57	0.00	T	0.00	0.18	
27	T	0.00	0.00	0.03	0.05	0.00	0.00	0.00	T	0.00	0.90	0.00	
28	T	0.00	0.00	0.00	T	0.00	0.60	0.07	0.04	0.00	0.34	0.07	
29	0.51		0.06	0.00	0.07	0.31	0.06	0.00	0.00	0.00	0.38	0.00	
30	T		T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.19	
31	0.01		0.00		0.00		0.00	1.71		0.00		0.00	
TOTAL	1.60	1.59	3.81	3.96	4.37	5.97	3.85	6.51	1.51	2.64	3.70	3.01	42.52
H/L	L	L	H	H	H	H	L	H	L	H	H	H	

Rain gauge is read at 7:00 am for the prior day. H/L compares the monthly rainfall with the 50 year average for this area

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American Energy Corporation
Century Mine

2002 RAINFALL (IN.)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1	0.00	0.00	0.00										
2	0.00	0.00	0.60										
3	0.00	T	0.00										
4	0.00	T	0.00										
5	0.00	0.00	0.00										
6	0.96	0.00	0.00										
7	0.01	0.00	0.00										
8	0.00	0.00	0.09										
9	0.00	0.00	0.00										
10	0.11	0.69	0.00										
11	0.00	0.00	0.01										
12	0.04	T	T										
13	0.00	0.00	T										
14	0.05	0.00	0.00										
15	0.00	0.00	0.70										
16	0.00	0.03	0.14										
17	0.00	0.00	0.23										
18	0.00	0.00	0.00										
19	0.18	0.02	0.52										
20	T	0.44	0.00										
21	T	0.02											
22	0.00	0.00											
23	0.50	0.00											
24	0.03	0.00											
25	0.00	0.14											
26	0.00	0.11											
27	0.00	0.02											
28	0.00	0.00											
29	0.30												
30	0.39												
31	0.09												
TOTAL	2.26	1.47	2.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.02
H/L	L	L	L										

Rain gauge is read at 7:00 am for the prior day. H/L compares the monthly rainfall with the 50 year average for this area

AEC 189442

Probable Hydrologic Consequences

Prepared for American Energy Corporation By Moody and Associates

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AEC 18943

American Energy Corporation – Century Mine
Potential Hydrologic Consequences
Application Area D-0425-4

INTRODUCTION

Moody and Associates, Inc. (Moody's) has prepared this Potential Hydrologic Consequences (PHC) statement for the American Energy Corporation (AEC) - Century Mine Application Area D-0425-4. The Century Mine is located in Belmont County, Ohio. The PHC was prepared using information provided by AEC., published geologic reports and Moody's knowledge of other longwall coal mines in this area. In particular, Moody's prepared the PHC for the existing Century Mine permit area and has prepared seven PHC's for the Powhatan No. 6 Mine, which is north of the Century Mine. This application is for a room and pillar section. Less than 50 percent of the coal will be removed in this area. No subsidence of the surface will be associated with the room and pillar mining in this application area.

TOPOGRAPHIC SETTING

The Century Mine is located Belmont County in southeastern Ohio. The topography of the entire application area is typical of the Appalachian Plateau Province and is characterized by narrow rounded ridges and deep V shaped valleys dissecting the terrain, which is underlain by essentially horizontal sedimentary rocks. Topographic relief within the D-0425-4 Application Area is approximately 310 feet. The lowest surface elevation with in the application area is approximately 950 feet located where Crabapple Creek crosses the northern application area boundary. The highest surface elevation is 1260 feet located on the hilltops in the southeast section of the application area.

The surface drainage within the application area is to the north through Crabapple Creek and Piney Creek which are tributaries to Captina Creek

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Most of the developed water supplies in the application area are located along or near roads. The undeveloped areas away from the roads contain few developed water supplies. The water supplies are listed on ATTACHMENT 14C.

GEOLOGIC SETTING

A detailed discussion of the stratigraphic and structural setting of the application area is provided in the Geologic Section of this application. However, those properties of the geologic setting pertinent to ground water occurrence and movement are described here.

The bedrock units that outcrop in the application area belong to the Dunkard Group, which is Upper Pennsylvanian to Permian in age. The rocks consist of interbedded sandstone, siltstone, shale, mudstone, clay, fresh to brackish water limestone and coal. The Monongahela Formation (Pennsylvanian) underlies the Dunkard Group and consists of similar rock types. The Pittsburgh (No. 8) Coal Seam, which is the seam to be mined, marks the bottom of the Monongahela Formation. According to Mr. James M. Raab, a hydrogeologist with the Ohio Department of Natural Resources, in correspondence to Dave Bartsch of the Ohio Valley Coal Company dated January 30, 1989, water below 250 feet beneath the stream bottoms is brackish (personal communication).

Based on corehole data presented in other parts of this application, "soft" rocks constitute an average of 65 percent of the rock column in the D-0425-4 Application Area. Soft rocks are defined here as shale, mudstone, claystone, sandy shale and clay. The relatively high percentage of soft rocks is significant as these units have limited primary permeability, tend to deform in a more plastic manner and are more prone to self-healing after fracturing. Aquifers in these units normally have low yields and are less susceptible to subsidence fracturing due to mining. Fractures tend to close in response to lithostatic pressures or plug with fine-grained sediment and may contain clays that swell when wetted.

In addition, there is considerable horizontal and vertical variability of the rock units. Rapid facies and hydrologic property changes tend to limit the horizontal continuity of the individual rock units. With the exception of major coal seams, very few lithologic units are continuous across the proposed application area. Horizontal facies changes and corresponding changes in hydrologic properties of the rocks tend to

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enhance the importance of localized flow systems. In addition, most available ground water in this region is limited to the first 100 feet of the surface where enhanced secondary permeability associated with rock fracturing is present. The records from the developed wells within the application area support this. The majority of the developed wells in the application area are less than 100 feet. (See ATTACHMENT 14C for well depths) Ground water recharge in the upland or ridge top areas results in downward migration primarily within this shallow saturated zone. Because the topographic relief between ridge tops often exceeds 100 feet, there are localized flow systems under the hilltops that are not in hydrologic communication with adjacent hilltops. While the ground water under any given ridge top can be viewed as being continuous, the continuity generally does not extend to adjacent hilltops.

The geologic structures in the application area consist of gently folded rocks that dip to the southeast at approximately 30 feet per mile. Overburden thickness above the Pittsburgh Coal seam ranges from a low of approximately 270 feet along the bottom of the Crabapple Creek valley to 560 feet under the hilltop in the southeast section of the application area. While geologic structure can influence regional ground water flow patterns, local variations in hydraulic properties of the rocks tend to accentuate localized flow systems.

GENERAL HYDROLOGIC SETTING

The source of all ground and surface water in the mine plan area is precipitation. Upon reaching the land surface, water that is not part of direct surface runoff or evapotranspiration infiltrates into the subsurface and contributes to soil moisture and ground water.

Within the bedrock aquifer system, ground water occurs in primary and secondary openings. Primary openings are pore spaces between sand, silt and clay grains formed at the time of sediment depositions. Primary permeability is the ability of water to move between pore spaces. In this area, primary permeability is very low and limited ground water movement occurs in hard or soft rocks as a result of primary openings (Stoner 1983, Siplivy 1992).

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Fractures or partings in the rock mass form secondary porosity and permeability. Most available ground water in the application area occurs within the first 100 feet below the surface within these secondary openings. The success of a water well in terms of yield potential is dependent upon the well encountering water filled fracture zone(s) that transmit enough water to the well bore to meet the well's intended use (Schmitt et al, 1983; Waite, 1987).

Fractures are not ubiquitous in the area, however, and are not interconnected over large areas. For these reasons, it is very difficult to identify aquifers over large areas and the ground water flow system tends to be made up of small localized fracture controlled systems. While fractures in hard rocks tend to stay open better than fractures in soft rock, the horizontal and vertical variability of even the hard rock units tend to produce hydraulically isolated areas. In addition, fractures tend to close at increasing depths due to overlying lithostatic pressures, thereby limiting the effective depth of the ground water flow system (Stoner, 1983).

Based on an evaluation of the geologic units presently supplying water to wells or springs in the Application Area, a total of three aquifers have been identified within the D-0425-4 hydrologic boundary. These units, which are also outlined on ATTACHMENT 14B of this application, are summarized below:

Aquifer A: Unconsolidated Material

Includes the layer of soil and weathered bedrock above solid bedrock.

Aquifer B: Washington No. 12 Cyclothem

Includes the rock sequence from the Washington Coal Seam to the surface of the consolidated bedrock. Occurs from approximately 350 feet to 500 feet above the No. 8 Pittsburgh Coal Seam.

Aquifer C: Waynesburg No. 11 Cyclothem

Includes the rock sequence from the Waynesburg No. 11 Coal Seam to the Washington No. 12 Coal Seam. Occurs from approximately 250 feet to 350 feet above the No. 8 Pittsburgh Coal Seam.

These units are only recognized as aquifers where they occur within 100 feet of the surface where secondary porosity and permeability is greatest.

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Allison Mine

The abandoned Allison Mine is located northeast of the application area. Part of the Allison Mine is in the Century Mine application area. The Century Mine utilized part of the old Allison Mine works. The old slope entry for the Allison Mine was used as the entry to the Century Mine. Unused sections of the Allison Mine were sealed off when the Century Mine was developed. The lowest coal elevation with in the Allison Mine is 685 feet and the highest coal elevation is 730 feet. The lowest surface elevation over the Allison Mine is 860 feet. The highest coal elevation within in the combined Century Mine application area and Allison Mine is 805 feet. The Century Mine is not expected to have any post mining breakouts through the old Allison Mine works.

The water supply inventory completed for the Century Mine, identified a number of existing water supply wells and springs located over the old Allison Mine works. The water supplies are utilized as private water sources. The presences of these water supplies indicate that room and pillar mining at the Allison Mine has not had a significant long term impact. The water supplies which were identified over the Allison Mine are as follows : DS -1, DS-5, DS-6, DS-16, DS-70, WL-5, DW-8, W-45, DW-46, W-49, W-67, W-125, DW-126 and W-127. The Attachment 14A's for these supplies were previously submitted with the D-0425-1 permit application.

WATER SUPPLIES

All water supplies, both used and unused, within the application area have been inventoried and are shown in ATTACHMENT 14C. Similar overburden, lithologic, and topographic settings are associated with the springs. Most of the inventoried springs occur as hillside seeps. This is a common phenomenon in this hydrogeologic setting and it reflects the presence of low permeability units that act as aquitards and promotes horizontal flow of groundwater to the side of the hills.

PROBABLE HYDROLOGIC CONSEQUENCES

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The mining in Application Area D-0425-4 will be entry development. No subsidence is expected to occur in this area as a result of the room and pillar mining. Also, the overburden thickness between the coal seam and the lowest utilized aquifer (Aquifer C) is 250 feet. Due to the lack of subsidence and thickness of the overburden, no impacts to the overlying aquifers or water supplies are expected to occur.

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D. (3) Based on the data listed on Attachment 14A, and other information submitted with this application, identify the seasonal variations in water quality and quantity for the streams identified in Part 2, D(2).

SEE ATTACHMENT 14A, ADDENDA, PHC

E. HYDROLOGIC DETERMINATION -**Permit, Shadow Area, and Adjacent Area**

Based on the information submitted in response to items B, C, and D in this part of the permit application, submit an addendum describing the probable hydrologic consequences of this proposed underground mining operation on the hydrologic regime of the proposed permit area, shadow area, and adjacent area. The description shall include findings on each of the following items:

(1) The consequences of the proposed operation on the contents of total suspended and dissolved solids, total iron, total manganese, acidity, and pH;

(2) Whether adverse impacts may occur to the hydrologic balance; and

(3) The impact the proposed operation will have on:

(a) sediment yield from the disturbed area, flooding and stream flow alteration or diminution, ground water and surface water availability.

SEE ADDENDA TO PART 2, PAGE 18, ITEM E

F. ALTERNATIVE WATER SUPPLY INFORMATION -**Permit, Shadow Area, and Adjacent Area**

(1) Based on the response in Part 2, Item E, submit an addendum identifying the extent to which the proposed coal mining activities may proximately result in contamination, diminution, or interruption of an underground or surface source of water within the proposed permit area, shadow area, and adjacent area that is used for domestic, agricultural, industrial, or other legitimate use.

SEE ADDENDUM TO PART 2, PAGE 18, F(1)

(2) If contamination, diminution, or interruption may result, submit an addendum identifying the alternative sources of water supply that could be developed to replace the existing sources including information on water availability and suitability of alternative sources for existing pre-mining uses and postmining land use.

SEE ADDENDUM TO PART 2, PAGE 18, F(2)

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ADDENDUM TO PAGE 18, PART 2, E
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

HYDROLOGIC DETERMINATION

Based on the information submitted in this application, the enclosed probable hydrologic consequences may be expected. With partial extraction mining, no impacts are expected on ground or surface water. The quality of the ground and surface water in the application area is not expected to change as a result of the proposed mining activities.

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ADDENDUM TO PART 2, PAGE 18, F(1)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

DEVELOPED SUPPLIES OF GROUND AND SURFACE WATER THAT MAY BE IMPACTED AS A RESULT OF THE PROPOSED OPERATION

Of the supplies listed in Attachment 14C and 14D, no impacts to any water supply are expected as a result of the proposed operation. According to the PHC, these sources will not be impacted.

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CENTURY MINE
PERMIT D-0425

ALTERNATIVE WATER SUPPLY INFORMATION

Adjacent Areas Above Partial Recovery Mining

The PHC contained in this application indicate a low potential for diminution and/or interruption of ground water supplies in areas above and contiguous to partial recovery mining operations. No contamination of such water supplies is expected. In the highly unlikely event that a utilized source is disrupted or contaminated, the following plan will be implemented.

Notwithstanding its mining rights and without waiving any of its mining rights, where such diminution or interruption results from its mining, AMERICAN ENERGY CORPORATION (AEC) will repair or install a replacement source in the adjacent area at its own expense in a manner mutually satisfactory to AMERICAN ENERGY CORPORATION, the water user, and the Division of Mineral Resources Management, and to a level sufficient to meet the water user's pre-mining quantity and quality levels which will be determined by monitoring information gathered in accordance with the Monitoring Plan.

The steps which AMERICAN ENERGY CORPORATION would take to repair or replace affected water sources in the adjacent area include:

1. Repair damaged cisterns after AMERICAN ENERGY CORPORATION has determined that damage is complete;

2. On a site-specific basis, re-drill existing wells, drill new wells, or connect the water user to public water supplies (if no public water supply exists, AMERICAN ENERGY CORPORATION may install a line of sufficient size to service those affected by AEC's mining operation);

3. On a site specific basis, developed springs will be replaced by a farm pond built according to accepted engineering practices, drilling of a new well, development of another spring in close proximity to the original spring, or connect the water user to public water supplies (if no public water supply exists, AEC may install a line of sufficient size to service those affected by AEC's mining operation);

4. Repair damaged farm ponds so as to be comparable to their pre-mining conditions;

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5. Install an interim water supply until affected water supplies are replaced. Interim supplies may include hauled water or a tap to public water. AMERICAN ENERGY CORPORATION will only install temporary, replacement water using a public water supply if it can be connected within 48 hours. AMERICAN ENERGY CORPORATION will use the local fire department to haul county water for temporary replacement supplies. The local fire department can haul water within a matter of hours after receiving a request. Temporary tanks and water troughs for livestock are kept in stock to facilitate quick installations.

6. Such other proven, cost effective, and reasonable techniques as AMERICAN ENERGY CORPORATION may now, or in the future, deem appropriate.

It is AEC's intention to bear the cost of the installation of both interim and permanent replacement of developed water sources being used at the time of undermining. A temporary inactive supply undergoing repair or maintenance, or used as a backup supply is considered a used supply. If contamination, diminution, or interruption of a water user's ground or surface water supply used for domestic use occurs as a proximate result of the mine's operation, AMERICAN ENERGY CORPORATION will repair such water supply or install a replacement supply at AEC's expense. AMERICAN ENERGY CORPORATION will not be responsible for non-developed sources or developed sources not being used at the time of undermining. A source is considered to be developed if it has been fully developed (i.e., water delivery system and drinking facilities) and is well maintained such that it is usable at the time of undermining.

AMERICAN ENERGY CORPORATION will install, at AMERICAN ENERGY CORPORATION's expense, an alternate water supply system (within 48 hours) to be used until repair or replacement is completed or will reimburse the water user for the reasonable cost of obtaining a water supply from the date of any such contamination, diminution, or interruption until the supply is repaired or replaced. In cases where temporary water cannot be provided within 48 hours, AMERICAN ENERGY CORPORATION will immediately notify the Chief of the Division of Mineral Resources Management who will determine if the circumstances warrant an extension of the 48 hours.

AMERICAN ENERGY CORPORATION will provide the affected water user with no less of an available water supply than the water user had before mining, based on the pre-mining measurements. If required, AMERICAN ENERGY CORPORATION will notify the Division of Mineral Resources Management immediately after it has been informed of the loss of developed water (ground or surface water) due to its mining activities.

As previously stated, the elevation of alternative water sources is unpredictable until the water system in the area again attains equilibrium after mining. Therefore, the alternative water supplies to be developed will be identified when the need arises.

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Those supplies may include but not be limited to re-development of an existing well, spring, or pond, or replacement of the source with the County Water System. The County Water System has been contacted by AMERICAN ENERGY CORPORATION and has assured us that there is capacity to replace each developed source with county water. A letter to that effect is enclosed.

If a water user believes that his or her underground or surface water source which is used for domestic use has been contaminated, diminished, or interrupted as a proximate result of the mine's operation, he or she should notify AMERICAN ENERGY CORPORATION by calling (740) 926-9152. AMERICAN ENERGY CORPORATION will make a determination of liability no later than sixty (60) days after notification of the contamination, diminution, or interruption of a water supply as a proximate result of the mine's operation.

Work on installing a temporary alternate water supply will be complete within 48 hours (unless an extension of the 48 hour time frame is granted by the Chief) after AEC learns of the contamination, diminution, or interruption to a domestic-use water supply proximately caused by the mining operation. AMERICAN ENERGY CORPORATION will pay for installation costs only for a temporary, alternate water supply. Permanent repair or the installation of a replacement water supply for an affected water supply shall be completed no later than eighteen (18) months after it has been determined that the supply has been contaminated, diminished, or interrupted as a proximate result of the mine's operation. The costs of repair of the original water supply and/or the installation of a replacement supply system to provide the affected water user with no less of an available water supply than was being used before mining, based on the pre-mining measurements, shall be paid for by AMERICAN ENERGY CORPORATION. If the water user opts to do so, he may install his own temporary water supply system. AMERICAN ENERGY CORPORATION will reimburse the water user for the costs of installing a temporary water supply system. Payment for domestic water will be the responsibility of the water user unless otherwise agreed upon by AEC and the water user.

In repairing or replacing a water user's ground or surface water supply system used for domestic use which is damaged as a proximate result of the mine's operation, AMERICAN ENERGY CORPORATION's first preference is to repair the affected supply system. If that is neither effective nor feasible, AMERICAN ENERGY CORPORATION's second preference is to replace the affected supply system with a like supply system. For example, a damaged pond, if not repairable, would be replaced with a new pond. If that is not feasible, AMERICAN ENERGY CORPORATION will replace the affected supply system with a similar supply system. For example, a damaged dug well, if not repairable or replaceable with another dug well, would be replaced by a potable-type cistern, a drilled well or a similar supply system.

It should be recognized that property sites differ in such elements as geologic and hydrologic composition. Thus, the determination of whether repair of an affected water supply system is feasible or whether replacement by a specific type of water supply system is feasible must be made on a case-by-case, site-specific basis by AMERICAN ENERGY CORPORATION. AMERICAN ENERGY CORPORATION, in the past, has always attempted to consult and negotiate with the

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affected water user concerning the selection of the type of water replacement system and its site. This is done at the request of water users who prefer this procedure to that of AMERICAN ENERGY CORPORATION making unilateral decisions about replacement supplies and sites. However, AMERICAN ENERGY CORPORATION if required by the Division of Mineral Resources Management, will make these decisions unilaterally.

In some cases, AMERICAN ENERGY CORPORATION reaches pre-subsidence agreements with water users, who are normally represented by counsel and in all cases, have full opportunity to consult with counsel or anyone else of their choosing. These agreements, which are typically negotiated by AMERICAN ENERGY CORPORATION employees, normally cover all potential damage claims. In situations where such an agreement is reached, AMERICAN ENERGY CORPORATION will comply with the water replacement terms contained in the agreement. Such an agreement will satisfy, at a minimum, this permit and ORC 1513.162.

In any situation where AMERICAN ENERGY CORPORATION determines that the contamination, diminution, or interruption of a water supply was not proximately caused by the mining operation, based on evidence such as the proximity of the supply to the mining operation, site specific geologic and surface conditions, or climatological conditions, AMERICAN ENERGY CORPORATION will provide the Division of Mineral Resources Management with notice of its determination and the proof in support of that determination to allow the Division of Mineral Resources Management to issue a Chief's Order deciding the issue. This Chief's Order is then appealable in accordance with O.R.C. §1513.13. The water user's water supply system will continue in operation during the time AMERICAN ENERGY CORPORATION seeks review of this matter pursuant to O.R.C. §1513.13. If it is determined that contamination, diminution, or interruption of a supply is the proximate result of the mine's operation, AMERICAN ENERGY CORPORATION shall bear the costs of installing temporary water system. AMERICAN ENERGY CORPORATION reserves the right to proceed against the water user to recover costs incurred if it is determined that AMERICAN ENERGY CORPORATION is not liable for the contamination, diminution, or interruption of the affected water supply.

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Village of Barnesville

An Equal Opportunity Employer

Administrator's Office

126 East Church Street
Barnesville, Ohio 43713

Phone: (740) 425-1880
Fax: (740) 425-3673

April 22, 2002

American Energy Corporation
Attn: Melanie Homan
4352 Mayhugh Hill Road
Beallsville, OH 73716

Dear Ms. Homan:

The Village of Barnesville sells water to the Switzerland of Ohio Water District. Our new water plant is scheduled to be completed in July, 2002. This will increase our finished water capacity from 1.0 MGD to 1.7 MGD. At that time, we will be able to increase Switzerland of Ohio Water District's capacity substantially.

We do not see any problem with Switzerland of Ohio Water District providing service to the customers described in your letter.

If you have any questions, please feel free to call.

Sincerely,

Bill Morgan, Administrator
Village of Barnesville

BM/rh

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G. LAND USE INFORMATION - **Permit Area**

(1) Describe the uses of the land within the proposed permit area existing at the time of the filing of this permit application and provide a map which delineates the area of each land use.

N/A, NO PERMIT AREA

(2) Was the land use described in item G(1) above changed within five years before the anticipated date of beginning this proposed mining operation? Yes, No. If yes, submit an addendum describing the historic use of the land.

N/A, NO PERMIT AREA

(3) Analyze the capability of the land within the proposed permit area before any mining to support a variety of uses, giving consideration to soil and foundation characteristics, topography, vegetative cover, and hydrology of the proposed permit area.

N/A, NO PERMIT AREA

(4) Analyze the productivity of the land within the proposed permit area before any mining to include average yields obtained under high level of management.

N/A, NO PERMIT AREA

(5) Is any land within the proposed permit area classified as prime farmland? _____ Yes, _____ No.

N/A, NO PERMIT AREA

(6) Submit an addendum describing the use of the land within the permit area, including the creation of permanent water impoundments, that is proposed to be made of the land following reclamation, including information regarding the utility and capacity of the reclaimed land to support a variety of alternative uses.

N/A, NO PERMIT AREA

(7) Are there existing land use classifications under local law of the proposed permit area? _____ Yes, _____ No. If yes, describe the land use classification and submit as an addendum to the permit application, the comments of the governmental agency which would have to initiate, implement, approve or authorize the proposed use of the land following reclamation. If no, describe the sources of information on which the determination was made.

N/A, NO PERMIT AREA

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G. (8) Submit as an addendum a copy of the comments from the legal or equitable owner of record of the surface of the proposed permit area concerning the proposed land use.

N/A, NO PERMIT AREA

(9) Describe the consideration which has been given to making all of the proposed coal mining activities consistent with surface owner plans and applicable state and local land use plans and programs.

N/A, NO PERMIT AREA

(10) Describe how the proposed land use is to be achieved and the necessary support activities that may be needed to achieve the proposed land use.

N/A, NO PERMIT AREA

(11) Is the postmining land use to be different from the premining land use? _____ Yes, _____ No. If yes, submit as an addendum to the permit application, the plans and findings required by paragraph (D) of rule 1501:13-9-7 of the Administrative Code.

N/A, NO PERMIT AREA

(12) Has the proposed permit area been previously mined?_____ Yes,_____ No. If yes, provide the following information, if available.

(a) Type of mining method
(b) Coal seam mined
(c) Non coal mineral mined
(d) Extent of mining (acres)
(e) Approximate dates
(f) Land use preceding mining

N/A, NO PERMIT AREA

H. PRIME FARMLAND INVESTIGATION-**Permit Area**

(1) Does the proposed permit area include any land that is prime farmland, taking into consideration the negative determinations listed in paragraph (L)(2) of rule 1501:13-4-13 of the Administrative Code?
Yes, No.

N/A, NO PERMIT AREA

(2) If the response to item H. (1) is yes, submit Attachment 15.

(3) If the response to item H. (1) is no, submit Attachment 16.

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PART 3 RECLAMATION AND OPERATIONS PLAN

A. GENERAL REQUIREMENTS-**Permit Area** (Items A. (1) and A. (2) - **Permit and Underground Workings)**

Submit an addendum describing the type and method of coal mining procedures for this application. Explain how these procedures will maximize the use and conservation of the coal resources.

SEE ADDENDUM TO PART 3, PAGE 21, ITEM A(1)

(2) Indicate the anticipated annual and total production of coal from this proposed operation.

Annual **325,500 TONS PER YEAR** Total **651,000 TONS**

(3) Will this operation be combined with surface coal mining activities to the extent that contemporaneous reclamation of areas disturbed by surface mining will be delayed or such that the underground workings will be within 500 feet of the surface mining activities? Yes, No. If yes, submit Attachment 30.

N/A, NO PERMIT AREA

(4) Are experimental mining practices to be employed in the proposed mining operations? Yes, No. If yes, submit as an addendum to the permit application, the description, maps, and plans required by paragraph (B) of rule 1501:13-4-12 of the Administrative Code.

N/A, NO PERMIT AREA

(5) Are mountaintop removal mining practices to be employed in the proposed mining operations? Yes, No. If yes, submit as an addendum to the permit application the information required by paragraph (C) of rule 1501:13-4-12 of the Administrative Code.

N/A, NO PERMIT AREA

(6) Are the natural pre-mining slopes within the permit area in excess of twenty (20) degrees? Yes, No. If yes, submit an addendum demonstrating compliance with the steep slope mining provisions of paragraph (D) of rule 1501:13-4-12 and 1501:13-13-05 of the Administrative Code.

N/A, NO PERMIT AREA

(7) Is augering proposed within the permit area? Yes, No. If yes, submit Attachment 18.

N/A, NO PERMIT AREA

(8) Are variances from approximate original contour to be employed for the proposed underground mining surface operations? Yes, No. If yes, submit an addendum to the permit application demonstrating compliance with paragraph (E) and/or (K) of rule 1501:13-4-12 of the Administrative Code.

N/A, NO PERMIT AREA

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ADDENDUM TO PART 3, PAGE 21, A(1)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

MINING METHODS

This application area will be mined by partial coal recovery methods. Pillars will be sized sufficiently to maintain a high safety factor for long-term standup of the pillars. See addendum to Page 29, K(4).

The areas in this application are proposed as development for full-recovery mining equipment to be used in the future.

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A. (9) Will access to the underground workings be gained through a drift entry _____ Yes, X No. If yes, provide as an addendum sufficient information to determine the location of the entry relative to the highest elevation of the coal reserve. Is the drift entry located so as to eliminate the potential for a gravity discharge? _____ Yes, _____ No. If no, the applicant must demonstrate that the coal seam is not acid or iron producing. Provide an analysis of the strata immediately above and below the coal, and the coal seam itself, sufficient to demonstrate that the water quality from the entry will meet effluent limitations without treatment.

(10) For entries to underground workings other than drift entries, provide as an addendum sufficient information to determine the location of the entry relative to the coal reserve. Are the entries located so as to eliminate the potential for a gravity discharge?
X Yes, _____ No. If no, provide the following demonstration:

(a) the gravity discharge will meet effluent limitations without treatment, or

(b) the water will be treated to meet effluent limitations and provisions will be made for consistent limitations of the treatment facility throughout the anticipated period of gravity discharge.

(11) Will the permanent entry seals be designed to withstand the maximum anticipated hydraulic head when the operations are abandoned? _____ Yes, _____ No. If yes, submit the appropriate information demonstrating that this will be accomplished. If no, provide a typical plan for the seals to be used to close the mine entries pursuant to applicable state and federal regulations.

N/A, NO PERMIT AREA

(12) Submit an addendum describing the construction, modification, maintenance, and removal (unless to be retained for postmining land use), including the proposed engineering techniques and major equipment to be used, of the following facilities:

(a) dams, embankments, and other impoundments. Do any of the plans for water, sediment or slurry impoundments meet the requirements of 30 CFR 77.216? _____ Yes, _____ No. If yes, submit as an addendum a plan that addresses each of the requirements in 30 CFR 77.216-2.

N/A, NO PERMIT AREA

(b) overburden and topsoil handling and storage areas and structures.

N/A, NO PERMIT AREA

ADDENDUM TO PART 3, PAGE 22, A(10)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

LOCATION OF ENTRY RELATIVE TO THE COAL RESERVE

The slope entry is located at a surface elevation of 948 feet. The bottom of the shaft is located at 703 feet. The shaft entry is located at an elevation of 948 feet, with a bottom elevation of 710 feet. The highest point in the coalmine has an elevation 800 feet (from application D-0425-1).

The entry to the coal mine is located in the original D-0425 permit area, located in Section 3, Wayne Township, Belmont County, Ohio.

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A. (12) (c) coal removal, handling, storage, cleaning, and transportation areas and structures; including, but not limited to, preparation plants, beltlines, tipples, rail sidings, and primary roads. For roads, conveyors and rail systems, submit an addendum describing the information required pursuant to paragraph (L) of rule 1501:13-4-14 and 1501:13-10-01 of the Administrative Code.

N/A, NO PERMIT AREA

(d) spoil removal, handling, storage, transportation, and disposal areas and structures, including underground development waste or excess spoil disposal sites. If underground development waste or excess spoil is to be generated, submit an addendum describing the information required by paragraph (O) and (P) of rule 1501:13-4-14 and 1501:13-9-07 of the Administrative Code.

N/A, NO PERMIT AREA

(e) mine facilities such as portal/shaft development, boreholes, de-gas holes, vents, office or shop buildings and maintenance facilities.

N/A, NO PERMIT AREA

(f) water and air pollution control facilities.

N/A, NO PERMIT AREA

(13) Provide an estimate of the cost per acre to reclaim the permit area.

N/A, NO PERMIT AREA

(14) Will the proposed operation include any of the following:

N/A, NO PERMIT AREA

(a) disposal of coal mine waste from a wash plant, tipple, or other source? _____ Yes, _____ No. If yes, submit Attachment 28 and, if applicable, the information required by paragraph (H) of rule 1501:13-4-14 of the Administrative Code.

(b) disposal of fly ash or other noncoal wastes? Yes, _____ No. If yes, submit an addendum which addresses the disposal material and a detailed disposal plan, pursuant to paragraph (E) of rule 1501:13-9-09 of the Administrative Code.

(c) return of slurry or other mine waste or material into the abandoned underground workings? _____Yes, _____ No. If yes, comply with provisions contained in paragraph (N) of rule 1501:13-4-14 and paragraph (Q) of 1501:13-9-04 of the Administrative Code, and submit copies of the required MSHA approvals as an addendum.

B. <u>EXISTING STRUCTURES-**Permit Area**</u>

(1) Are any existing structures proposed to be used in connection with or to facilitate the coal mining and reclamation operation? _____ Yes, ____ No. If yes, submit as an addendum to the permit application a description of each structure. The description shall include the information required by paragraph (B)(1) of rule 1501:13-4-14 of the Administrative Code.

N/A, NO PERMIT AREA

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B. (2) Are any existing structures proposed to be modified or reconstructed for use in connection with or to facilitate the coal mining and reclamation operation? _____ Yes, _____ No. If "yes", submit as an addendum to the permit application, a compliance plan for each structure. The plan shall include the information required by paragraph (B)(2) of rule 1501:13-4-14 of the Administrative Code.

N/A, NO PERMIT AREA

C. BLASTING-**Permit Area**

Will blasting occur within 25 feet of the surface during shaft and portal development or other on-site development?

_____ Yes, _____ No. If yes, submit Attachment 29.

N/A, NO PERMIT AREA

D. RECLAMATION PLAN - GENERAL REQUIREMENTS-**Permit Area** (Item D.12) -**Permit, Shadow, and Adjacent Area**)

(1) Provide a detailed timetable for the completion of backfilling and grading for each mining year.

N/A

(2) Provide a detailed timetable for completion of resoiling for each year.

N/A

(3) Provide a detailed timetable for completion of planting for each mining year.

N/A

(4) Describe the plan for backfilling, compacting and grading of the disturbed permit area, including the disposal of all mine generated debris.

N/A

(5) Submit an addendum describing the plan for the removal, storage, redistribution and stabilization of topsoil, subsoil, or approved alternative resoiling material to meet the requirements of rule 1501:13-9-03 of the Administrative Code. If an alternative resoiling material is to be used, submit Attachment 19.

N/A

(6) Provide the following information for the revegetation plan:

(a) Schedule for revegetation to include planting of temporary vegetation.

N/A

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D. (6) (b) List the species and amounts per acre of seeds and seedlings to be used.

N/A, NO PERMIT AREA

(c) Describe the methods to be used in planting and seeding.

N/A, NO PERMIT AREA

(d) Describe the mulching techniques.

N/A, NO PERMIT AREA

(7) Describe the soil testing plan for evaluation of the results of topsoil handling and reclamation procedures related to revegetation.

N/A, NO PERMIT AREA

(8) Submit an addendum describing the measures to be employed to handle and place acid or toxic-forming materials in accordance with paragraph (J) of rule 1501:13-9-04 and paragraph (J) of rule 1501:13-9-14 of the Administrative Code.

N/A, NO PERMIT AREA

(9) Describe the measures, including appropriate cross sections and maps, to be used to plug, case or manage mine openings or bore holes other than those entries utilized to gain access to the underground workings, pursuant to rule 1501:13-9-02 of the Administrative Code.

N/A, NO PERMIT AREA

(10) Is the reclamation plan consistent with local physical, environmental, and climatological conditions?

_____ Yes, _____ No.

N/A, NO PERMIT AREA

(11) Identify any other applicable air and water quality laws and regulations and health and safety standards and describe the steps to be taken to comply with each.

N/A, NO PERMIT AREA

(12) Submit an addendum describing the plan for minimizing to the extent possible and using the best technology currently available, disturbances and adverse impacts of the operation on fish and wildlife and related environmental values and achieving enhancement of such resources where practical for the permit, shadow, and adjacent areas.

SEE ADDENDUM TO PART 3, PAGE 25, D(12)

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ADDENDUM TO PART 3, PAGE 25, D(12)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

RECLAMATION PLAN - FISH, WILDLIFE, ENVIRONMENTAL VALUES

The proposed mining operation is not expected to impact fish, wildlife, and other related environmental values. Minnows have been found in some of the larger stream segments within the application area. However, the normal annual cycle shows that during the summer and fall months, when the stream flow is minimal, the minnows swim downstream, only to return again. There are several ponds overlying the application area. Experience at neighboring mines show that partial recovery mining does not influence ponds. Wildlife has never been shown to be affected by partial recovery mining. Undeveloped springs are not impacted by partial recovery mining. AEC will replace undeveloped springs if they are legitimately used according to our water replacement plan.

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E. RECLAMATION PLAN PROTECTION OF HYDROLOGIC BALANCE-**Permit and Adjacent Area**

Submit an addendum describing the measures to be taken during and after the proposed mining operations to:

(1) minimize disturbance to the hydrologic balance, including quality and quantity, within the permit and adjacent areas and to prevent material damage outside the permit area;

(2) protect the rights of present users of surface and ground water;

(3) avoid acid or toxic drainage.

SEE ADDENDUM TO PART 3, PAGE 26, E(1-3)

F. GROUND WATER AND SURFACE WATER MONITORING PLAN-**Permit and Shadow Area**

Based upon the probable hydrologic consequences determination and analysis of all baseline hydrologic, geologic, and other information submitted in this application, address the following items in accordance with paragraph (F) of rule 1501:13-4-14 and paragraph (N) of rule 1501:13-9-04 of the Administrative Code.

(1) In addition to the quality and quantity parameters required for quarterly monitoring and NPDES monitoring, will any other parameters be monitored? _____Yes, __X__ No. If yes, indicate the parameter(s)and the site(s) where such monitoring will occur.

(2) Do you propose or anticipate the need for a variation in the required monitoring frequency for ground and surface water sites and monthly sites to be affected?_____Yes, __X__ No. If yes, describe the variation in frequency and the monitoring sites to be affected.

(3) Describe the plan for collection, recording, and reporting of all surface and ground water quality and quantity monitoring data, including data collected for the NPDES program.

SEE ADDENDUM TO PART 3, PAGE 26, F(3)

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ADDENDUM TO PART 3, PAGE 26, E(1-3)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425

RECLAMATION PLAN - PROTECTION OF HYDROLOGIC BALANCE

This area will be mined using partial recovery mining methods; therefore, no changes to the hydrologic balance are anticipated. Experience with the partial recovery operations that do not result in subsidence shows that the hydrologic balance will not be disturbed.

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GROUND AND SURFACE WATER MONITORING

Ground water and surface water monitoring as previously proposed for CENTURY MINE will continue with respect to the future surface operations. Ground water and surface water monitoring over longwall areas of the underground operations is proposed to determine the impacts of underground mining on these areas. The proposed plan presented below is to be used in lieu of all previously proposed and existing plans for such areas.

Intermittent and perennial streams originating within the mining area will be monitored where the stream leaves the area; and the streams crossing through the mining area will be monitored both upstream and downstream of the area currently being mined.

Ground water monitoring will consist of sampling all developed water sources, with the permission of the landowner, in the following manner:

1. Monthly monitoring will be done for quantity (static water level/flow) for a one-year period before and after mining for developed springs, wells, and stream monitoring points. This information will be reported quarterly but will be available at the AMERICAN ENERGY CORPORATION office.

2. Quarterly monitoring will be conducted for quality for a one-year period before and after mining for developed springs, wells, and stream monitoring points. This information will be reported quarterly. Piney Creek and Crabapple Creek will be monitored upstream and downstream of the proposed shadow area. The monitoring stations along Piney Creek are labeled Piney Creek Upper, and Piney Creek Lower. The monitoring stations along Crabapple Creek are labeled Crabapple Creek Lower, and U1-07.

3. Daily precipitation data from the mining area will be submitted to evaluate its impact on spring and stream flow. This information will be submitted quarterly but will be available at the AMERICAN ENERGY CORPORATION office.

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An attempt will be made to sample as outlined above, however, some sources may not be accessible should a landowner deny permission to sample, a well may be buried, etc.. These locations, if encountered, will be documented in the quarterly reports.

All samples will be taken as outlined to the extent that existing well construction allows. Any samples that are unobtainable will be documented as such in the quarterly report. Sampling will include analyses for nitrates.

AMERICAN ENERGY CORPORATION will monitor all developed supplies in accordance with the monitoring plan outlined above regardless of the aquifers and/or saturated zones that they access. All developed supplies have been identified and have been indicated on the Application Map.

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All wells, both drilled and dug have been identified. Developed springs, consisting of a french drain and catchment basin, have been shown. A map will be included in the quarterly monitoring report showing the location of the wells, streams, and springs monitored and their position relative to the active mining areas of AMERICAN ENERGY CORPORATION

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C. DIVERSION AND DRAINAGE CONTROLS-**Permit Area**

(1) Will the proposed coal mining activities result in diversions of overland flow away from the disturbed areas? _____ Yes, _____ No. If yes, describe, including maps and cross sections, the diversion to be constructed to achieve compliance with paragraph (I) of rule 1501:13-4-14 of the administrative code.

N/A, NO PERMIT AREA

(2) Will the proposed coal mining activities result in the diversion of intermittent or perennial streams within the proposed permit area? ___ Yes, _____ No. If yes, describe, including maps and cross sections, the paragraph (I) of rule 1501:13-4-14 of the Administrative Code.

N/A, NO PERMIT AREA

(3) Will the proposed coal mining activities result in construction of diversions to direct runoff through a sediment pond or a series of sediment ponds?

Yes, _____ No. If yes, submit an addendum to describe, including maps and cross sections, the paragraph (I) of rule 1501:13-4-14 of the Administrative Code.

N/A, NO PERMIT AREA

(4) Indicate which of the following are proposed to be constructed within the proposed permit area and submit as an addendum the detailed design plans for each structure in accordance with paragraph (H) of rule 1501:13-4-14 and 1501:13-9-04 of the Administrative Code.

N/A, NO PERMIT AREA

_____ sedimentation pond(s) (submit Attachment 20)

_____ water impoundment(s) (submit Attachment 20)

_____ other (specify)

(5) Submit an addendum describing the plan for the control of water drainage into, through, and out of the proposed permit area. If applicable, submit as an addendum any request for variances pursuant to paragraphs (B) and (E) of rule 1501:13-9-04 of the Administrative Code.

N/A, NO PERMIT AREA

(6) Describe the treatment, when required, of ground and surface water drainage from the area to be disturbed by the proposed coal mining activities.

N/A, NO PERMIT AREA

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H. PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES-Permit and Planned Subsidence Area

Will the proposed coal mining activities adversely affect any public parks and places listed on the National Register of Historic Places? _____ Yes, __X__ No. If yes, submit an addendum describing the measures to minimize or prevent these impacts.

I. MINING NEAR OR THROUGH A PUBLIC ROAD-Permit Area

If the response to Part 1, item D(6) of the permit application is yes, submit an addendum describing the measures to be used to ensure that the interests of the public and land owners are protected.

N/A, NO PERMIT AREA

J. SUBSIDENCE CONTROL SURVEY-Shadow Area

(1) Is this a full coal recovery operation?
____Yes, __X__ No. If yes, complete Attachment 31, Subsidence Control Survey, and following items J(2) and (3).

(2) Does the shadow area contain any of the structures or facilities listed in 1501:13-12-03(J)(1-3)?
_____ Yes, __X__ No. If yes, complete Attachment 32, Protection of Specific Structures, and specifically identify the structures or facilities on the application map.

(3) Are any aquifers or bodies of water that serve as a significant water source for any public water supply present in the shadow area?
_____ Yes, __X__ No. If yes, complete Attachment 32, Protection of Specific Structures, and specifically identify the areas on the application map.

K. SUBSIDENCE CONTROL PLAN-Shadow Area

(1) Submit an addendum which describes the method of coal removal, and indicates the size, sequence, and timing of the development of the underground workings.

SEE ADDENDUM TO PART 3, PAGE 28, K(1)/ TIMING, STRUCTURE, CONTOUR, AND PARCEL MAP

(2) Utilizing the application map, specifically indicate areas where planned subsidence mining methods (i.e. longwall or pillar extraction) will be used.

THE PROPOSED AREA WILL EVENTUALLY BE USED FOR FULL-COAL RECOVERY TECHNIQUES, BUT THIS SUBMITTAL IS ONLY FOR DEVELOPMENTAL PURPOSES

(3) Utilizing the application map, specifically indicate room-and-pillar mining areas where subsidence will be prevented or minimized.

SEE APPLICATION MAP AND TIMING, STRUCTURE, CONTOUR, AND PARCEL MAP

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ADDENDUM TO PAGE 28, PART 3, K(1)
AMERICAN ENERGY CORPORATION
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PERMIT D-0425

ENGINEERING AND MINING TECHNIQUES

Partial Recovery Mining Sections

There will be one set of main entries driven in a general north-south direction. Gates are then driven in an east-west direction, and typically consist of three entries, and are developed through the use of continuous miners. The main entries consist of approximately seven entries, are also driven with continuous miners and are primarily used for ventilation, transportation of men and materials, and haulage. These entries are designed for long-life with the pillars providing roof support. The maximum recovery factor for mains and submains is below 50 percent and is much less if one considers the barrier blocks left in place at the approaches to butt and longwall sections.

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K. (4) Submit as an addendum, for those areas mapped as room-and-pillar mining, the following information:

SEE ADDENDUM TO PAGE 29, PART 3, K(4)

(a) the maximum and average overburden thickness.

(b) the projected maximum extraction ratios for mains, submains, and butt sections, as well as the existing ranges of values for the same areas.

(c) projected maximum width of entries and cross cuts throughout the mine, as well as the existing ranges of values for the same areas.

(d) the center spacing for entries and cross cuts.

(e) minimum pillar dimensions for mains, submains, and butt sections, as well as the existing ranges of values for these areas.

(f) the barrier pillar width between butt sections, as well as the existing ranges of values for the same areas.

(g) the engineering properties of the clay/shale, or other soft rock material in the roof and floor or the mine.

(h) measures to be taken on the surface to prevent damage or lessening of the value or reasonably foreseeable use of the surface, if any.

(i) the minimum pillar safety factor, for protected structures, based upon coal strength and load.

(j) methods and calculations used to determine the safety factor.

(5) Submit as an addendum for those areas mapped as full coal recovery mining, the following information:

N/A - NO FULL COAL RECOVERY MINING

(a) for each method to be employed (i.e. longwall or pillar extraction), provide the following:

i) rate and direction of dip for the coal seam.
ii) dimensions of panels or butt sections.
iii) thickness of coal to be extracted (mining heights).
iv) maximum angle of draw.
v) maximum anticipated subsidence.
vi) width of barrier pillars or chain pillars between sections or panels.
vii) the maximum extraction ratio within a pillaring section.

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ADDENDUM TO PAGE 29, PART 3, K(4)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-4
PAGE 1

INFORMATION REGARDING AREAS MAPPED AS ROOM-AND-PILLAR MINING

(a) The overburden thickness for the application area ranges from 286 to 660 feet with an average of 458 feet.

(b) The projected extraction ratios for mains, submains, and butt sections are as follows:

EXTRACTION RATIOS

Section	Minimum	Maximum
Mains	44.0%	48.1%
Submains	44.0%	48.1%
Butts	33.0%	43.0%

(c) The projected entry and crosscut widths for mains, submains, and butt sections are as follows:

ENTRY AND CROSSCUT WIDTHS

Section	Minimum	Maximum
Mains	18-ft	20-ft
Submains	18-ft	20-ft
Butts	18-ft	20-ft

(d) The center spacing for entries and crosscuts for mains, submains, and butt sections are as follows:

CENTER SPACING

Section	Entries	Crosscuts
Mains	65-ft	80-ft
Submains	65-ft	80-ft
Butts	68-ft	120-ft

(e) The pillar dimensions for mains, submains, and butt sections are as follows:

PILLAR DIMENSIONS

Section	Minimum	Maximum
Mains	45-ft	60-ft
Submains	45-ft	60-ft
Butts	48-ft	100-ft

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(f) The barrier pillar width between butt sections are as follows:

Section	Minimum	Maximum
Mains	150-ft	1000-ft
Submains	150-ft	1000-ft
Butts	150-ft	1000-ft

(g) Table 13 shows typical compressive strengths for the immediate floor in the adjacent Powhatan No. 6 Mine (Pittsburgh No. 8 Seam), which are similar in the Century Mine. The floor primarily consists of shale or calcareous shale, with an occasional thin bed of claystone. The compressive strength of the shale is 5,034 to 9,453 psi and for the calcareous shale, 9,444 to 12,590 psi. These shale units frequently contain limestone nodules, which makes excavating the mine floor particularly difficult and costly.

(h) In order to prevent damage to the surface, pillars with safety factors greater than 2.0 will be utilized and no pillar extraction will take place.

(i) The minimum pillar safety factor is 2.17 for the mains and 2.74 for the butts based upon coal strength and load.

(j) The Analysis of Retreat Mine Pillar Stability (ARMPS) program, developed by the National Institute for Occupational Safety and Health (NIOSH), was used to determine pillar safety factors as shown in the attached ARMPS reports. Information pertaining to the ARMPS method of pillar design is attached.

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TABLE 13

COMPRESSIVE STRENGTH

PITTSBURGH (NO. 8) FLOOR

ROCK CORE COMPRESSIVE STRENGTH TEST RESULTS				
OHIO VALLEY COAL COMPANY				
Boring N91-3				
Sample No.	Depth (ft.)	Unit Wt. (pcf)	Compressive Strength (psi)	LITHOLOGIC DESCRIPTION
1	580.6 - 580.9	165.7	9444	Calcareous Shale
2	582.3 - 582.6	163.2	3930	Claystone
3	585.1 - 585.4	168.9	9453	Shale
4	587.2 - 587.5	162.9	3767	Shale
5	589.3 - 589.6	168.9	2995	Shale
Boring N91-4				
Sample No.	Depth (ft.)	Unit Wt. (pcf)	Compressive Strength (psi)	
1	596.2 - 596.5	183.2	10272	Claystone*
2	600.4 - 600.7	165.1	8535	Shale
3	602.9 - 603.2	163.9	5034	Shale
4	604.2-604.5	158.3	9643	Shale
Boring N91-6				
Sample No.	Depth (ft.)	Unit Wt. (pcf)	Compressive Strength (psi)	
1	453.6 - 453.9	165.9	5288	Shale
2	454.0 - 454.3	170.9	12590	Calcareous Shale
3	455.0 - 455.3	161.6	9918	Calcareous Shale
4	455.3 - 455.6	163.0	9752	Calcareous Shale
5	456.8 - 457.1	161.0	6903	Shale
6	457.3 - 457.6	163.3	6220	Shale
7	458.0 - 458.3	161.4	7585	Shale
8	464.3 - 464.7	160.6	5689	Shale

* Strength and density too high for claystone, may have had limestone nodule in prepared sample.

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ADDENDUM TO PART 3, PAGE 29 (K)(vii)
PILLAR DESIGN FOR MAINS

ANALYSIS OF RETREAT MINING PILLAR STABILITY (ARMPS)

Name of Mine: Century Mine

Mining Height (ft)	6.5	Overburden Depth (ft)	660
In-situ Coal Strength (psi)	900	Crosscut Angle (deg)	90.0
Entry Width (ft)	20.0	Crosscut Spacing (ft)	80.0

Entry Spacing (ft)

PILLAR:	1	65.0	PILLAR:	2	65.0	PILLAR: 3	65.0
PILLAR:	4	65.0	PILLAR:	5	65.0		

LOADING CONDTION: 1 DEVELOPMENT

ARMPS STABILITY FACTORS

Development Loading: 2.17

STATE OF OHIO
RYAN T. DESKO
E-65518
PROFESSIONAL ENGINEER

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ANALYSIS OF RETREAT MINING PILLAR STABILITY (ARMPS)

Name of Mine: Century Mine

Mining Height (ft)	6.5	Overburden Depth (ft)	660
In-situ Coal Strength (psi)	900	Crosscut Angle (deg)	60.0
Entry Width (ft)	20.0	Crosecut Spacing (ft)	120.0

Entry Spacing (ft)

PILLAR: 1 68.0 PILLAR: 2 68.0

LOADING CONDTION: 1 DEVELOPMENT

ARMPS STABILITY FACTORS

Development Loading: 2.74

STATE OF OHIO
RYAN T. DESKO
E-65518
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PROFESSIONAL ENGINEER

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ANALYSIS OF RETREAT MINING PILLAR STABILITY (ARMPS)

By Christopher Mark, Ph.D.,[1] and Frank E. Chase[2]

ABSTRACT

The prevention of pillar squeezes, massive pillar collapses, and bumps is critical to safe pillar recovery operations. To help prevent these underground safety problems, the Pittsburgh Research Center has developed the Analysis of Retreat Mining Pillar Stability (ARMPS) computer program. ARMPS calculates stability factors (SF) based on estimates of the loads applied to, and the load-bearing capacities of, pillars during retreat mining. The program can model the significant features of most retreat mining layouts, including angled crosscuts, varied spacings between entries, barrier pillars between the active section and old (side) gobs, and slab cuts in the barriers on retreat. It also features a pillar strength formula that considers the greater strength of rectangular pillars. The program may be used to evaluate bleeder designs, as well as active workings.

A data base of 140 pillar retreat case histories has been collected across the United States to verify the program. It was found that satisfactory conditions were very rare when the ARMPS SF was less than 0.75. Conversely, very few unsatisfactory designs were found where the ARMPS SF was greater than 1.5. Preliminary analyses also indicate that pillar failures are more likely beneath sandstone roof and that the ARMPS SF may be less meaningful when the depth of cover exceeds 230 m (750 ft).

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Pittsburgh Research Center, National Institute for Occupational Safety and Health, Pittsburgh, PA.

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INTRODUCTION

The use of remote-control continuous miners, extended cuts, and mobile roof supports has increased the productivity of room-and-pillar retreat mining (also referred to as "pillaring," "pillar recovery," "robbing," and "second mining"). In the southern Appalachian coalfields, many mines are choosing room-and-pillar retreat mining because of its lower capital cost and greater flexibility [Blaiklock 1992]. Unfortunately, between 1989 and 1996, 25% of all roof and rib fatalities occurred on pillar recovery sections.

Roof fall accidents are not the only problem associated with retreat mining. Millions of tons of coal are sterilized annually because of pillar squeezes, floor heave, pillar line roof falls, and pillar bumps. Traditional pillar design methods are of little help due to the complex mining geometries and abutment pressures that are present during pillar extraction. The Pittsburgh Research Center has developed the Analysis of Retreat Mining Pillar Stability (ARMPS) computer program to aid in the design of pillar recovery operations. This paper describes the program and presents the findings thus far.

THE ARMPS METHOD

The goal of ARMPS is to help ensure that the pillars developed for future extraction (production pillars) are of adequate size for all anticipated loading conditions. The key is to be able to estimate the magnitudes of the various loads that the pillars might experience throughout the mining process. The formulas used in ARMPS are based on those originally developed for the Analysis of Longwall Pillar Stability (ALPS) method, which is widely used for longwall pillar design [Mark 1990, 1992]. ALPS was initially derived from underground measurements of longwall abutment stresses and was later validated by the back-analysis of more than 100 case histories. In ARMPS, the formulas have been extensively modified for the variety of mining geometries typically found in pillar recovery operations.

USER INPUT

The first step in using the ARMPS program is to enter the dimensions of the pillars in the working section, as illustrated in figure 1. The program can accommodate angled crosscuts, varied spacings between the entries, and barrier pillars between the active section and old (side) gob areas. Slabbing of barriers

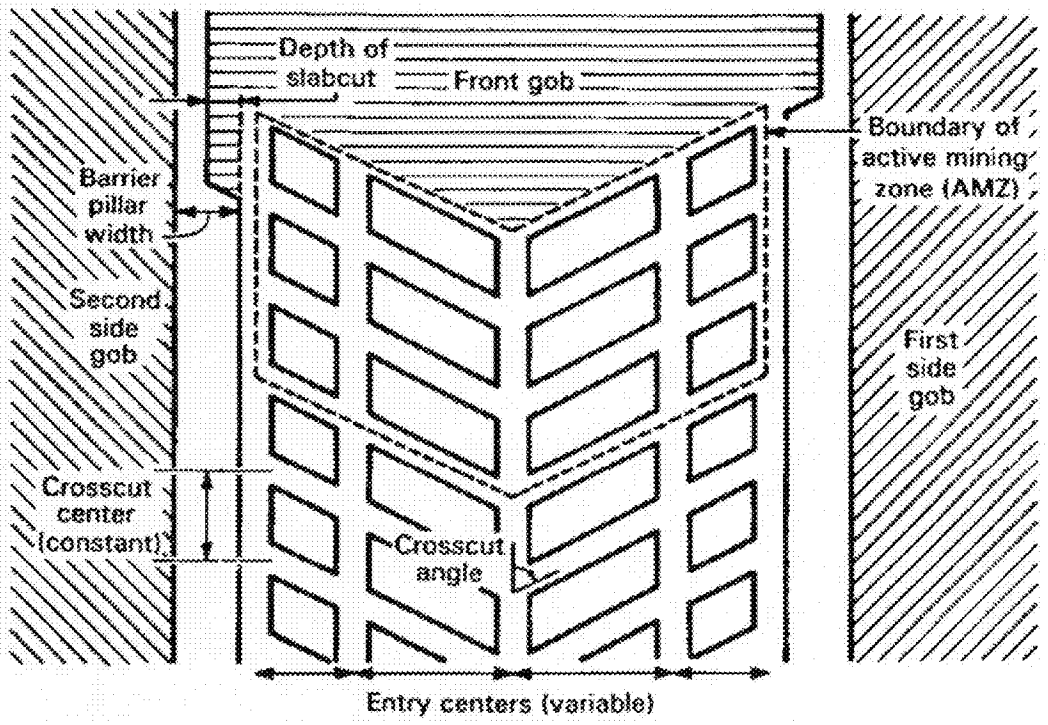

Figure 1.—Section layout parameters used in ARMPS.

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on retreat can also be included. Other parameters that must be defined include depth of cover, mining height, entry width, and crosscut spacing. Finally, the user chooses one of four possible *loading conditions* (figure 2). The simplest, loading Condition 1, is development loading only. Loading condition 2 occurs when the active, or "front," panel is being fully retreated and there are no adjacent mined-out areas. The total applied load is the sum of the development loads and the front abutment load. Loading condition 3 occurs where the active mining zone (AMZ) is adjacent to an old (side) gob and the pillars are subjected to development, side abutment, and front abutment loads. Where the pillar line is surrounded by gob on three sides (sometimes referred to as "bottlenecking"), loading condition 4 is used. In every case, the extent of each gob is defined by the user.

ARMPS STABILITY FACTOR FOR THE ACTIVE MINING ZONE

The basic output from the ARMPS program is the stability factor (SF), defined as

$$\text{ARMPS SF} = \text{LBC}/\text{LT}, \qquad (1)$$

where LBC = the estimated total load-bearing capacity of the pillars within the AMZ,

and LT = the estimated total load applied to pillars within the AMZ.

Figure 3 illustrates the development and front abutment loads applied to the AMZ.

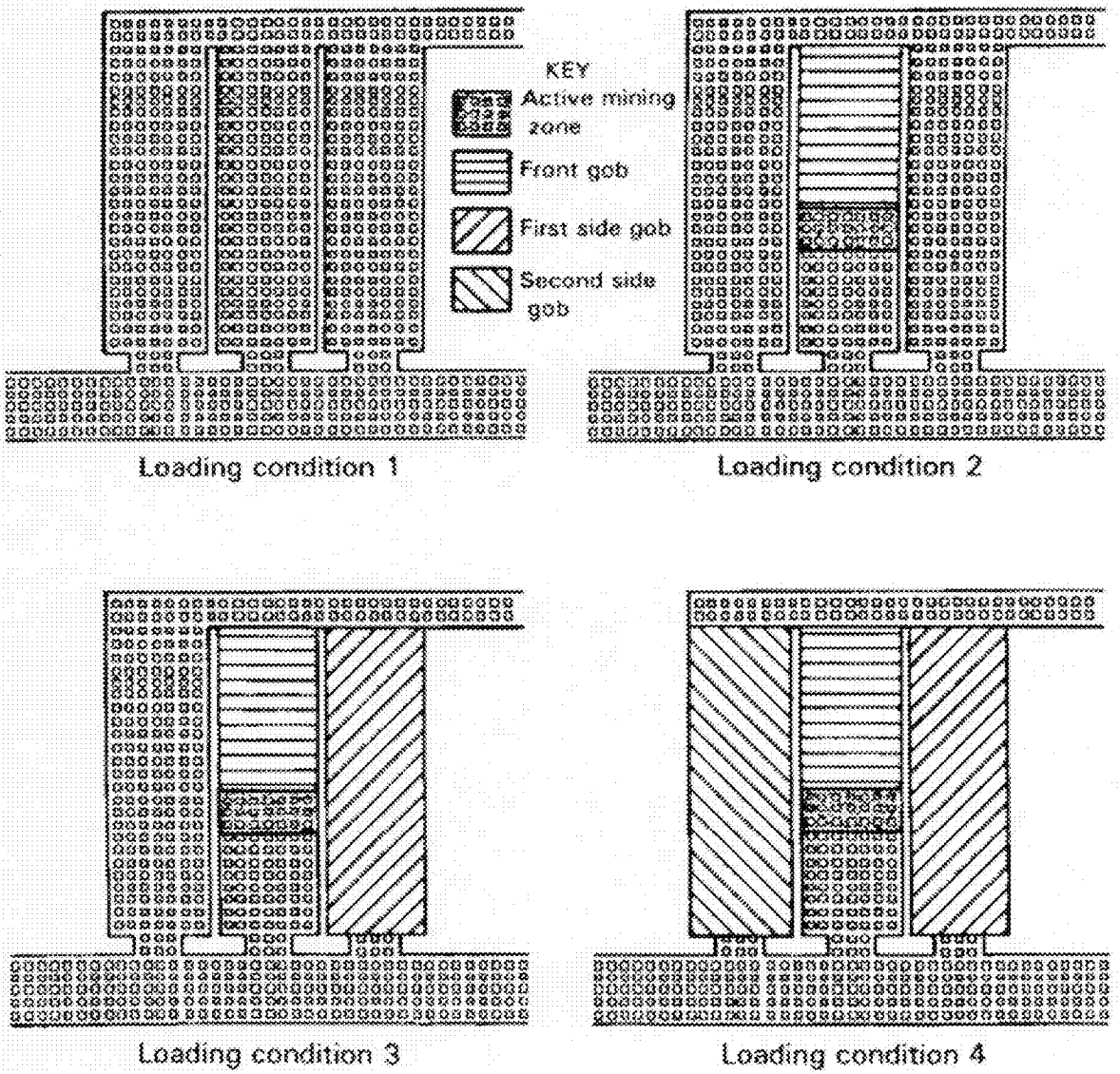

Figure 2.—The four loading conditions that can be evaluated with ARMPS.

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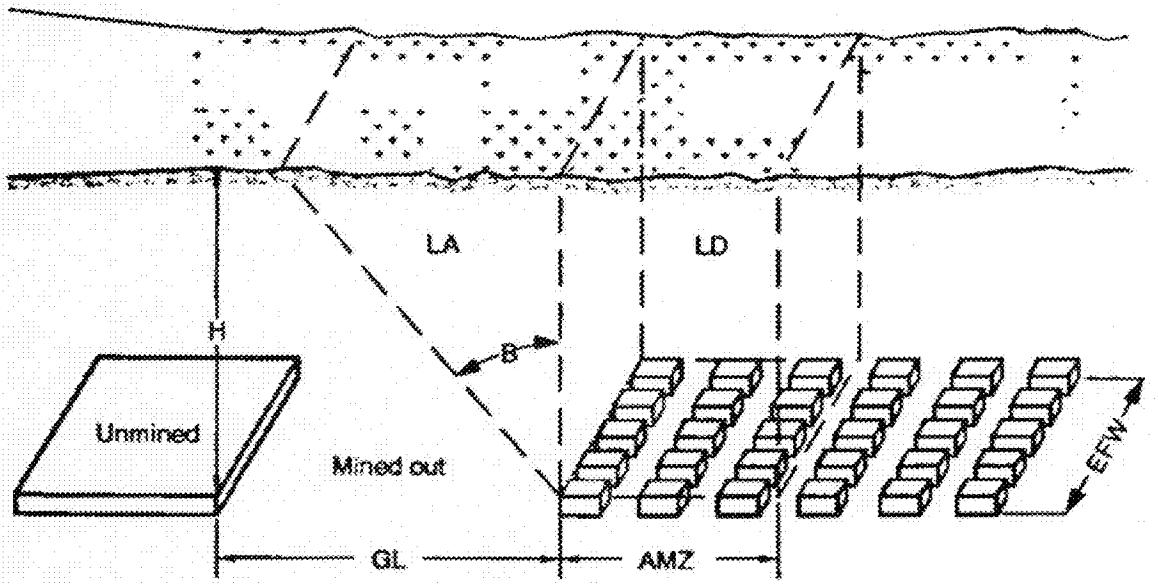

KEY

AMZ	Active mining zone	H	Depth of cover
B	Abutment angle	LA	Abutment load
EFW	Extraction front width	LD	Development load
GL	Mined out area		

Figure 3.—Schematic showing the active mining zone, the development load, and the front abutment load.

The AMZ includes all of the pillars on the extraction front (or "pillar line") and extends outby the pillar line a distance of five times the square root of the depth of cover ($5\sqrt{H}$). This distance was selected because measurements of abutment stress distributions [Mark 1990] show that 90% of the front abutment load falls within its boundaries (figure 4).

ARMPS calculates the SF for the entire AMZ, rather than stability factors for individual pillars, because experience has shown that the pillars within the AMZ typically behave as a *system*. If an individual pillar is overloaded, it will normally transfer its excess load to adjacent pillars. If those pillars are adequately sized, the process ends there. A pillar squeeze occurs only when the adjacent pillars are also undersized. They then fail in turn, resulting in a "domino" of load transfer and pillar failure. The ARMPS SF is therefore a measure of the overall stability of the pillar system.

PILLAR LOAD-BEARING CAPACITY

The load-bearing capacity of the AMZ is calculated by summing the load-bearing capacities of all of the pillars within its boundaries. The strength of an individual pillar (SP) is determined using a new pillar strength formula (the Mark-Bieniawski formula) that considers the effect of pillar length:

$$SP = S_i\,[0.64 + (0.54 - 0.18\,(w^2/hL))], \qquad (2)$$

where S_i = in situ coal strength, assumed = 6.2 MPa (900 psi),

w = pillar width,

h = pillar height,

and L = pillar length.

The new pillar strength formula was needed because the pillars used in retreat mining are often much longer than they are wide. The strength of rectangular pillars can be significantly greater than square pillars due to the greater confinement generated within them. The Mark-Bieniawski formula was derived from analyses of the pillar stress distributions implied by empirical pillar strength formulas. A complete discussion of the Mark-Bieniawski formula is included in appendix A of this paper. The in situ coal strength is assumed to be 6.2 MPa (900 psi) in ARMPS; however, this value can be modified by the user.

The load-bearing capacity of the pillars is determined by multiplying their strength by their load-bearing area. When angled crosscuts are employed, the algorithm still calculates accurately each pillar's least dimension, length, and load-bearing area (A_p):

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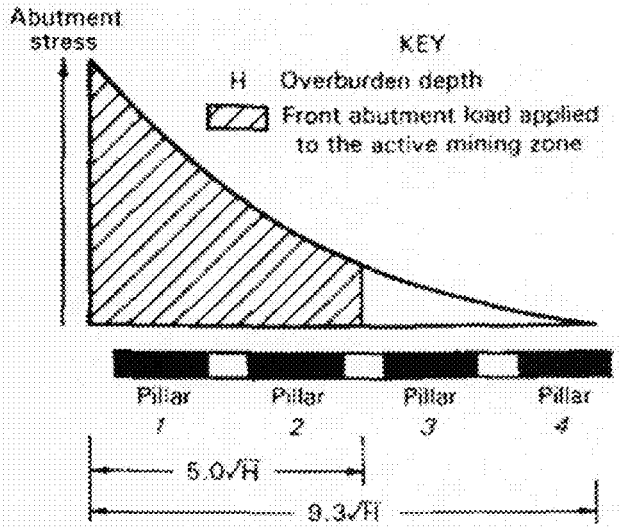


Figure 4.—Distribution of abutment stress, showing that 90% of the abutment falls within the distance of (5√H) from the gob edge.

$$A_p = [(XC)(ECTR) - (XC)(W_e) - (ECTR)(W_e)/(\sin \phi) + (W_e)^2/(\sin \phi)]. \quad (3)$$

where XC = center-to-center crosscut spacing,

ECTR = center-to-center entry spacing,

W_e = entry width,

and ϕ = angle between the crosscut and the entry.

The load-bearing capacity of the pillar system is then obtained by summing the capacities of the individual pillars within the AMZ. ARMPS calculates the strength and load-bearing capacity of barrier pillars in the same manner as the panel pillars, except that their length is limited to the breadth of the AMZ.

PILLAR LOADINGS

The loadings applied to the AMZ include development loads, abutment loads, and loads transferred from barrier pillars. Table 1 shows the sources of loads and the loading conditions in which they occur.

Table 1.—Loads applied to the active mining zone in ARMPS

Source of load	Loading condition 1	2	3	4
Development	X	X	X	X
Front abutment		X	X	X
Side gob abutments			X	X
Transfer from barriers between active mining zone and side gobs			X	X
Transfer from remnant barriers between front gob and side gobs			X	X

Development loads are due to the weight of the overburden directly above the pillars before any retreat mining takes place. The tributary area theory is used in ARMPS to estimate development loads.

Abutment loads occur as a result of retreat mining and gob formation. They are determined by the depth of cover, the extent of the gobs, the width of the extraction front, and the abutment angles. These parameters are illustrated in two dimensions in figure 5. The abutment angle determines how much load is carried by gob. Measurements of longwall abutment stresses indicated that an abutment angle of 21° is appropriate for normal caving conditions [Mark 1992]. The ARMPS program initializes the abutment angles for all gobs to 21°; however, this can be changed by the user. For example, if it is known that no caving has occurred, then the abutment angle may be set to 90° to simulate zero load transfer to the gob [Chase and Mark 1993].

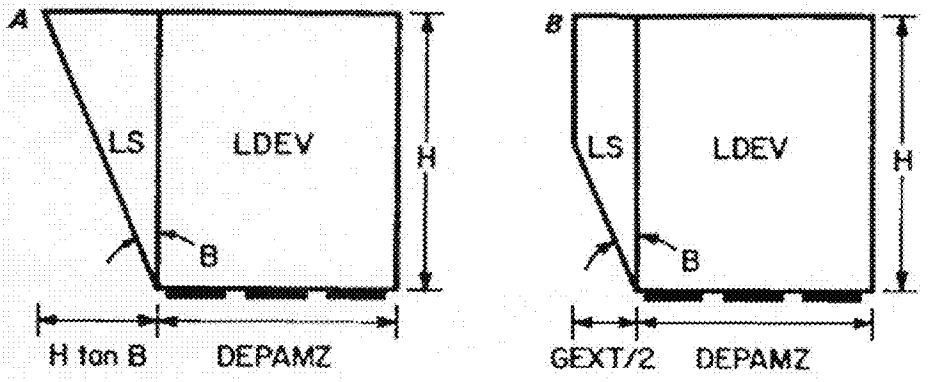
The abutment stresses are assumed to be distributed following the inverse-square function shown in figure 4. Abutment loads are also applied to barrier pillars; however, if a barrier is too small to carry its share, then some or all of the excess is transferred to the AMZ.

The front abutment load applied to the AMZ is calculated as follows. The volume of the overburden above the mined-out active gob is the depth of cover multiplied by the gob area. The portion of this volume whose weight is carried by the gob is determined by the tangent of the abutment angle, as shown in figure 5. This portion is subtracted, and the remainder is shared between the AMZ and the unmined coal on the other three sides of the gob. It is assumed that barrier pillars (or substantial production pillars) are present on the other three sides of the gob. Load applied to the barriers here may be transferred back to the AMZ if the barriers are removed later in the mining process.

The magnitude of the front abutment load applied to the AMZ is determined by the extent of the extraction zone and the depth of cover. The front abutment is considered fully developed if the gob area is large relative to the depth of cover (figure 6A). If only a few rows of pillars have been extracted (figure 6B), much of the load will be carried by the back barrier. If the full extraction zone is rather narrow (figure 6C), much of the load will be carried by the side barriers.

The side abutment loads are shared by the AMZ and, if it is present, the barrier pillar between the AMZ and the side gob. The inverse-square stress distribution (figure 4) again is used to apportion the load between the barrier and the AMZ. Next, if it is determined that the barriers are overloaded, some additional side abutment load is transferred to the AMZ.

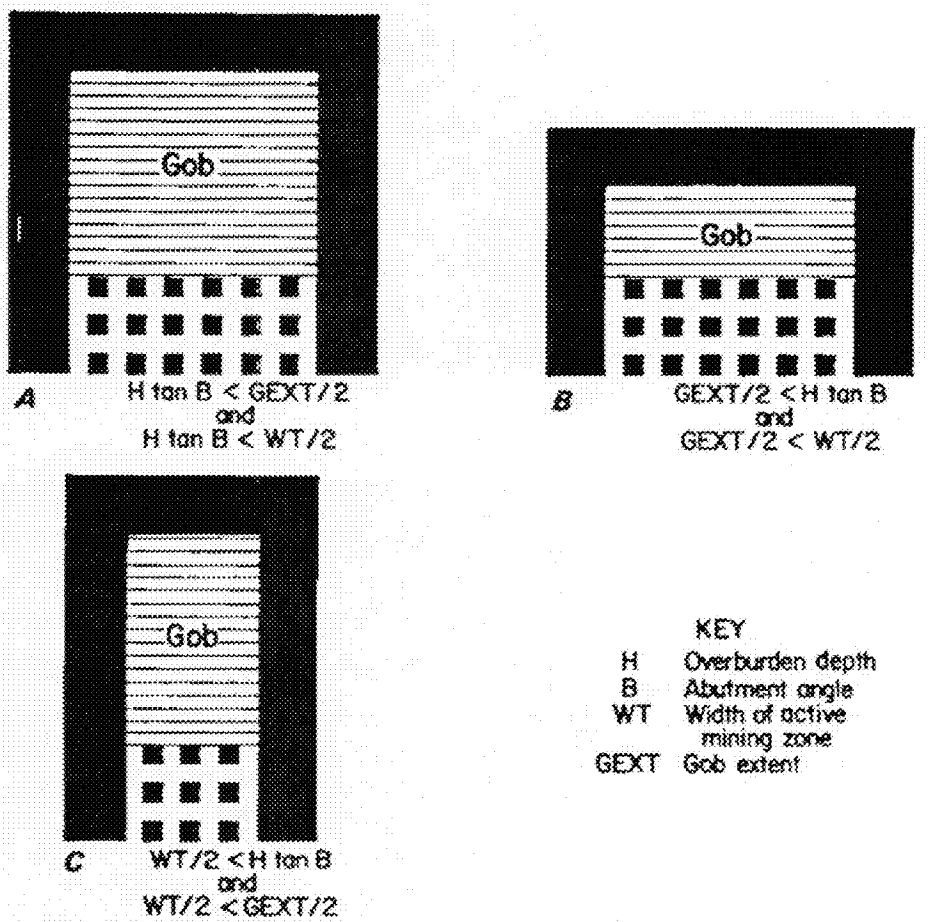
To determine whether a barrier pillar can carry the load applied to it, ARMPS estimates the barrier's SF by dividing its load-bearing capacity by its load. The total load applied to a barrier pillar is the sum of the development load, the front abutment load due to any slabbing, and the side abutment load applied to the barrier. If the SF is greater than 1.5, the barrier is assumed to be stable. When the barrier's SF is between 1.5



KEY

H	Overburden	GEXT	Gob extent
LS	Abutment load	DEPAMZ	Breadth of active mining zone
LDEV	Development load		
B	Abutment angle		

Figure 5.—Schematic showing the abutment load in two dimensions. *A*, supercritical gob; *B*, subcritical gob.



KEY

H	Overburden depth
B	Abutment angle
WT	Width of active mining zone
GEXT	Gob extent

Figure 6.—Illustration of the effect of panel geometry on the front abutment loading in ARMPS. *A*, gob area is supercritical in both width and extent; *B*, gob area is subcritical in extent; *C*, gob area is subcritical in width.

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and 0.5, a portion of its abutment load is transferred to the AMZ. If the SF is less than 0.5, all of the additional side abutment load (but not the development or front abutment load) is transferred to the AMZ.

The final sources of load on the AMZ are the remnant barrier pillars inby the pillar line (between the front and side gobs). If the remnant barriers are too small to carry their load, some part of it is returned to the AMZ. The decision to transfer the load and how much is based on the remnant barrier's SF. Slabbing of the remnant will also return some abutment load to the AMZ.

Further details on the formulas and calculations used in ARMPS loadings can be found in the "Help" text that accompanies version 4.0 of the program.

VERIFICATION OF THE ARMPS METHOD

The ARMPS method is being verified through back-analysis of pillar recovery case histories. To date, 140 case histories have been obtained from 10 States (see appendix B of this paper). They cover an extensive range of geologic conditions, roof rock cavability characteristics, extraction methods, depths of cover, and pillar geometries. Ground conditions in each case history have been categorized as either satisfactory or unsatisfactory. Pillar failures responsible for unsatisfactory conditions were found to include—

- Pillar squeezes, accompanied by significant entry closure and loss of reserves;
- Sudden collapses of groups of pillars, usually accompanied by airblasts; and/or
- Coal pillar bumps (violent failures of one or more pillars).

As figure 7 shows, pillar failures occurred in 93% of the cases where the ARMPS SF was less than 0.75. Where the ARMPS SF was greater than 1.5, 94% of the designs were satisfactory. SF values ranging from 0.75 to 1.50 form a "gray" area where both successful and unsuccessful cases are found.

Current research has begun to evaluate other factors that may contribute to satisfactory conditions when the ARMPS SF falls between 0.75 and 1.5. These include—

Coal strength: An extensive data base of laboratory tests of the strength of coal was compiled by Mark and Barton (1997). When compared with the ARMPS data base, no correlation was found between coal strength and pillar strength.

Depth of cover: Figure 8 shows that there is a marked reduction in SF as depth of cover increases. When the depth exceeds 305 m (1,000 ft), the ARMPS SF was below 1.0 for 70% of the satisfactory designs. Highly unsatisfactory conditions have also been encountered under deep cover, which recently led to two fatalities. Pillar design for retreat mining under deep cover remains an important research issue.

Seam height: A plot of seam height against ARMPS SF shows no correlation (figure 9).

Roof geology: A detailed study of pillar performance was conducted at a mining complex in southern West Virginia. More than 50 case histories were collected. Analysis showed that satisfactory conditions were more likely to be encountered under shale roof than massive sandstone roof (figures 10-11). This implies that better caving occurs with shale, resulting in lower pillar loads.

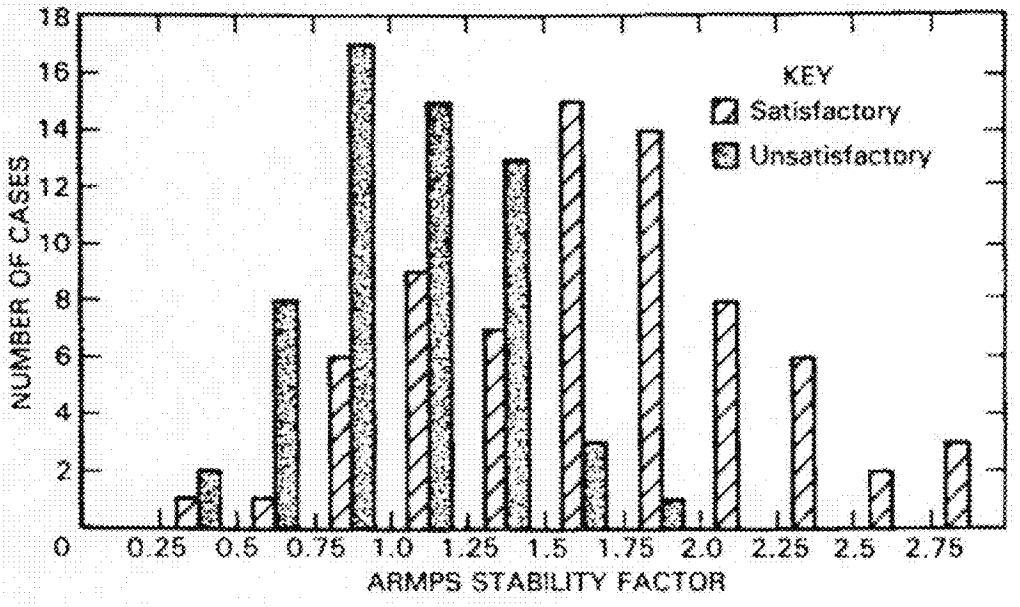

Figure 7.—ARMPS data base.

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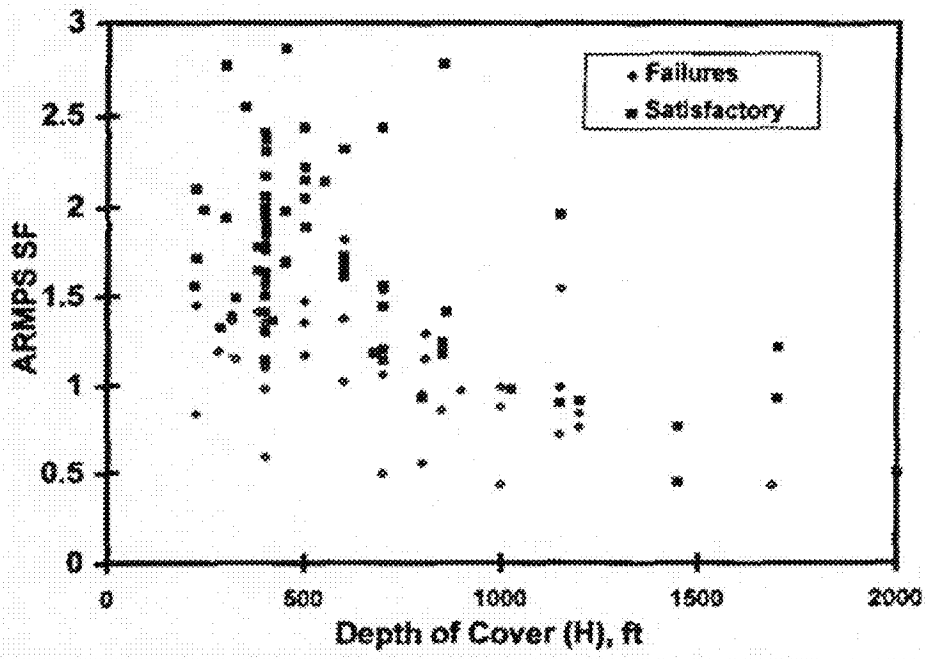

Figure 8.—Relationship between ARMPS SF and depth of cover within the case history data base.

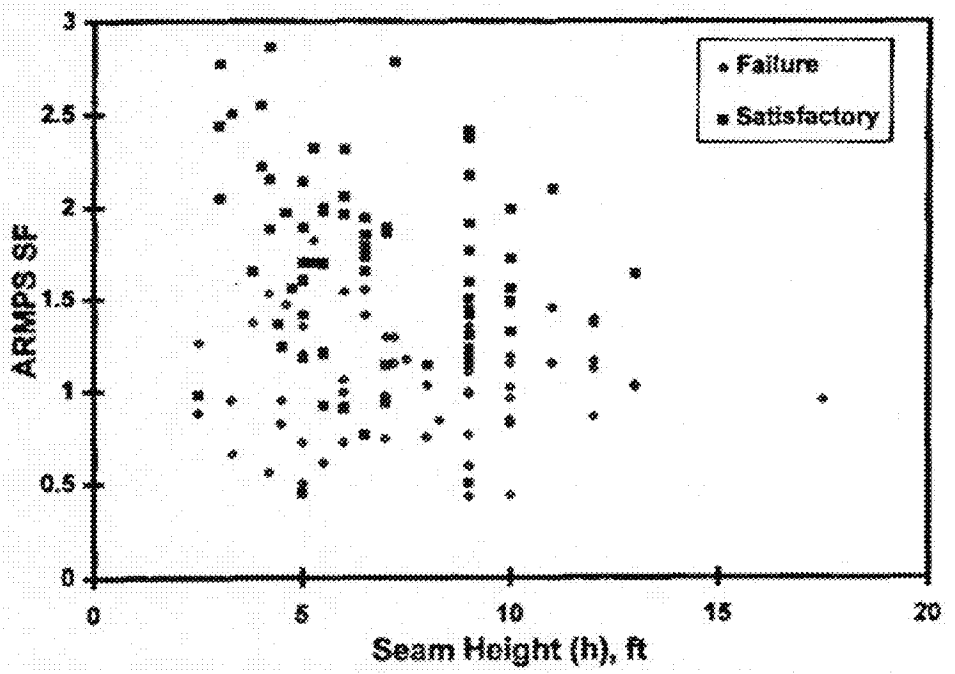

Figure 9.—Relationship between ARMPS SF and seam height within the case history data base.

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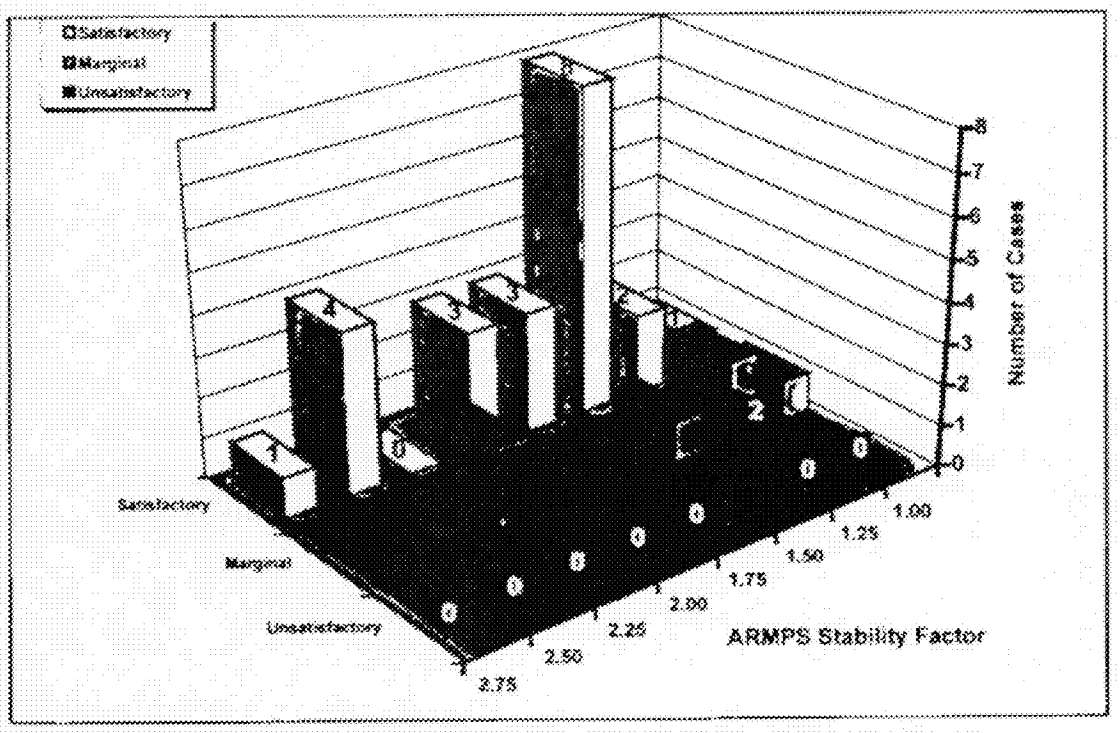

Figure 10.—Shale roof case histories from mining complex in southern West Virginia.

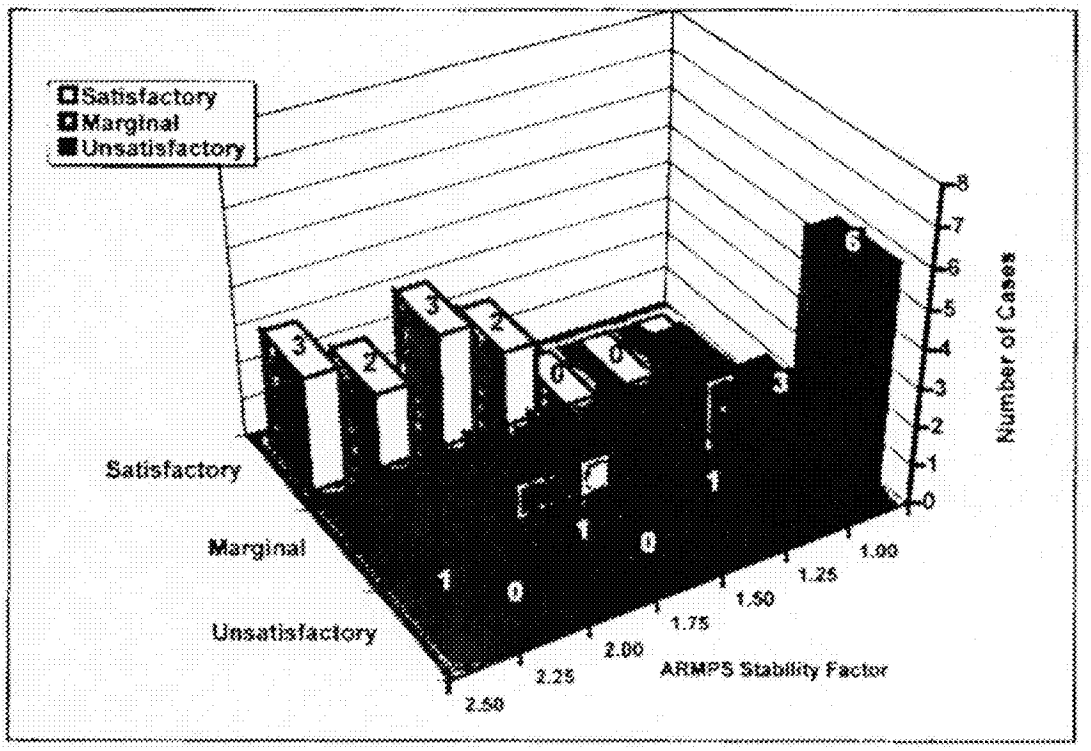

Figure 11.—Sandstone roof case histories from mining complex in southern West Virginia.

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GUIDELINES FOR USING ARMPS

ARMPS appears to provide good first approximations of the pillar sizes required to prevent pillar failure during retreat mining. In an operating mine, past experience can be incorporated directly into ARMPS. ARMPS stability factors can be back-calculated for both successful and unsuccessful areas. Once a minimum ARMPS SF has been shown to provide adequate ground conditions, that minimum should be maintained in subsequent areas as changes occur in the depth of cover, coal thickness, or pillar layout. In this manner, ARMPS can be calibrated using site-specific experience.

ARMPS is also well suited for initial feasibility studies where no previous experience is available. Operators may begin with an SF near 1.5, then adjust as they observe pillar performance. ARMPS may also help in optimizing panel designs by identifying pillars that might be needlessly oversized.

ARMPS may be used to analyze a wide variety of mining geometries. For example, most bleeder designs can be analyzed by selecting loading condition 3, then setting the extent of the active gob to zero. The "Help" text included with version 4.0 of the program contains many tips on selecting the proper input parameters when using ARMPS.

In some cases, more detail may be desired than can be provided by ARMPS. Some complex situations, such as multiple-seam interactions, are beyond the capabilities of ARMPS. In these instances, the newly developed LAMODEL [Heasley 1997] may be the appropriate tool to use.

CONCLUSIONS

The ARMPS program has already proven to be a useful aid in planning pillar recovery operations. It is easy to use, and a large number of analyses can be run in a relatively short period. The program is sufficiently flexible to be applicable to a wide variety of mining geometries. If the user desires, it also provides a full range of intermediate calculations in addition to the SF. Many mines throughout the United States and abroad already use ARMPS, and the Mine Safety and Health Administration has also made extensive use of the program.

Current efforts are aimed at improving the interpretation of the ARMPS SF. Although pillar failures seem unlikely when the ARMPS SF is greater than 1.5, there are apparently many cases where SF values as low as 0.75 have been successful. Factors such as roof quality, floor strength, and mining method may determine whether a pillar design succeeds. These factors are now being included in the retreat mining case history data base and will be integrated into future design guidelines.

To obtain a single copy of the ARMPS computer program, version 4.0 for Windows, send three double-sided, high-density diskettes to: Christopher Mark, Ph.D., NIOSH, Pittsburgh Research Center, Cochrans Mills Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070.

REFERENCES

Blaiklock J [1992]. A Kentuckian vote for continuous mining. Mining Magazine June:365-366.

Chase FE, Mark C [1993]. Ground control design for pillar extraction. Soc Min Eng AIME preprint 93-282.

Heasley KA [1997]. A new laminated overburden model for coal mine design. In: Mark C, Tuchman RJ, comp. Proceedings: New Technology for Ground Control in Retreat Mining. Pittsburgh, PA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, IC 9446.

Mark C [1990]. Pillar design methods for longwall mining. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9247.

Mark C [1992]. Analysis of longwall pillar stability (ALPS): an update. In: Iannacchione AT, Mark C, Repsher RC, Tuchman RJ, Jones CC, comp. Proceedings of the Workshop on Coal Pillar Mechanics and Design. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9315, pp. 238-249.

Mark C, Barton TM [1997]. Pillar design and coal strength. In: Mark C, Tuchman RJ, comp. Proceedings: New Technology for Ground Control in Retreat Mining. Pittsburgh, PA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, IC 9446.

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APPENDIX A.—DERIVATION OF THE MARK-BIENIAWSKI PILLAR STRENGTH FORMULA

Early versions of the ARMPS program, following the ALPS program, used the Bieniawski formula to estimate pillar strength [Bieniawski 1992]:

$$S_p = S_1 \{0.64 + (0.36\, w/h)\}, \qquad \text{(A-1)}$$

where S_p = pillar strength,

S_1 = in situ coal strength,

w = pillar width (or least plan dimension),

and h = pillar height.

The Bieniawski formula was originally developed in the 1960's from in situ testing of large-scale coal specimens. The specimen strengths were determined as the ultimate load-bearing capacity divided by the area. Bieniawski recognized that the formula underestimated the strength of rectangular pillars; however, because all of the specimens were square, there was no obvious way of estimating a "pillar length" effect.

It has been recognized that a major disadvantage of empirical formulas, like that of Bieniawski, is that they treat the pillar as a single structural element. In reality, the stress within even a relatively small pillar is highly nonuniform. Tests conducted by Wagner [1974] demonstrated this quite dramatically (figure A-1).

Modern *mechanics-based* approaches to coal pillars begin with stress distribution. Perhaps the best known is the approach proposed by Wilson [1973, 1983]. Wilson derived an expression for the vertical stress gradient within the yield zone, which he then integrated over the area of the pillar (figure A-2) to determine the ultimate pillar resistance (R). The "pillar strength" is simply the ultimate pillar resistance divided by the pillar area. Numerical models also provide stress distribution profiles, although not normally in the form of an equation. Mechanics-based approaches can be used to evaluate any pillar shape, because the stresses within the pillar are determined by laws that are independent of overall pillar geometry.

Although empirical formulas do not explicitly consider the effect of internal pillar mechanics, it is apparent that they imply a nonuniform stress distribution because of the shape effect. Once the implied stress gradient has been derived, the length effect can be readily determined. The derivation has been published previously [Mark et al. 1988; Mark and Iannacchione 1992] and is summarized below.

First, three assumptions are implicit in Wilson's and other analytical formulations:

1. The stress within the yield zone of a given pillar is a continuous function of the distance from the nearest rib.

2. The stress gradient within the yield zone of a given pillar does not change with time or load (i.e., the yielded coal is perfectly plastic).

3. The stress distribution is symmetric with respect to the center of the pillar.

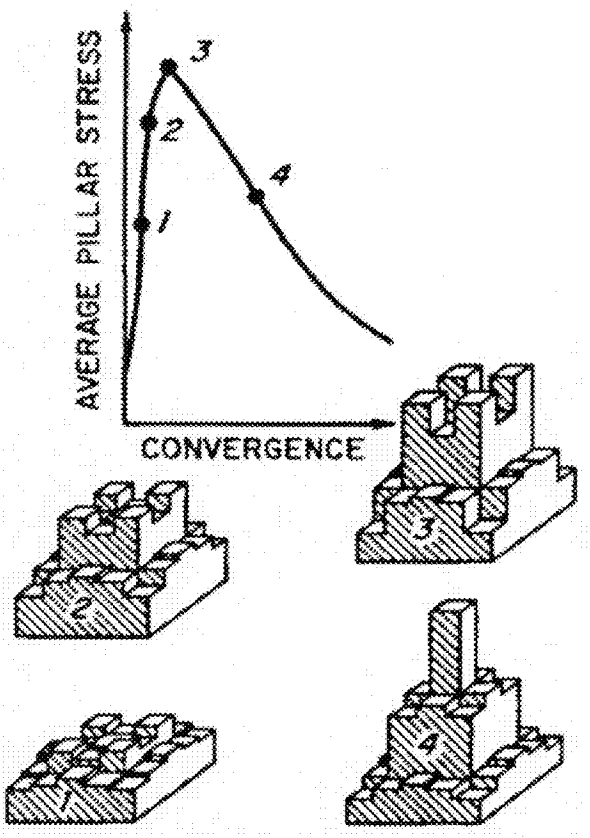

Figure A-1.—Pillar stress profiles measured in small coal pillars (after Wagner [1974]).

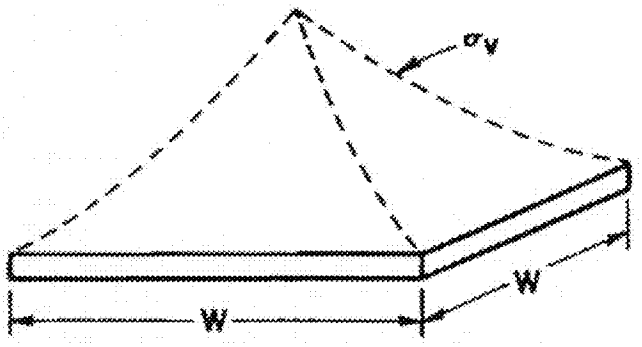

Figure A-2.—Determination of pillar load-bearing capacity as the integral of the pillar stress distribution.

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The next step in the derivation is to calculate the ultimate resistance of a square pillar. Using the Bieniawski formula:

$$R = S_1 \left(0.64 + 0.36 \frac{w}{h}\right) w^2. \qquad \text{(A-2)}$$

Then, the increase in pillar resistance dR due to an increase in cross-sectional area dA = 2w dw (figure A-3*A*) may be calculated by taking the derivative of equation A-2 with respect to w:

$$dR = S_1 \left(1.28 + 1.08 \frac{w^2}{h}\right) dw. \qquad \text{(A-3)}$$

In the next step, the assumption that the vertical pillar stress is a continuous function of the rib distance (x) is applied. It may be seen (figure A-3*B*) that

$$dR = 4 \int_0^{\frac{w}{2}} \sigma_v \, dx \, dw. \qquad \text{(A-4)}$$

Equating A-3 and A-4 and simplifying, we have

$$S_1 \left(0.32 \, w + 0.27 \frac{w^2}{h}\right) = \int_0^{\frac{w}{2}} \sigma_v \, dx. \qquad \text{(A-5)}$$

The function that satisfies equation A-5 is

$$\sigma_v = S_1 \left(0.64 + 2.16 \frac{x}{h}\right). \qquad \text{(A-6)}$$

Equation A-6 is the stress gradient in the yield zone predicted by the Bieniawski formula. Stress gradients have also been derived for several other common empirical pillar strength formulas [Mark and Iannacchione 1992].

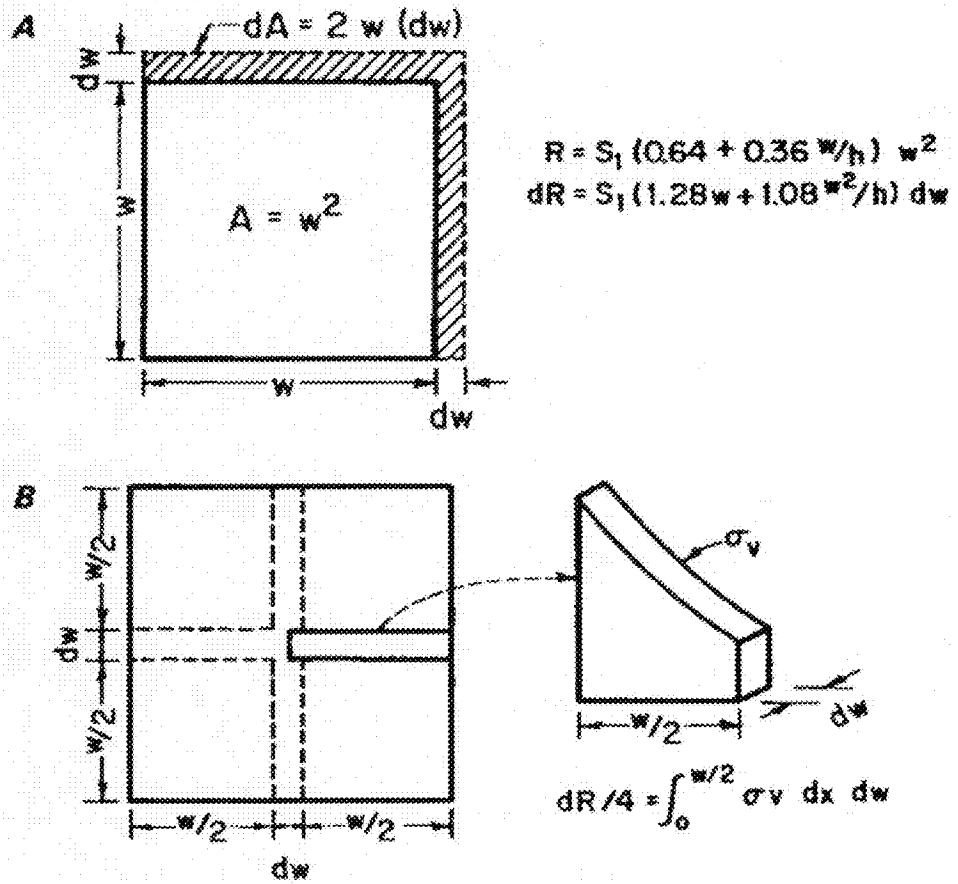

Figure A-3.—Determination of pillar stress gradients from a pillar strength formula. *A*, calculation of dR directly from the formula; *B*, calculation of dR in terms of the vertical stress gradient.

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To determine the load-bearing capacity of any pillar shape, it is now only necessary to integrate equation A-6 over the load-bearing area of the pillar. For example, the load-bearing capacity of an extremely long strip pillar (R_s) is

$$R_s = 2L\int_0^{\frac{w}{2}} S_1\left(0.64 + 2.16\frac{x}{h}\right)dx. \qquad \text{(A-7)}$$

Solving:

$$R_s = (Lw)\,S_1\left(0.64 + 0.54\frac{w}{h}\right). \qquad \text{(A-8)}$$

Dividing by the pillar area (L*w*) yields the strength of a strip pillar (S_s):

$$S_s = S_1\left(0.64 + 0.54\frac{w}{h}\right). \qquad \text{(A-9)}$$

Equation A-9 implies that a strip pillar's strength can approach 150% that of a square pillar, but that the strength difference is reduced as the w/h ratio is reduced.

The ultimate load carried by a rectangular pillar is equivalent to the load carried by a square pillar of width w plus a section of a strip pillar of length (L − w), as shown in figure A-4. Combining equations A-6 and A-9, the ultimate load carried by a rectangular pillar (R_r) is

$$R_r = S_1\left\{\left[w^2\left(0.64 + 0.36\frac{w}{h}\right)\right] + \left[(w(L-w))\left(0.64 + 0.54\frac{w}{h}\right)\right]\right\}. \qquad \text{(A-10)}$$

Simplifying:

$$R_r = S_1\left[0.64\,wL + 0.54\left(w^2\frac{L}{h}\right) - 0.18\left(\frac{w^3}{H}\right)\right]. \qquad \text{(A-11)}$$

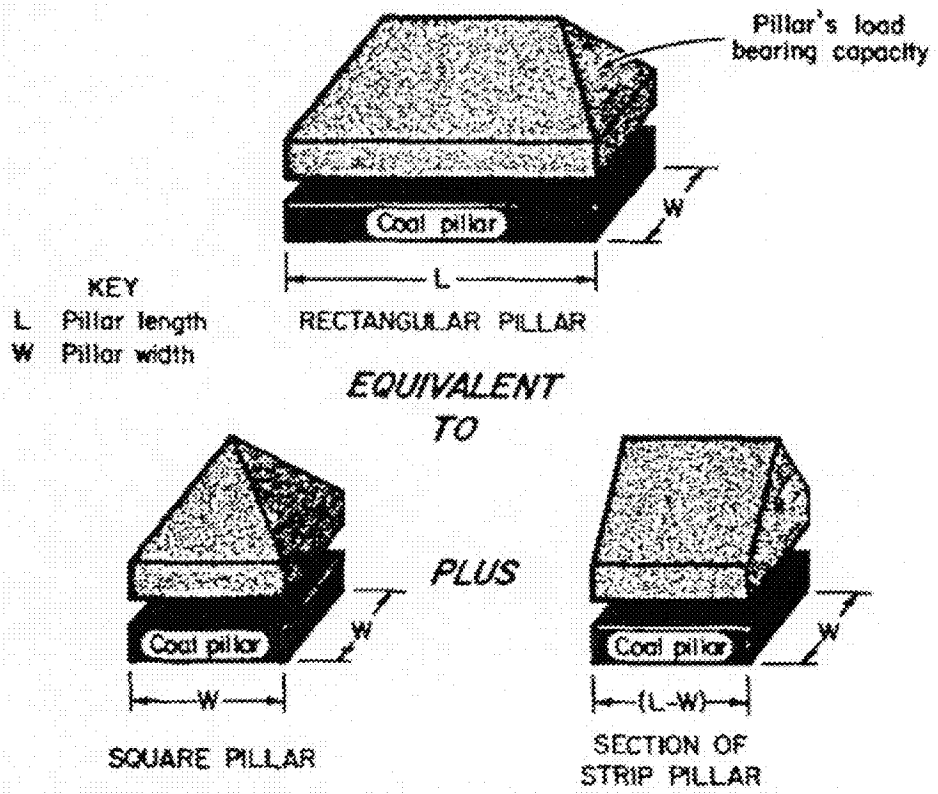

Figure A-4.—Pillar stress distributions for square, strip, and rectangular pillars.

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Dividing by the load-bearing area (wL), the Mark-Bieniawski formula is obtained:

$$S_p = S_1 \left[0.64 + 0.54 \left(\frac{w}{H} \right) - 0.18 \frac{w^2}{Lh} \right]. \qquad \text{(A-12)}$$

Equation A-12 indicates that the increase in strength in a rectangular pillar depends on both (w/h) and (w/L). Table A-1 compares the pillar strengths determined by the Mark-Bieniawski formula with those obtained from the Bieniawski formula.

Table A-1.—Pillar strength from the Mark-Bieniawski formula, assuming the strength of a square pillar (original Bieniawski formula) as unity

Pillar L/w	Pillar w/h				
	1	2	4	10	20
1.5	1.06	1.09	1.12	1.14	1.16
2.0	1.09	1.13	1.18	1.21	1.23
4.0	1.14	1.23	1.32	1.41	1.46
10.0	1.16	1.25	1.34	1.42	1.46

REFERENCES

Bieniawski ZT [1992]. A method revisited: coal pillar strength formula based on field investigations. In: Iannacchione AT, Mark C, Repsher RC, Tuchman RJ, Jones CC, comp. Proceedings of the Workshop on Coal Pillar Mechanics and Design. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9315, pp. 158-163.

Mark C, Iannacchione AT [1992]. Coal pillar mechanics: theoretical models and field measurements compared. In: Iannacchione AT, Mark C, Repsher RC, Tuchman RJ, Jones CC, comp. Proceedings of the Workshop on Coal Pillar Mechanics and Design. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9315, pp. 78-93.

Mark C, Listak JM, Bieniawski ZT [1988]. Yielding coal pillars—field measurements and analysis of design methods. In: Proceedings of the 29th U.S. Symposium on Rock Mechanics. Minneapolis, MN: University of Minnesota, pp. 261-270.

Wagner H [1974]. Determination of the complete load-deformation characteristics of coal pillars. In: Proceedings of the 3rd International Society for Rock Mechanics Congress. Denver, CO: pp. 1076-1081.

Wilson AH [1973]. An hypothesis concerning pillar stability. Min Eng (London) *131*(141):409-417.

Wilson AH [1983]. The stability of underground workings in the soft rocks of the coal measures. Intl J Rock Mech Min Sci *1*:91-187.

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APPENDIX B.—ARMPS CASE HISTORY DATA BASE

Table B-1.—Unsatisfactory pillar retreat case histories

State and coal seam	ARMPS SF	Seam thickness, m (ft)	Depth, m (ft)	Loading condition
Alabama:				
Blue Creek	1.54	1.8 (6.0)	350 (1,150)	2
Blue Creek	0.99	1.8 (6.0)	350 (1,150)	3
Colorado:				
Cameo	0.74	2.1 (7.0)	90 (300)	1
D	1.20	2.7 (9.0)	260 (850)	2
D	0.89	2.7 (9.0)	305 (1,000)	3
Kentucky:				
Harlan	1.15	3.7 (12)	285 (940)	1
Harlan	0.96	2.1 (7.0)	305 (1,000)	1
Harlan	0.86	3.7 (12)	260 (850)	2
Harlan	1.12	3.7 (12)	325 (1,070)	1
Hazard No. 4	0.44	3.0 (10)	305 (1,000)	4
Hazard No. 4	0.56	1.3 (4.2)	245 (800)	3
Hazard No. 4	0.50	1.5 (5.0)	215 (700)	3
Lower Elkhorn (No. 2 Gas)	1.03	4.0 (13.0)	245 (800)	1
Lower Elkhorn (No. 2 Gas)	1.02	4.0 (13.0)	185 (600)	3
Ohio:				
Lower Freeport	1.20	1.5 (5.0)	215 (700)	1
Mahoning	0.66	1.0 (3.3)	75 (250)	1
Mahoning	0.95	1.0 (3.3)	75 (250)	1
Pennsylvania:				
Lower Kittanning	1.41	2.0 (6.5)	115 (380)	2
Lower Kittanning	1.55	2.0 (6.5)	120 (400)	2
Lower Kittanning	1.29	2.1 (7.0)	75 (250)	1
Pittsburgh	0.97	2.1 (7.0)	275 (900)	3
Pittsburgh	1.17	2.3 (7.5)	150 (500)	3
Pittsburgh	1.29	2.2 (7.2)	245 (810)	4
Pittsburgh	1.15	2.2 (7.2)	245 (810)	4
Sewickley	1.82	1.6 (5.25)	185 (600)	3
Tennessee:				
Beach Grove	1.26	0.8 (2.5)	315 (1,025)	1
Beach Grove	0.88	0.8 (2.5)	305 (1,000)	3
Utah:				
Blind Canton	0.84	2.5 (8.3)	365 (1,200)	3
Gilson	0.76	2.7 (9.0)	365 (1,200)	3
Gilson	0.43	2.7 (9.0)	515 (1,690)	3
Lower O'Connor	0.95	5.3 (17.5)	170 (550)	1
Virginia:				
Blair	1.37	1.2 (3.8)	185 (600)	3
Glamorgan	1.06	1.8 (6.0)	215 (700)	3
Jawbone	1.53	1.3 (4.2)	215 (700)	3
Jawbone	1.47	1.4 (4.6)	150 (500)	3
Pocahontas No. 3	0.61	1.7 (5.5)	520 (1,700)	1
Pocahontas No. 3	1.35	1.5 (5.0)	150 (500)	3
Pocahontas No. 4	1.03	2.4 (8.0)	90 (300)	1
West Virginia:				
Beckley	0.72	1.8 (6.0)	350 (1,150)	4
Coalburg	0.75	2.4 (8.0)	90 (300)	1
Coalburg	0.59	2.7 (9.0)	120 (400)	NAp
Coalburg	0.98	2.7 (9.0)	120 (400)	NAp
Coalburg	1.10	2.7 (9.0)	120 (400)	NAp
Coalburg	1.35	2.7 (9.0)	120 (400)	NAp

See explanatory notes at end of table.

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Table B-1.—Unsatisfactory pillar retreat case histories—Continued

State and coal seam	ARMPS SF	Seam thickness, m (ft)	Depth, m (ft)	Loading condition
West Virginia:—Continued				
Dorothy	1.36	3.7 (12.0)	95 (315)	3
Dorothy	1.37	3.7 (12.0)	95 (315)	2
Dorothy (Winifrede)	1.15	3.4 (11.0)	70 (225)	1
Dorothy (Winifrede)	1.45	3.4 (11.0)	70 (225)	4
Dorothy (Winifrede)	1.39	3.7 (12.0)	95 (315)	2
Dorothy (Winifrede)	1.02	3.0 (10.0)	55 (175)	1
Dorothy (Winifrede)	1.15	3.0 (10.0)	100 (325)	2
No. 2 Gas	0.95	1.4 (4.5)	245 (800)	4
Stockton	0.84	3.0 (10.0)	70 (225)	2
Stockton	0.96	3.0 (10.0)	75 (240)	1
Stockton	0.82	3.0 (10.0)	75 (245)	1
Stockton	1.47	3.0 (10.0)	85 (280)	1
Stockton	1.19	3.0 (10.0)	85 (280)	2
([1])	0.72	1.5 (5.0)	120 (400)	1
([1])	0.82	1.4 (4.5)	115 (375)	1

NAp Not applicable.

[1]Not provided by original reference.

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Table B-2.—Satisfactory pillar retreat case histories

State and coal seam	ARMPS SF	Seam thickness, m (ft)	Depth, m (ft)	Loading condition
Alabama:				
Blue Creek	1.96	1.8 (6.0)	350 (1,150)	2
Colorado:				
Cameo	1.86	2.1 (7.0)	120 (400)	3
Cameo	1.14	2.1 (7.0)	215 (700)	2
Cameo	0.93	2.1 (7.0)	245 (800)	3
D	1.23	2.7 (9.0)	260 (850)	2
D	1.44	2.7 (9.0)	215 (700)	2
Illinois:				
Herrin No. 6	1.14	2.4 (8.0)	215 (700)	3
Kentucky:				
Harlan	1.94	2.0 (6.5)	90 (300)	3
Hazard No. 4	1.36	1.3 (4.4)	130 (420)	3
Kellioka	1.41	1.5 (5.0)	260 (860)	2
Kellioka	1.18	1.5 (5.0)	205 (675)	3
Kellioka	0.45	1.5 (5.0)	440 (1,450)	3
Kellioka	1.61	1.5 (5.0)	185 (600)	3
Lower Elkhorn (No. 6 Gas)	1.64	4.0 (13.0)	120 (400)	3
Pond Creek	1.20	1.7 (5.5)	215 (700)	2
Pond Creek	1.70	1.7 (5.5)	135 (450)	3
Pond Creek	2.0	1.7 (5.5)	120 (400)	2
Pond Creek	1.98	1.7 (5.5)	135 (450)	3
Pond Creek	1.69	1.7 (5.5)	135 (450)	2
Ohio:				
Lower Freeport	1.60	1.5 (5.0)	170 (550)	1
Lower Freeport	1.70	1.5 (5.0)	170 (550)	1
Mahoning	2.50	1.0 (3.3)	75 (250)	1
Pennsylvania:				
Lower Freeport	2.06	1.8 (6.0)	120 (400)	3
Lower Kittanning	1.65	2.0 (6.5)	115 (380)	3
Lower Kittanning	1.78	2.0 (6.5)	115 (380)	3
Lower Kittanning	1.79	2.0 (6.5)	120 (400)	3
Lower Kittanning	1.85	2.0 (6.5)	120 (400)	2
Lower Kittanning	2.14	1.5 (5.0)	170 (550)	3
Pittsburgh	1.89	2.1 (7.0)	150 (500)	3
Pittsburgh	2.78	2.2 (7.2)	260 (855)	2
Sewickley	1.70	1.6 (5.25)	185 (600)	3
Sewickley	2.32	1.6 (5.25)	185 (600)	2
Upper Freeport	1.88	1.3 (4.2)	65 (210)	1
Tennessee:				
Beach Grove	0.98	0.8 (2.5)	315 (1,025)	2
Utah:				
Gilson	0.50	2.7 (9.0)	610 (2,000)	2
Virginia:				
Blair	1.65	1.2 (3.8)	185 (600)	3
Glamorgan	2.31	1.8 (6.0)	120 (400)	3
Jawbone	2.86	1.3 (4.2)	135 (450)	2
Jawbone	2.15	1.3 (4.2)	150 (500)	3
Jawbone	1.97	1.4 (4.6)	120 (400)	3
Mossy-Haggy	2.05	0.9 (3.0)	150 (500)	3
Pocahontas No. 3	0.92	1.7 (5.5)	520 (1,700)	2
Pocahontas No. 3	1.21	1.7 (5.5)	520 (1,700)	3
Pocahontas No. 3	1.89	1.5 (5.0)	150 (500)	2
Pocahontas No. 4	0.91	1.8 (6.0)	365 (1,200)	3
Pocahontas No. 4	2.77	0.9 (3.0)	90 (300)	2
Pocahontas No. 4	0.76	2.0 (6.5)	440 (1,450)	3
Red Ash	2.44	0.9 (3.0)	150 (500)	2
Red Ash	2.44	0.9 (3.0)	215 (700)	3
Tiller	2.22	1.2 (4.0)	150 (500)	3

See explanatory notes at end of table.

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Table B-2.—Satisfactory pillar retreat case histories—Continued

State and coal seam	ARMPS SF	Seam thickness, m (ft)	Depth, m (ft)	Loading condition
West Virginia:				
Beckley	0.90	1.8 (6.0)	350 (1,150)	4
Beckley	1.17	2.7 (9.0)	260 (850)	4
Coalburg	1.14	2.7 (9.0)	120 (400)	NAp
Coalburg	1.30	2.7 (9.0)	120 (400)	NAp
Coalburg	1.41	2.7 (9.0)	120 (400)	NAp
Coalburg	1.50	2.7 (9.0)	120 (400)	NAp
Coalburg	1.59	2.7 (9.0)	120 (400)	NAp
Coalburg	1.76	2.7 (9.0)	120 (400)	NAp
Coalburg	1.91	2.7 (9.0)	120 (400)	NAp
Coalburg	2.17	2.7 (9.0)	120 (400)	NAp
Coalburg	2.37	2.7 (9.0)	120 (400)	NAp
Coalburg	2.41	2.7 (9.0)	120 (400)	NAp
Dorothy (Winifrede)	2.10	3.4 (11.0)	70 (225)	2
Dorothy (Winifrede)	1.32	3.0 (10.0)	85 (285)	2
Dorothy (Winifrede)	1.49	3.0 (10.0)	100 (325)	2
Dorothy (Winifrede)	1.72	3.0 (10.0)	70 (225)	2
Fire Creek	1.24	1.4 (4.5)	260 (850)	2
Lower Winifrede	1.73	2.0 (6.5)	185 (600)	2
Peerless	1.56	1.4 (4.75)	215 (700)	2
Sewell	2.55	1.2 (4.0)	105 (350)	2
Stockton	1.56	3.0 (10.0)	65 (220)	2
Stockton	1.99	3.0 (10.0)	75 (245)	2

NAp Not applicable.

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PILLAR DESIGN AND COAL STRENGTH

By Christopher Mark, Ph.D.,[1] and Timothy M. Barton[1]

ABSTRACT

A comprehensive data base was created that includes more than 4,000 individual uniaxial compressive strength test results from more than 60 coal seams. These data were compared with 100 case studies of in-mine pillar performance from the Analysis of Retreat Mining Pillar Stability (ARMPS) data base.

Statistical analysis found no correlation between the ARMPS stability factor of failed pillars and coal specimen strength. Pillar design was much more reliable when a uniform coal strength of 6.2 MPa (900 psi) was used in all case histories. The conclusion is that laboratory testing should *not* be used to determine coal strength for ARMPS.

Other analyses provided evidence of why laboratory strength does not correlate with pillar strength. The data showed clearly that the "size effect" observed in laboratory testing is related to coal structure. The widely used Gaddy formula, which predicts a significant strength reduction as the specimen size is increased, was found to apply only to "blocky" coals. For friable coals, the size effect was much less pronounced, or even nonexistent. Laboratory tests do not account for large-scale discontinuities, such as roof and floor interfaces, which apparently have more effect on pillar strength than small-scale structure.

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BACKGROUND

The uniaxial compressive strength of coal was one of the first issues addressed by early rock mechanics researchers. Bunting [1911] observed that "to mine without adequate pillar support will result, sooner or later, in a squeeze; the inherent effects of which are crushing of the pillars, the caving of the roof, and the heaving of the bottom." By testing anthracite specimens of various sizes and shapes in the laboratory, Bunting and his collaborators hoped to aid mine operators in "establishing the width of chambers and pillars." They soon found that "the crushing strength of small cubes is greater than that for large cubes; and, with a constant base area, the crushing strength becomes less as the height increases" [Daniels and Moore 1907]. Bunting apparently concluded that these two issues, the "size effect" and the "shape effect," prevented the direct use of laboratory strength results in design. His design equation was the first U.S. empirical coal pillar strength formula:

$$S_p = S_1 [0.70 + 0.30(w/h)], \quad (1)$$

where S_p = pillar strength,

S_1 = coal strength parameter,

w = pillar width,

and h = pillar height.

Bunting used the laboratory results to determine the *shape* of the formula (figure 1). The coal strength parameter was determined from analysis of in situ pillar failure ("actual squeezes" in figure 1). For anthracite pillars, it was set at 7 MPa (1,000 psi).

The basic approach employed by Bunting and his colleagues remained the state of the art for much of the 20th century. For example, Zern presented the following equation in the 1928 edition of the "Coal Miner's Pocketbook":

$$S_p = S_1 (w/h)^{0.5}. \quad (2)$$

Zern's suggested value of the coal strength parameter is 4.8-7 MPa (700-1,000 psi).

More than 30 years later, Gaddy [1956] attempted to provide the link between laboratory specimens and field strength. He attacked the size effect by testing coal cubes of various sizes from five seams. Gaddy concluded that the strength decrease with increasing specimen size could be expressed as

$$k = S_c (d)^{-0.3}, \quad (3)$$

where k = Gaddy constant
= estimated strength of a 2.5-cm (1-in) cube,

S = coal specimen strength,

and d = specimen dimension (in).

His work led to the widely used Holland-Gaddy pillar strength formula [Holland and Gaddy 1956]:

$$S_p = k (w)^{0.5}/h. \quad (4)$$

The Holland-Gaddy formula appears to have been the first in the United States to employ a seam-specific strength parameter determined from laboratory testing.

In situ testing of full-scale pillars in South Africa during the 1960's resulted in the concept of a "critical" specimen size beyond which the strength is constant [Bieniawski 1968]. The Bieniawski pillar strength formula below employed this concept:

$$S_p = S_1 [0.64 + 0.36(w/h)], \quad (5)$$

where S_1 = in situ coal strength.

Following Hustrulid [1976], Bieniawski recommended that the in situ strength be determined from laboratory tests and that the Gaddy formula be used to reduce the strength to that of a 1-m (36-in) critical-sized specimen [Bieniawski 1984].

Others proposed versions of the Holland-Gaddy and Obert-Duvall (Bauschinger) formulas that employed the in situ strength parameter [Bieniawski 1984]. It may be noted that the in situ coal strength in equation 5 is functionally equivalent to the "coal strength parameter" in equations 1 and 2.

Despite the fact that textbooks have considered laboratory testing an integral part of pillar design for nearly 30 years, it has remained controversial. One reason is that coal remains notoriously difficult to test. Coal contains many types of discontinuities, including microfractures, cleats, bedding planes, partings, shears, and small faults. Three sources of unreliability have been identified:

1. *Material variability within a particular seam:* Unrug et al. [1985] tested multiple layers of the Warfield and the Coalburg Seams and found that the strongest layers were *six times* stronger than the weakest in each seam. Newman and Hoelle [1993] reported similar results from the Harlan Seam.

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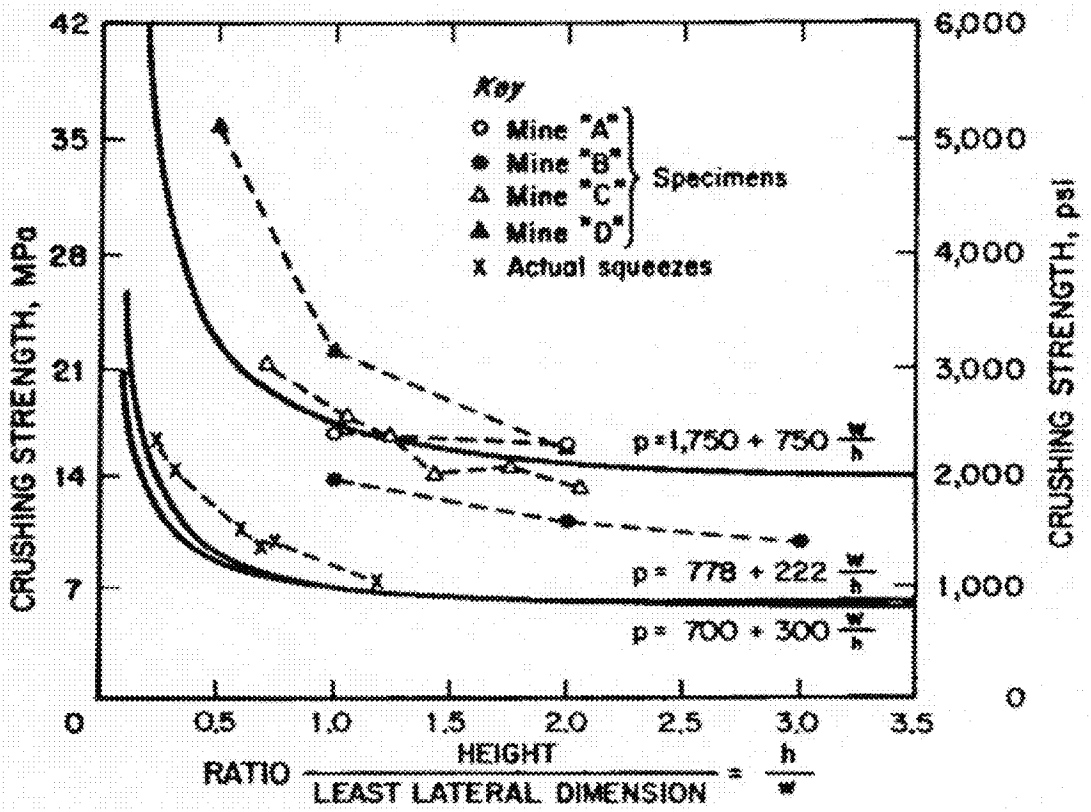

Figure 1.—Data used to develop the first U.S. pillar strength formula (after Bunting, [1911]).

2. *Variation in sampling, specimen preparation, and testing techniques:* Townsend et al. [1977] found that small cylindrical specimens were typically 30% weaker than cubical specimens of the same cross-sectional area. Khair [1968] documented large effects due to platen friction.

3. *Variation in size and shape effects between seams:* Panek [1994] and Mrugala and Belesky [1989], among others, have speculated that Gaddy's size effect exponent of −0.5 may be the *maximum* and not universally applicable. The shape effect has been the subject of numerous studies.

Some have held that these difficulties and the resulting high variability in results are enough to largely invalidate laboratory testing. Another school of researchers in the Republic of South Africa, Australia, and the United States have argued that, although the strength of laboratory-sized specimens varies widely, the in situ coal strength may fall within a narrow range [Salamon 1991; Galvin 1995; Mark 1990]. In each case, their conclusions were based on analysis of in-mine pillar failures. Salamon and Munro [1967] originally analyzed 27 pillar collapses and 92 intact cases. Their formula, perhaps the most widely used in the world, explained the data very well without reference to individual seam strengths. In 1991, Madden reanalyzed an updated version of their data set. Although he found some differences in strength between seams, he concluded again that the average strength could represent all seams. Galvin [1995] conducted a probabilistic analysis of 30 collapsed and stable bord-and-pillar workings from Queensland and New South Wales, Australia. He concluded that "pillar strength in the field is only marginally dependent on the seam strength once the w/h exceeds 2." In the United States, Mark and Chase [1997] presented data from 140 case histories, which were analyzed using the Analysis of Retreat Mining Pillar Stability (ARMPS). ARMPS estimates pillar strength using a slightly modified version of the Bieniawski formula; the analyses assumed a uniform in situ coal strength. Mark and Chase [1997] found that pillar failures occurred in 83% of cases when the ARMPS stability factor (SF) was less than 0.75, but only 8% of cases when it greater than 1.5 (figure 2).

These researchers have all determined that the value of the in situ coal strength falls between 5.4-7.4 MPa (780-1,070 psi). The range is remarkably small, considering that it was determined from three data sets that span the globe. On the other hand, at least one South African seam has been shown by back-calculation to be significantly weaker than the average [Van der Merwe 1993]. In India, researchers concluded from back-analysis of 43 pillar case histories that coal strength should be considered in design [Sheorey et al. 1987].

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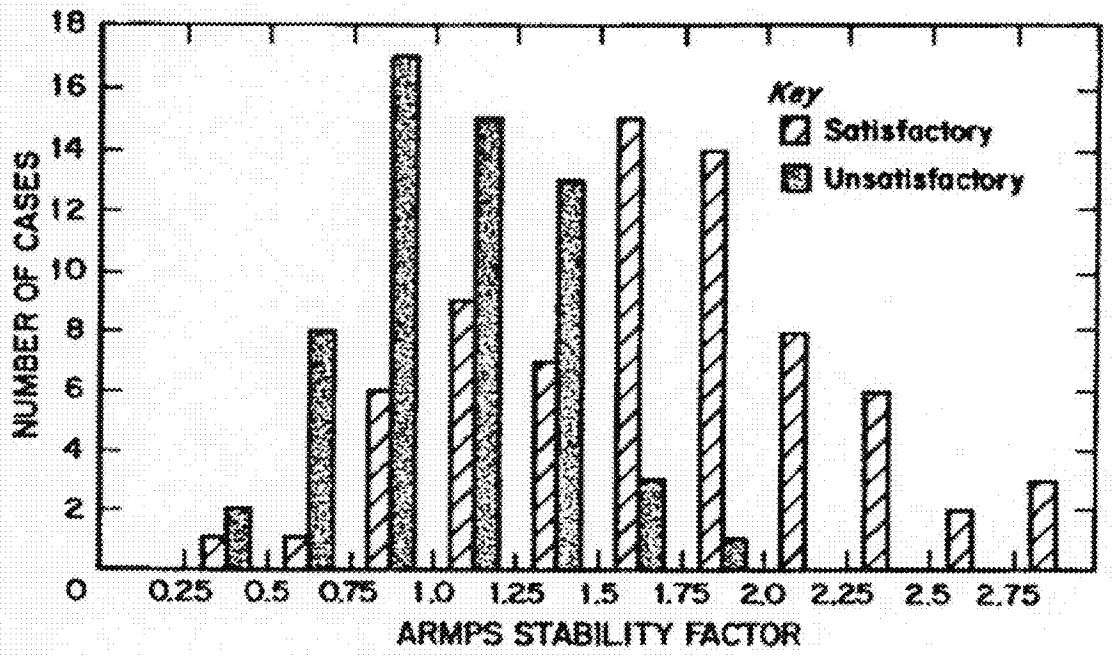

Figure 2.—ARMPS data base.

Interest in the uniaxial compressive strength of coal has also waned over the past 15 years because researchers have devoted their energy to analytic pillar strength formulas and numerical models. These theories are developed from the principles of mechanics rather than curve-fitting to test data. The shift in emphasis has been related to the recent focus on pillar design for longwall mining. Longwalls employ pillars that are much more "squat" than those traditionally used in room-and-pillar operations. Few compressive strength tests have ever been conducted where the specimen width-to-height (w/h) ratio exceeded 4; however, longwall pillars often employ w/h ratios of 10, 20, or greater.

Obviously, the very concept of pillar failure takes on a different meaning for squat pillars. The wide range of conflicting theories about the mechanics of squat pillars and the substantial difficulties with obtaining field data to confirm or disprove any of them have been described elsewhere [Mark and Iannacchione 1992]. On the other hand, Mark et al. [1994] have shown that longwall tailgate performance can be accurately predicted without reference to seam-specific coal strength. There is clearly overwhelming evidence, theoretical and empirical, that the uniaxial compressive strength is irrelevant to the strength of a squat pillar.

Longwall mines, however, account for only 45% of the coal mined underground in the United States. Much of the remainder comes from small room-and-pillar mines usually operating at relatively shallow cover. These mines use many "slender" pillars, and traditional pillar failures still occur. The ARMPS data base contains 60 instances of pillar squeezes, bumps, or collapses that have taken place in recent years. About one-half of these occurred at depths of less than 150 m (500 ft) and involved pillars whose w/h ratio was less than 5. The failures occurred in a variety of seams. Because some seams appear blocky and strong, and others seem weak and extremely friable, it is reasonable to expect that these obvious structural differences might affect pillar strength. As figure 2 shows, successful and unsuccessful designs occur in approximately equal proportions in the ARMPS SF range of 0.75 to 1.5. Might seam-specific laboratory coal strength data explain some of this variability? That was the question this research was initiated to answer.

DISCUSSION OF RESEARCH

Despite the large volume of coal strength testing reported in the literature, it had never been compiled into a single data base. The Pittsburgh Research Center, therefore, undertook the task. The Coal Strength Data Base now contains the results from more than 4,000 individual uniaxial compressive strength tests covering more than 60 seams and obtained from more than 30 references. All of the data have been entered into a spreadsheet and are readily accessible for a wide variety of statistical studies.

Two types of data are included. For about 2,300 tests, information was provided on single specimens. These data were entered individually, then grouped by reference, seam,

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specimen geometry, and specimen size. Each group, or suite, of tests was placed on a separate page within the data base. A "summary line" containing the mean compressive strength and standard deviation for the suite was also generated. The summary lines were collected and placed in the summary table. The summary table also includes lines representing about 1,700 tests that were reported in summary form in the original reference. The summary table contains information on about 380 suites of tests. The structure of the Data Base of Uniaxial Coal Strength (DUCS) is illustrated in figure 3.

A single copy of the DUCS may be obtained by sending three formatted, double-sided, high-density diskettes to: Timothy M. Barton, NIOSH, Pittsburgh Research Center, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070. Please specify whether you prefer .xls, .wk3, or comma-separated values format.

A table of average U.S. coalbed strengths was derived from the summary statistics (table 1). To minimize size and shape effects, this table uses only specimens whose w/h ratio is approximately 1.0 and whose smallest dimension is approximately 5-8 cm (2-3 in). The average coalbed strength is calculated as the weighted mean of all of the summary lines for a particular seam that meet these geometric criteria. In addition to strength data, the Coal Strength Data Base also includes a variety of coal quality information for each seam tested. The most relevant is perhaps the Hardgrove Grindability Index (HGI), which is a measure of the relative grindability of coal. Larger HGI values imply easier grindability and greater friability. The HGI is almost universally required by utilities that purchase coal, so the information is readily accessible. Representative values of the rank, carbon content, volatile content, ash content, and heating value are also included. Because the coal quality data were collected independently of the coal strength data and from different sources, they are approximations for comparative purposes only.

During the past 6 years, coal samples measuring about 0.003 m^3 (0.1 ft^3) have also been collected from 45 seams. These were classified using the following simple system:

Composition:

Bright (>90% bright coal)
Semibright (60%-90% bright coal)
Intermediate (40%-60% bright coal)
Semidull (60%-90% dull coal)
Dull (>90% dull coal)

Structure:

Blocky (major cleat spacing > 8 cm (3 in))
Semiblocky (major cleat spacing 3-8 cm (1-3 in))
Friable (cleat spacing < 3 cm (1 in))

Shearing: Yes or no.

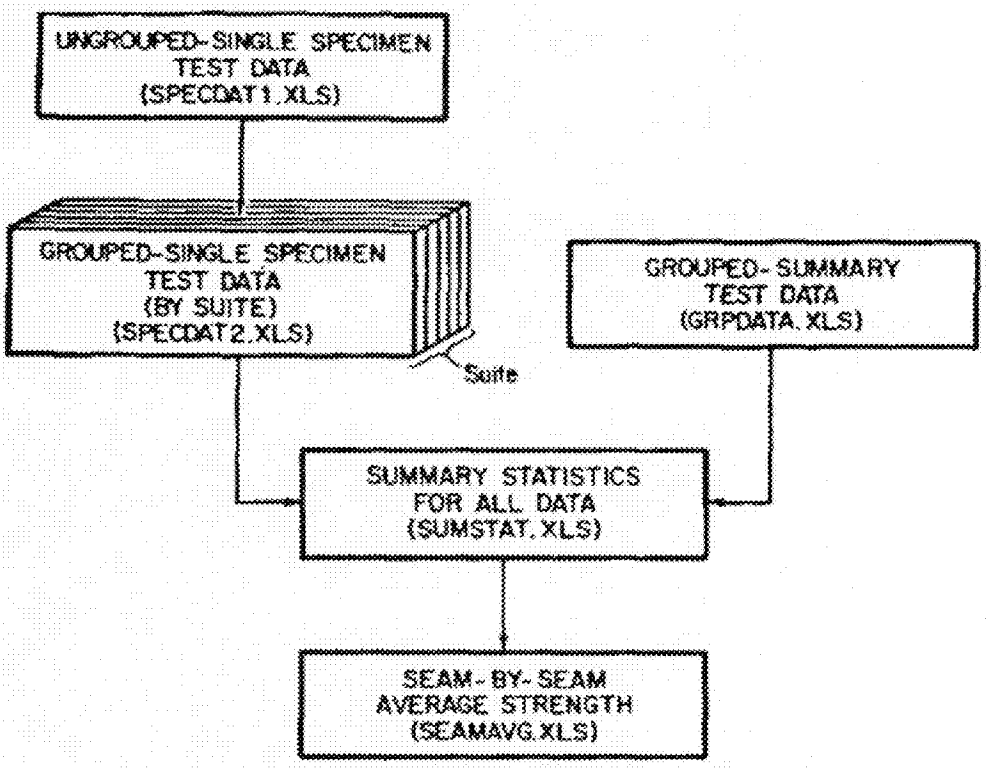

Figure 3.—Structure of the Coal Strength Data Base.

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Table 1.—Unconfined compressive strength of U.S. coal seams (5- to 8-cm (2- to 3-in) specimens)

Coalbed	Seam average strength, MPa (psi)	Typical HGI	No. of tests	Coalbed	Seam average strength, MPa (psi)	Typical HGI	No. of tests
Allen	10.8 (1,570)	100	11	Kentucky No. 13	26.8 (3,890)	80	37
Alma	27.7 (4,024)	56	30	Lower Kittanning	14.6 (2,117)	90	96
B	25.1 (3,633)	95	61	Marker	44.9 (6,509)	47	24
Bakerstown	16.7 (2,420)	64	12	Mary Lee	7.8 (1,135)	76	10
Beckley	14.6 (2,121)	101	30	No. 2 Gas	12.4 (1,801)	52	50
Blind Canyon	38.9 (5,646)	46	54	Pittsburgh	160 (4,330)	56	160
Blue Creek	9.1 (1,324)	81	10	Pocahontas No. 3	10.5 (1,528)	110	85
Chilton	27.4 (3,973)	50	6	Pocahontas No. 4	19.9 (2,892)	90	31
Clintwood	19.2 (2,783)	63	40	Pocahontas No. 5	14.7 (2,127)	100	4
Coalburg	24.3 (3,521)	45	124	Pond Creek	32.0 (4,635)	39	13
D	18.2 (2,632)	46	10	Powellton	13.8 (2,008)	58	13
Darby	20.9 (3,907)	49	22	Redstone	20.2 (2,932)	65	10
Douglas	15.9 (2,300)	50	7	Sewell	16.5 (2,386)	65	30
E	24.2 (3,514)	47	4	Sewickley	27.6 (4,000)	60	72
Eagle	10.5 (1,526)	59	10	Stockton	47.2 (6,844)	45	10
Elkhorn No. 4	30.3 (4,393)	42	24	Sunnyside	26.6 (3,856)	50	48
Geneva	36.2 (5,250)	48	3	Tiller	15.3 (2,215)	54	12
Harlan	32.6 (4,728)	44	88	Upper Banner	9.6 (1,391)	84	30
Hazard No. 4	18.2 (2,644)	43	67	Upper D	46.5 (6,746)	50	36
Hemshaw	32.6 (4,727)	47	10	Upper Freeport	10.3 (1,493)	82	17
Herrin No. 6	24.7 (3,578)	57	102	Upper Hiawatha	37.6 (5,448)	46	20
Island Creek	32.6 (4,734)	42	8	Upper Kittanning	10.5 (1,519)	79	60
Jawbone	3.7 (539)	54	3	Warfield	22.7 (3,295)	50	93
Kalkoka	21.8 (3,159)	44	49	Waynesburg	30.9 (4,474)	54	15
Kentucky No. 9	28.3 (4,102)	54	46	Welch	13.1 (1,902)	95	6
Kentucky No. 11	25.5 (3,693)	52	52	Winifrede	43.8 (6,345)	45	10
Kentucky No. 12	15.6 (2,258)	58	5	York	18.9 (2,735)	54	50

The ARMPS data base contains the best available information on the in situ strength of U.S. coal pillars. ARMPS SF have been back-calculated for 140 case histories (figure 2), covering an extensive range of geologic conditions, extraction methods, depths of cover, and pillar geometries [Mark and Chase 1997]. Ground conditions in each case history have been categorized as either satisfactory or unsatisfactory. Unsatisfactory conditions included—

- Pillar squeezes, with significant entry closure and loss of reserves.
- Sudden collapses of groups of pillars, usually accompanied by airblasts.
- Coal pillar bumps (violent failures of one or more pillars).

RESULTS

ARMPS CASE HISTORY DATA BASE

Coalbed specimen strength data were available for approximately 100 case histories in the ARMPS data base. The case histories are about evenly split between successes and failures. In figure 4, the ARMPS SF are plotted against coal strength. All ARMPS SF were calculated assuming the in situ strength was 6.2 MPa (900 psi). If pillar strength was related to specimen strength, low-strength seams would be expected to fail at greater SF than high-strength seams. Instead, no meaningful correlation between SF and coal strength is apparent in the data. The best discrimination is achieved at an ARMPS SF of 1.55, with a misclassification rate of 20%. Only one failure is included among the misclassifications, which is highly significant from a practical standpoint.

In a second analysis, the ARMPS SF were recalculated using individual seam strengths instead of the uniform in situ strength. The seam strengths were divided by 4, as suggested by the Gaddy formula for a 6.5-cm (2.5-in) specimen, resulting in a mean SF that is about the same as in the first analysis.

The results are shown in figure 5. Now there is a strong correlation between specimen strength and SF, with "stronger" coals requiring higher SF to avoid failure. The best misclassification rate, at an SF of about 1.7, is 37%. Also, the misclassifications now include 10 failures. In other words, when seam-specific strengths are used, the SF becomes almost meaningless.

A third analysis applied seam-specific size-effect exponents to the coal strength data, as defined later in the "Size Effect" section of this paper. The correlation between seam strength and SF was still apparent, as in figure 5. Although the misclassification rate improved to 33%, it was still 50% greater than in the uniform seam strength analysis.

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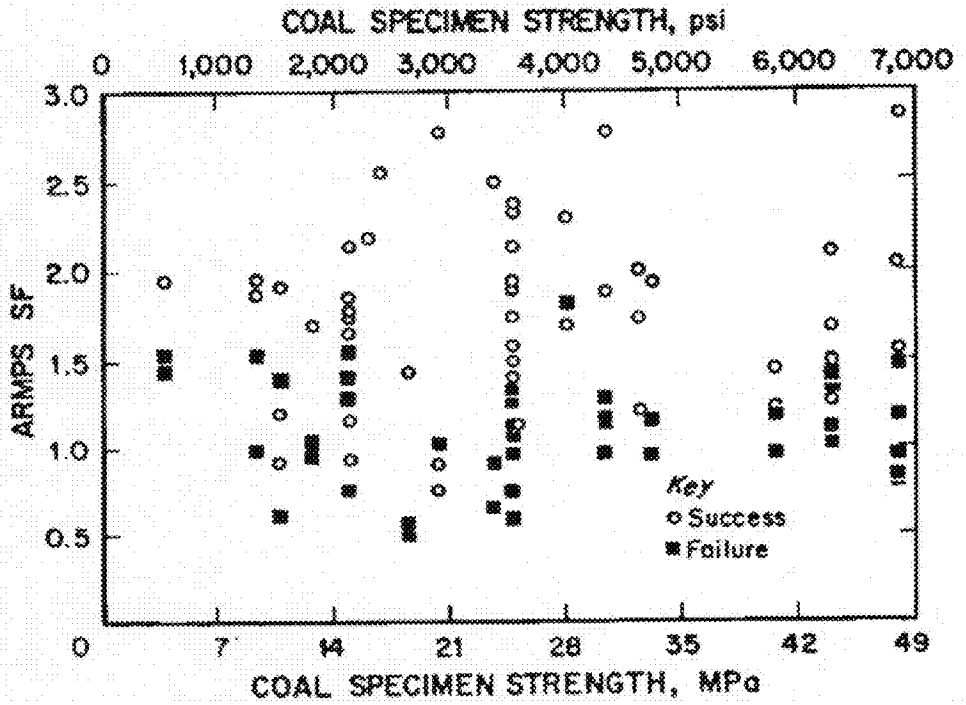

Figure 4.—ARMPS SF compared with specimen strength data.

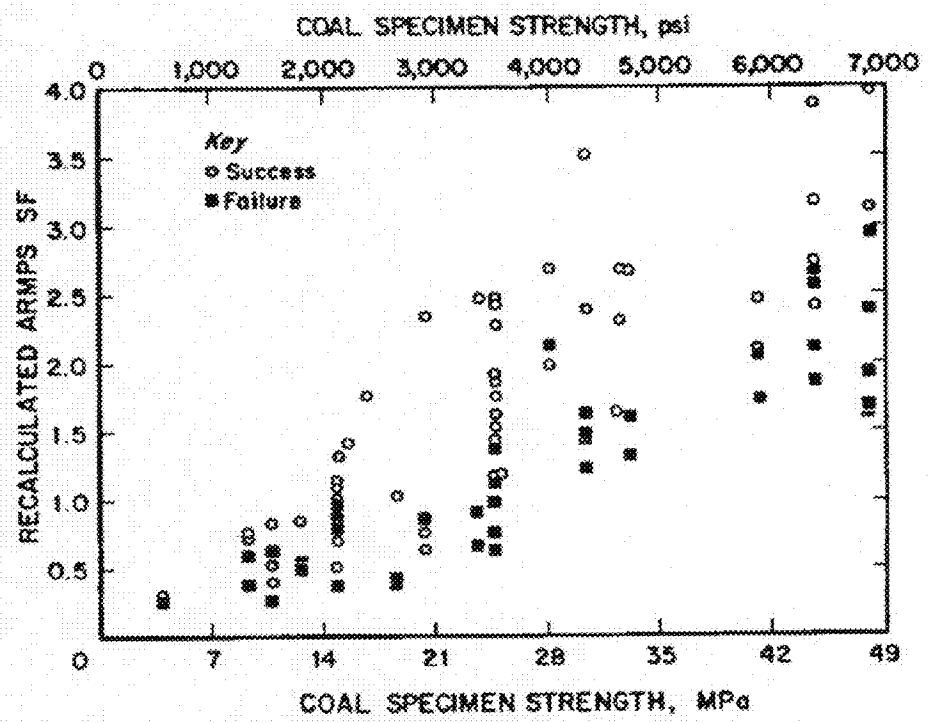

Figure 5.—Recalculated ARMPS SF compared using seam-specific coal strength data.

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The data indicate that there is no meaningful correlation between the specimen strength and the in situ strength of U.S. coal seams. Knowledge of the specimen strength does not improve the accuracy of the design formula's prediction; it *reduces* it. A uniform coal strength provides a much more reliable prediction of pillar performance. Based on these results, laboratory test results are explicitly *not* recommended for use in ARMPS.

SIZE EFFECT

The Coal Strength Data Base contains information from 10 seams where a wide range of specimen sizes have been tested. Five of these were the seams originally tested by Gaddy.

To determine the size effect, only specimens with a w/h ratio of approximately 1:1 were used. Figures 6 and 7 show how power curves were fit to the data of the form:

$$S_c = k(d)^{\alpha}, \qquad (6)$$

where α = size effect exponent.

The results are summarized in table 2. Gaddy's α of −0.5 was found to apply to four seams: the Blind Canyon, Elkhorn, Pittsburgh, and Taggart-Marker. At the other extreme, the two Pocahontas Seams displayed negligible size effect. The other four seams had intermediate size effects. The r^2 values indicate that the size effect typically explains about 50% of the variability in the test results, which is higher than expected considering all of the potential sources of variation in these data. The explanation for the substantial range in size effect exponents is the different structure of the coalbeds. In a blocky coalbed, like the Pittsburgh (figure 6), a small sample will be largely free of cleats and fractures. As the specimen size increases, the density of cleating increases until it finally approaches in situ. In contrast, the fracture density of even a small sample of a friable seam like the Pocahontas No. 3 is nearly as great as in situ (figure 7). The following relationship between size effect and HGI was found (r^2 = 0.75):

$$\alpha = 0.0063\ \mathrm{HGI} - 0.75. \qquad (7)$$

The implications of seam-specific size effects are quite important. It appears that the Gaddy equation underestimates the in situ strength of most seams, sometimes by a factor of 3 or more. Extremely costly and inefficient mining plans have certainly been the result.

COAL STRUCTURE

Several analyses explored the relationship between coal structure and specimen strength. Figure 8 shows U.S. coalbed strengths plotted against HGI. It shows that specimens from all seams with HGI > 70 have strengths less than 20 MPa (3,000 psi). These seams include all of the medium- and low-volatile seams in the data base. Likewise, 85% of seams with HGI < 50 have a strength exceeding 20 MPa (3,000 psi). For the large number of seams between these extremes, the HGI is a poor predictor of strength. Many of these intermediate HGI seams are high-volatile A in rank. The r^2 for the power curve fit to the entire data set is 0.33.

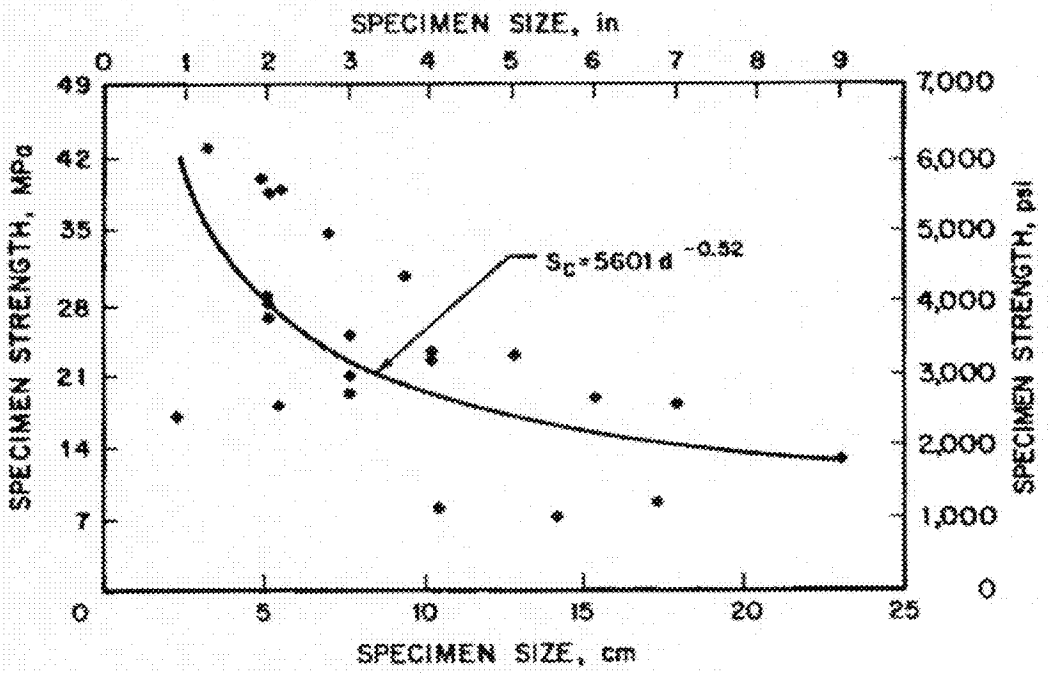

Figure 6.—Size effect in the blocky Pittsburgh Seam.

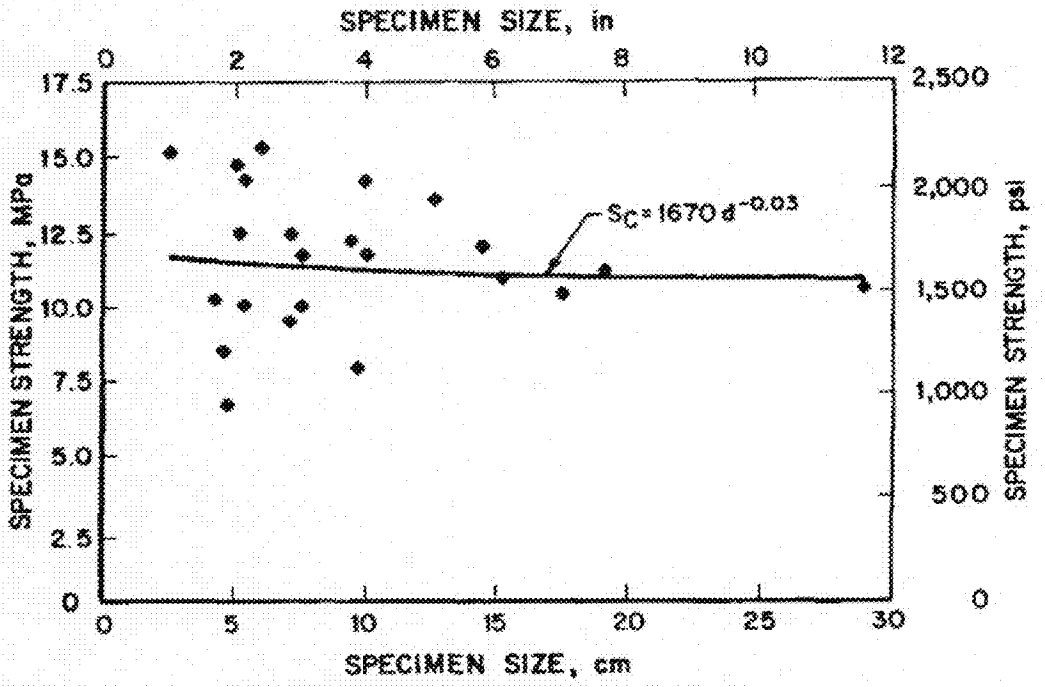

Figure 7.—Size effect in the friable Pocahontas No. 3 Seam.

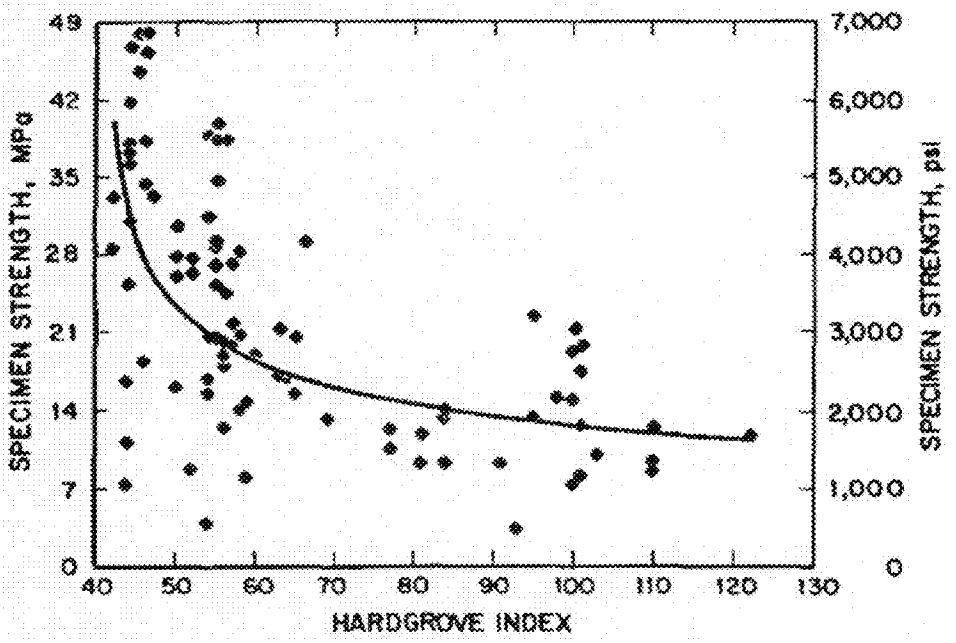

Figure 8.—Specimen strength and HGI of U.S. coalbeds.

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Table 2.—Size effect exponents for 10 U.S. coal seams

Coalbed	No. of specimens	No. of references	Maximum specimen size, cm (in)	HGI	Size effect (α)	k	r^2
Blind Canyon	126	2	29.5 (11.6)	46	-0.54	7,045	0.90
Clintwood	88	1	18 (7)	63	-0.31	3,686	0.93
Elkhorn	69	1	16.0 (6.3)	42	-0.55	7,302	0.52
Harlan	129	2	18 (7)	44	-0.29	6,491	0.31
Herrin No. 6	150	5	34.5 (13.6)	56	-0.38	4,293	0.33
Taggart-Marker	60	1	18 (7)	47	-0.45	8,837	0.99
Pittsburgh	272	7	22.9 (9.0)	55	-0.52	5,601	0.48
Pocahontas No. 3	140	5	29.5 (11.6)	110	-0.03	1,670	0.01
Pocahontas No. 4	74	1	18 (7)	100	-0.13	3,238	0.58
Upper Banner	78	1	20.8 (8.2)	84	-0.29	1,730	0.34

The second analysis compared the structure of the hand samples obtained from the mines with the HGI. In this case, every seam rated "blocky" had an HGI less than 60. The HGI of the "semiblocky" seams was less than 80. "Friable" seams were found throughout the range of HGI.

Compressive strength and sample structure data were available for 26 seams. The specimen strength of all eight blocky seams exceeded 23 MPa (3,500 psi), but so did that of four friable and one semiblocky seam. Another 13 friable and semiblocky seams were intermixed below 23 MPa (3,500 psi).

CONCLUSIONS

The results of this study cast doubt on many textbook assumptions about the value of coal strength testing. The data clearly show that specimen strength and the "size effect" are highly seam-specific and related to coal structure. The widely used Gaddy formula, which applies a uniform strength reduction for all seams as specimen size is increased, only applies to "blocky" coals with cleats spaced more than 8 cm (3 in) apart. For friable coals, the size effect was much less pronounced, or even nonexistent.

Case histories of failed pillars are the best available data on in situ coal strength. This study found no correlation between the ARMPS SF of failed pillars and coal specimen strength in the ARMPS data base. In current ARMPS practice, pillars are designed assuming an in situ strength of 6.2 MPa (900 psi) for all seams. When the specimen strength was used instead, the reliability of the ARMPS design method decreased substantially. Australian and South African studies have also found that pillar strength in the field is largely independent of specimen strength.

It should be noted that the coal strength tests were only matched with the seams in the case histories, not with the individual mines. It is also possible that some of the case histories involved roof or floor failure rather than pillar failures. Using a different pillar strength formula might also have changed the results somewhat. However, the data base is so large and the trends so strong that it is highly unlikely that the study is unrepresentative.

The most likely explanation for the results of the study is that specimen and in situ strengths are determined by different parameters. Laboratory tests, particularly those of blocky coals, require a significant amount of fracturing of intact coal. Pillars contain so many cleats and other discontinuities that their failure can occur almost entirely along preexisting fractures. The laboratory tests measure a parameter—the intact coal strength—that is apparently irrelevant to the in situ strength.

The study did not prove that the in situ strength of all U.S. coals is uniform. It only showed that a uniform strength is a better approximation than one based on laboratory testing. There is still significant variability in the ARMPS SF range of 0.75 to 1.5. Recent model studies have indicated that features such as roof and floor interfaces, bedding planes, partings, or weak coal layers have the greatest effects on in situ strength [Iannacchione 1990; Su and Hasenfus 1996]. A rock mass classification, such as the one proposed by Kalamaras and Bieniawski [1993], may prove to be an effective way of evaluating these effects in the field. In the meantime, laboratory uniaxial coal strength test results should not be used for pillar design with ARMPS.

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REFERENCES

Bieniawski ZT [1968]. The effects of specimen size on the compressive strength of coal. Intl J Rock Mech Min Sci 5:325-335.

Bieniawski ZT [1984]. Rock mechanics design in mining and tunneling. Balkema, Rotterdam, pp. 55-92.

Bunting D [1911]. Chamber pillars in deep anthracite mines. Trans AIME 42:236-245.

Daniels J, Moore LD [1907]. The ultimate crushing strength of coal. Eng Min J, Aug 10:263-268.

Gaddy FL [1956]. A study of the ultimate strength of coal as related to the absolute size of cubical specimens tested. VA Polytechnic Bull 112, Aug:1-27.

Galvin JM [1995]. Roadway and pillar mechanics workshop: stage 2 - design principles and practice (Course notes). Sydney, New South Wales, Australia: University of New South Wales.

Holland CT, Gaddy FL [1956]. Some aspects of permanent support of overburden on coal beds. In: Proceedings of the West Virginia Coal Mining Institute, pp. 43-65.

Hustrulid WA [1976]. A review of coal pillar strength formulas. Rock Mechanics 8:115-145.

Iannacchione AT [1990]. The effects of roof and floor interface slip on coal pillar behavior. In: Hustrulid WA, Johnson GA, eds. Proceedings of the 31st U.S. Symposium on Rock Mechanics. Golden, CO: Colorado School of Mines, pp. 153-160.

Kalamaras GS, Bieniawski ZT [1993]. A rock mass strength concept for coal seams. In: Proceedings of the 12th Conference on Ground Control in Mining. Morgantown, WV: West Virginia University, pp. 274-283.

Khair AW [1968]. The effects of coefficient of friction on strength of model coal pillar [Thesis]. Morgantown, WV: West Virginia University, Department of Mining Engineering.

Madden BJ [1991]. A re-assessment of coal-pillar design. J South Afr Inst Min Metall 91:27-37.

Mark C [1990]. Pillar design methods for longwall mining. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9247.

Mark C, Iannacchione AT [1992]. Coal pillar mechanics: theoretical models and field measurements compared. In: Iannacchione AT, Mark C, Repsher RC, Tuchman RJ, Jones CC, comp. Proceedings of the Workshop on Coal Pillar Mechanics and Design. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, IC 9315, pp. 78-93.

Mark C, Chase FE, Molinda GM [1994]. Design of longwall gate entry systems using roof classification. In: Mark C, Tuchman RJ, Repsher RC, Simon CL, comp. New Technology for Longwall Ground Control; Proceedings: U.S. Bureau of Mines Technology Transfer Seminar. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, SP 01-94, pp. 5-18.

Mark C, Chase FE [1997]. Analysis of retreat mining pillar stability (ARMPS). In: Mark C, Tuchman RJ, comp. Proceedings: New Technology for Ground Control in Retreat Mining. Pittsburgh, PA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, IC 9446.

Mraguda MJ, Belesky RM [1989]. Pillar sizing. In: Proceedings of the 30th U.S. Symposium on Rock Mechanics. Morgantown, WV: West Virginia University, pp. 395-402.

Newman DA, Hoelle JL [1993]. The impact of variability in coal strength on mine planing and design - a case history. In: 12th Conference on Ground Control in Mining. Morgantown, WV: West Virginia University, pp. 237-243.

Panek LA [1994]. Scaling mine pillars' size and shape with the psi function. Soc Min Eng AIME preprint 94-52, pp. 1277-1280.

Salamon MDG [1991]. Behavior and design of coal pillars. Australian Coal J 32:11-22.

Salamon MDG, Munro AH [1967]. A study of the strength of coal pillars. J South Afr Inst Min Metall, Sept:55-67.

Sheorey PR, Das MN, Barat D, Prasad RK, Singh B [1987]. Coal pillar strength estimation from failed and stable cases. Intl J Rock Mech Min Sci Geomech Abstr 24(6):347-355.

Su DWH, Hasenfus GJ [1996]. Practical coal pillar design considerations based on numerical modeling. In: 15th Conference on Ground Control in Mining. Golden, CO: Colorado School of Mines.

Townsend JM, Jennings WC, Haycocks C, Neall GM, Johnson, LP [1977]. A relationship between the ultimate compressive strength of cubes and cylinders for coal specimens. In: Symposium for Rock Mechanics, Keystone, CO, pp. 4A6-1 to 4A6-6.

Unrug KF, Nandy S, Thompson E [1985]. Evaluation of the coal strength for pillar calculations. SME AIME preprint 85-314.

Van der Merwe JN [1993]. Revised strength factor for coal in the Vaal basin. J South Afr Inst Min Metall 93(3), pp. 71-77.

Zern EN [1928]. Coal miner's pocketbook. McGraw-Hill, NY, 12th ed., pp. 641-645.

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(5) (b) the anticipated effects of planned subsidence upon the land and water resources identified in the subsidence control survey and survey of ground and surface water resources.

(c) the measures to be taken to mitigate the anticipated effects of planned subsidence to the land and water resources.

(d) the anticipated effects of planned subsidence upon the structures identified in the subsidence control survey.

(e) the proposed measures to be taken to mitigate anticipated effects to structures.

(f) the proposed measures to determine the extent of mining related damages including a presubsidence survey with an indication of the timing of the survey.

(g) the provisions for repair and/or compensation for damages to structures.

(h) describe the monitoring, if any, needed to determine the commencement and degree of subsidence so that, when appropriate, other measures can be taken to prevent, reduce, or correct material damage in accordance with rule 1501:13-12-03 of the Administrative Code.

(6) Will planned subsidence operations be conducted within the angle of draw of urbanized areas, cities, towns, communities, industrial or commercial buildings, major impoundments, or perennial streams? ____Yes, __X__ No. If yes, describe any measures or activities that will prevent a condition or practice that could result in an imminent danger to the health or safety of the public.

(7) Will planned subsidence operations be conducted within the angle of draw of transmission pipelines? Yes, __X__ No. If yes, describe the procedural plan to avoid the creation of a situation of imminent danger to the health and safety of the public.

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PART 4 FORMAT AND CONTENT

FILING OF ADDENDA

If an addendum is needed to present the information required by the items in the permit application, the addendum is to be submitted with the permit application and each page, map, plan or other document in the addendum should include the applicants name and indicate to what item the addendum applies. For example, Addendum to Part 3, item K(2),Zebco Coal Company.

Provide the information requested below for all technical data submitted in the application.

Identification of Technical Data (1)	Person/Organization that Collected Data and Date	Methodology for Collecting Data	Person/Organization that Collected Data and Date	Methodology Used to Analyze Data
PART 2, C ATTACHMENT 14	FRED BLACKMAN, QUALITY ENVIRONMENTAL SERVICES	GRAB SAMPLES AND INTERVIEWS	FRED BLACKMAN, QUALITY ENVIRONMENTAL SERVICES	ANALYZE AS NECESSARY FOR PARAMETERS
ATTACHMENT 14	MOODY AND ASSOCIATES	GRAB SAMPLES, AND INTERVIEWS	DAVE ANDERSON, MOODY AND ASSOCIATES	ANALYZE AS NECESSARY FOR PARAMETERS
ATTACHMENT 13	KEROGEN RESOURCES, INC	CORE DRILL	KIM CECIL, KEROGEN RESOURCES, INC	ANALYZE AS NECESSARY FOR PARAMETERS

(1) The technical data is to be identified by referencing the particular item in the application for which the data was used in preparing the response (e.g. Part 2, B(1); Attachment 14; Part 4, A).

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Provide the name, address, and position of officials of each private or academic research organization or governmental agency contacted in the preparation of the application for information on land uses, soils, geology, vegetation, fish and wildlife, water quantity and quality, air quality, and archeological, cultural, and historic features.

Name and Address of Official	Position of Official	Name of Agency/ Organization	Type of Information (e.g. Geology)
BILL HAIKER 1855 FOUNTAIN SQUARE COURT, COLUMBUS, OHIO 43224	HYDROGEOLOGIST	ODNR, DIVISION OF WATER	Groundwater Inventory
RICHARD WHITT P. O. BOX 2019 WHEELNG, WV 26003	ANALYSIST	TRA-DET, INC	Water Sample Analysis

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APPLICATION FOR ABANDONED MINED LAND DIRECT NEGOTIATED CONTRACT (IF APPLICABLE)

N/A

In accordance with Section 1513.27 of the Ohio Revised Code, the chief of the Division of Reclamation has been granted the authority to enter into contracts with licensed operators for reclamation of abandoned mined lands affected by coal mining prior to April 10, 1972 and located adjacent to a permit area. To be eligible for reclamation funding, the abandoned mined land must be causing offsite environmental problems, will not be affected by the operator during the normal course of mining, and is not likely to be mined in the foreseeable future. If such lands exist adjacent to your permit area and you are interested in contracting for reclamation of the lands, complete this application , detach and send directly to:

Robert S. Baker, Manager
Mined Land Reclamation
Division of Reclamation
Fountain Square, H-2
Columbus, Ohio 43224

Upon receipt, a representative from the Mined Land Reclamation section will contact you.

Applicant:

Address:

City: _____ State: _____ Zip:

Business Telephone:

Contact Person:

Description of Abandoned Mined Land:

County:
Township:
Section/Lot:
Approximate Acreage:

Environmental Problems Associated with Site:

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