UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

MAR 23 1993

Mr. Gene Shockey
Vice President and General Manager
Island Creek Coal Company, Virginia Division
Drawer L
Oakwood, VA 24631

Re: VAS2D926BBUC

Your January 22, 1993 submission of a permit application for a Class IID brine disposal well to be utilized for the injection of brine into Island Creek Coal Company's Number 5 Mine in Oakwood, Buchanan County, VA has been reviewed for completeness by Region III UIC program staff. The above referenced permit application number has been assigned to this submission. All future correspondence to EPA should reference this number.

Under the provisions of 40 CFR Parts 124.3 and 144.3(d), I am transmitting a notice of deficiency regarding this permit application submission. Until such time as the enclosed deficiencies are corrected, your permit application can not be considered complete and an effective date for further processing can not be set. Should you fail to correct these deficiencies, permit denial may result in accordance with 40 CFR Part 124.3(d).

Please contact Steve Platt of my staff at 215-597-2537 if you should have any questions regarding this notice.

Sincerely,

Karen D. Johnson

Karen D. Johnson, Chief
UIC Section (3WM43)
DW/GW Protection Branch

Enclosure

cc: Larry Rine, MSES Consultants
Tom Fulmer, DMME

U. S. Environmental Protection Agency
Region III
Underground Injection Control Program

Notice of Deficiency
for
EPA Permit Application VAS2D926BBUC

Attachment A: The Area of Review for this well is atypical in that the injection zone is a mine void contained within a geologic formation and not a situation where pressure will determine the extent of the Area of Review away from the wellbore. Since injection will be by gravity, the Area of Review for this case must be represented by the volume of brine which can be injected into the mine void as well as the actual boundary limits to the mine void. Therefore, you will need to calculate as accurately as possible the volumetric capacity of the mine void, taking into account all of the unmined portions or benches which exist. We have conducted some preliminary calculations based on the dimensions of the mine provided in your drawings. We will compare your calculations against ours and use this information to determine the potential life expectancy of this operation.

Attachment B: The inventory of private wells was conducted in 1980. Is it possible that new supplies now exist in the area? If so, provide this information.

Attachment C: Identify the names and addresses of all property owners of record within one-quarter mile of the facility's boundary.

The application indicated that the exploration core holes within the limits of the mine void have been plugged. Please provide additional information on how these holes were plugged as well as the date each hole was plugged.

The application provided no information on the status of the ventilation holes, test hole, nitrogen injection hole NIT1, rock dust hole, or the water supply well for the mine. Have all of these holes been plugged? If so, please provide the same information as requested above. If these holes have not been plugged, they will need to be addressed through plugging or monitoring (see attachment P) prior to injection.

How is the proposed monitoring well (i.e.,

nitrogen injection hole NIT2) constructed?

Attachment E: We have identified the lowermost USDW to be 400 feet below land surface. If possible, provide the geologic name of the formation which corresponds to this lowermost USDW.

Attachment G: The need to document the confinement of this mine void is extremely important. More so than any other application with which this office has dealt, assurances to the public that their water supplies will not be compromised and that the brine will remain confined to the mine void will be imperative. You will need to more adequately document the confinement of this mine void both vertically and horizontally. Do you have additional information from the core holes on permeabilities of the adjacent confining units? Also, how are the mine ports sealed (e.g., with what materials)?

In addition, we are concerned about the fracturing of the surrounding formations which likely occurred during the mining of the Pocahontas. Is it possible the quartz arenite formation could have been fractured during mining? Any fractured units above, below or lateral to the Pocahontas would have to be considered part of the injection zone and would require any wells drilled to these units being included within the area of review.

Finally, what plans does Island Creek or other companies in the area have for drilling or mining above or below the Pocahontas in this area in the future? We are concerned that any future activities in the area could have a significant impact on the confinement of the brine to this mine void.

Attachment K: How will the well and the well site be secured to prevent unauthorized injection? Since injection will be a simple matter of just hooking up to a hose attached to the well, security issues become more of a concern.

Attachment O: The application indicates that in the event of a well failure the well will be shut-in immediately. How will failure be detected immediately and what device will automatically shut the well in?

Attachment P: Even though the well will be operated under gravity, Section 146.8 of the UIC regulations requires that a mechanical integrity test be performed on the well prior to injection being authorized. We recommend that a pressure test, utilizing no more than 300 psi, be run on the 8 5/8 inch by 4 1/2 inch casing/tubing annulus.

You have proposed utilizing only one monitoring well (NIT2), plus the injection well, to monitor the fluid level within the mine void. We believe it will be necessary to place additional monitoring wells at different locations around the mine void to ensure confinement. We believe that monitoring of the sealed ports as well as the monitoring of the northern and southern limits of the mine will be necessary. You may be able to utilize certain holes currently in place (e.g., L-223 and L-221) for monitoring. Other wells will need to be constructed at the lower southern ports of the mine and laterally north and south of the mine limits.

Karen D. Johnson

Karen D. Johnson, Chief
UIC Section (3WM43)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Mr. Gerald Ramsey
Island Creek Coal Company
Virginia Division
Drawer L
Oakwood, PA 24631

SEP 21 1993

Dear Mr. Ramsey:

EPA Region III Underground Injection Control (UIC) staff have completed their review of Island Creek Coal Company's August 26, 1993 notice of deficiency response for the Class IID brine disposal well to be located at the Number 5 Mine in Oakwood, Buchanan County, Virginia. Most of the deficiencies that this office cited in the initial notice of deficiency have been adequately addressed. However, there are a few remaining deficiencies which require further explanation and we have listed these below.

In general, UIC program staff continue to have doubts and remain concerned that this project will be unable to continually protect underground sources of drinking water. You have admitted in your response that there exists the potential for roof collapse in the mine and as a consequence subsidence may occur as well. Should these events occur, the protection of USDWs may be compromised. We also believe that fracturing has not been, and may not be able to be, adequately substantiated. Any roof collapse of the mine would only add to the fracturing and instability of the geologic formations above the mine. We further noted in our review of your response that there are approximately 25 private water supply wells within one-quarter mile of the mine. Some of these wells are as deep as 400 feet and others are located directly on top of the mine void near unplugged vent holes. How can the protection of these water supplies and USDWs be guaranteed if the mine roof collapses creating additional fracturing and the potential for subsidence? Unless our office is convinced that the protection of the USDWs in the area will not be effected throughout the duration of this operation, we will be unable to defend this project before the public once we go to public notice.

Should you be able to provide additional assurances that the protection of USDWs will be adequate, more stringent permit conditions, in addition to those which typically are imposed with each permit issuance, would be required. These conditions would include, but not be limited to, the following: 1) the placement of one ground water monitoring well outside of each sealed port, as well as one in the northern limits of the mine near the

private water supplies; 2) the permit being issued for only 5 years, after which time the project would be evaluated prior to permit reissuance (reissuance of a permit requires public notification); 3) A 0 psi injection pressure would be maintained throughout the operation and any exceedence of this pressure would result in the well being shut-in; 4) Some amount of pressure (approximately 50 psi) would be required to be maintained on the annulus for the purpose of monitoring for leak detection; and 5) the monitoring and recording of daily as well as cumulative volume of fluid injected would be required.

As mentioned in the first paragraph of this letter, we need additional information or clarification on the following deficiencies.

1. There are a number of active ventilation holes which have not been plugged. Have all of these remained active in order to vent gas from the mine? Could any of these vents be used for monitoring?

2. Ventilation hole VVH-110 is not 5 miles away. According to DWG #91-56-1, this hole is located approximately 1500 feet east of VVH-105. Please clarify.

3. We could not locate VVH-104 and VVH-105. Both are plugged according to your submission.

4. What does "surface to surface" mean under the cementing column in Appendix I? For example, for WH-90, does this mean the 9 5/8 inch casing is cemented from 215 feet to the surface and the 7 inch casing is cemented from 1839 feet to the surface?

5. What purpose does it serve to allow holes 5HLMR2, 5H2OBH, and 5RKDST to remain open and active?

If you should have any questions, please give Steve Platt of my staff a call at 215-597-2537. A prompt response to this letter would be appreciated.

Sincerely,

Karen D. Johnson

Karen D. Johnson, Chief
UIC Section (3WM43)
Drinking Water/Ground Water
Protection Branch

cc: Tom Fulmer, Virginia Gas and Oil
Larry Rine, MSES Consultants, Inc.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PERMIT APPLICATION
NUMBER

VAS2D926BBUC

RESPONSE TO NOTICE

OF DEFICIENCY OF

PERMIT APPLICATION FOR

CLASS II-D INJECTION WELL

UNDERGROUND INJECTION

OF

BRINE WATER

ISLAND CREEK COAL COMPANY
DRAWER L
OAKWOOD, VIRGINIA 24631

MSES PROJECT NO. 91-56

JULY, 1993

MSES CONSULTANTS, INC.
609 WEST MAIN STREET
P.O. DRAWER 190
CLARKSBURG, WEST VIRGINIA 26302-0190

MSES
Environmental & Engineering Consultants

ISLAND CREEK COAL COMPANY
VIRGINIA DIVISION
Drawer L
Oakwood, Virginia 24631

January 13, 1994

Ms. Karen D. Johnson, Chief
UIC Section (3WM43)
Drinking Water/Groundwater Protection Branch
United States Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, PA 19107

RESPONSES TO
NOTICE OF DEFICIENCY
FOR
ISLAND CREEK COAL COMPANY
PERMIT APPLICATION VAS2D926BBUC
DATED SEPTEMBER 21, 1993

Dear Ms. Johnson:

Island Creek Coal Company is submitting the enclosed responses to the September 21, 1993 Notice of Deficiency for UIC Permit Application Number VAS2D926BBUC.

The responses to the September 21, 1993 Notice of Deficiencies are provided by the following pages identified as:

Should you have questions or require further information, please contact Mr. Gerald Ramsey of Island Creek Coal Company.

Sincerely,

Richard R. Rieger

Richard R. Rieger
Vice President, VA Operations

xc: Mr. Gerald Ramsey, Island Creek Coal Company
Mr. Larry Rine, MSES Consultants, Inc.
Mr. Byron T. Fulmer, Virginia Gas and Oil

Permit Application Number VAS2D926BBUC

RESPONSES TO NOTICE OF DEFICIENCY FOR ISLAND CREEK COAL COMPANY

1.0 INTRODUCTION

This response to the U. S. Environmental Protection Agency Region III Notice of Deficiencies for Island Creek Coal Company Permit Application Number VAS2D926BBUC dated September 21, 1993 is provided by the following sections of this submittal.

2.0 MONITORING

The main thrust of the underground injection control (UIC) program is the protection of underground sources of drinking water. The Island Creek Coal Company's proposal to inject produced fluids from its mining operations into a topographic low sealed mined out area of the VP Number 5 mine can achieve this protection of the USDW. This protection is achieved by:

1) The area to receive the fluids is greater than 1,000-feet below the lowest known USDW.

2) The aerial extent of the fluid disposal/storage area is defined thus establishing a fluid depth and a volummetric measurement that can be used as an effective monitoring tool.

3) The area proposed for the fluid disposal/storage is a topographic low thus creating a natural depression from below any known USDW.

4) The area proposed for the fluid disposal/storage has been sealed from the remainder of the active mining activities being conducted in the VP Number 5 mine. These seals and their condition are visually checked on a weekly basis. This type of monitoring allows for a rapid detection of any problem with the seals or conditions that may effect the seal's integrity.

5) The area proposed for the fluid disposal/storage has been mined and as a result of this mining some roof collapse has been experienced within this sealed area. The type and magnitude of the roof's collapse in this sealed area or other areas of the VP Number 5 mine are localized and with the type, thickness, and structural qualities of the strata overlying the coal, no fractures have occurred which extend from the mine void to USDW's.

6) The injection of the fluids into the sealed area of VP Number 5 mine will be by a drilled, cased and sealed injection port (well) that will allow the fluids to flow by gravity into the sealed area. The proposed injection port is strategically placed in the sealed area near the highest elevation of the area to receive/store the fluids. Therefore, gravity injection (flow) into the sealed area at the location chosen will allow the fluids to flow down gradient and fill the topographic low. Further, with the gravity injection and the location of the injection port, no injection pressure above normal atmosphere pressure will be achieved.

7) The location of the injection port will allow for both the fluid pressure and fluid level monitoring of the fluids introduced into this sealed area.

To further protect the USDW, Island Creek Coal Company would suggest the following monitoring program:

1) Visually monitor the mine seals.

2) Fill the annular area between the 8 5/8-inch casing and the 4 1/2-inch injection tubing with a weighted fluid and monitor its level. A loss in the level would indicate a possible problem in the injection port's piping.

3) Install a water meter that would allow the recording of each injection individually and provide a total to date of all injections.

4) Monitor and record (manually) the pressure of the injection port during any injection.

5) Monitor the liquid level in the proposed injection port (well). A recordable level in the injection port would signify that the topographic low area within the sealed mined out area has achieved its maximum volume and injection should cease.

6) Monitor the liquid level in the one (1) existing hole identified as 5-NIT2. This liquid level measurement coupled with the liquid level measurement of the injection port will allow for the monitoring of the disposal/storage area's performance.

No other monitoring is suggested. Should a problem be recorded by any of the individual monitoring points, injection will be stopped until the problem is corrected and US EPA Region III and the Virginia Gas and Oil Section approves the resumption of injection.

3.0 NOTICE OF DEFICIENCY

On September 21, 1993, the U. S. Environmental Protection Agency Region III provided a list of deficiencies for which further information was requested. The following will reproduce the deficiency followed by Island Creek Coal Company's response

Permit Application Number VA520926BBUC

Deficiency

There are a number of active ventilation holes which have not been plugged. Have all of these remained active in order to vent gas from the mine? Could any of these vents be used for monitoring?

Response

Vertical ventilation holes (VVH) 91 and 92 are located within the sealed area of the VP Number 5 mine. However, these VVH holes are open to the atmosphere and are located in the unmined solid coal and overburden with no communications with the open mined areas that will store the injected fluid. The function of these two VVH holes serves as a vent to the unmined coal seam.

Vertical ventilation holes (VVH) 90, 93, 105, and 106 are venting the mine void area (sealed area of the VP Number 5 mine) and would not be acceptable for liquid level monitoring.

Vertical ventilation holes (VVH) 104, 112, 113, 115, and 168 are located within the sealed area of the VP Number 5 mine. These VVH holes have bridge plugs set at various depths within each of these VVH holes well above the sealed mined area. The bridge plug settings and placement of cement, as outlined by Appendix I, would prevent the monitoring of fluids in the sealed (void areas) of VP Number 5 mine.

Vertical ventilation hole (VVH) 187 is located some 5,300-feet to the northeast of the sealed mine area. This VVH hole does not penetrate the sealed mine area that would receive the injection fluids. Therefore this VVH hole is incapable of monitoring the fluid level within the area to receive/store the injection fluids.

The holes identified as 5-NIT1 and 5-NIT2 are located within the sealed area of the VP Number 5 mine. Further these two holes are located within the areas that has been mined (void areas). These holes are fully cased and cemented from the top of the mined out area to ground surface. However, only 5-NIT2 could be used as a monitoring point since 5-NIT1 does not intersect the proposed pool area within the mine void area since its bottom elevation is above the maximum fluid level (pool) elevation.

Holes identified as 5HLMR2, 5H208H, and 5RKDST are located outside of the sealed area of the VP Number 5 mine. Further these holes are located within the active portion of VP Number 5 mine and serve as a supply conduit of mining materials into the active mine. These holes do not penetrate the sealed mine area and therefore would be incapable of monitoring the fluid level within the area to receive/store the injected fluids.

Deficiency

Ventilation hole VVH-110 is not 5 miles away. According to DWG #91-56-1, this hole is located approximately 1500 feet east of VVH-105. Please clarify

Response

VVH-110 should have been identified as VVH-104. Drawing 91-56-1 Rev. 2 has corrected this mislabeling.

Deficiency

We could not locate VVH-104 and VVH-105. Both are plugged according to your submission.

Response

Drawing 91-56-1 Rev. 2 provides the location of VVH-104 (Previously mislabeled as VVH-110) and VVH-105. Drawing 91-56-1 Rev. 2 also shows the location of VVH-115. VVH-105 has not been plugged.

Deficiency

What does "surface to surface" mean under the cementing column in Appendix 1? For example, for WH-90, does this mean the 9 5/8 inch casing is cemented from 215 feet to the surface and the 7 inch casing is cemented from 1839 feet to the surface?

Response

Using VVH-90 as an example, the "surface to surface" column under cementing in Appendix I would mean that the 9 5/8-inch casing is cemented from 215-feet back to the surface and the 7-inch casing is cemented from 1839-feet back to the surface. The remainder of the table would have the same interpretation.

Deficiency

What purpose does it serve to allow holes 5HLMR2, 5H20BH, and 5RKDST to remain open and active?

Response

Holes 5-HLMR2, 5-H20BH, and 5-RKDST are located outside of the sealed area of VP Number 5 mine that would receive the injected fluids. Holes 5-H20BH and 5-RKDST are used as supply conduits for materials needed to support the active mining of coal in the northeast reaches of VP Number 5 mine. Support materials are transported vertically from the surface thorough this fully cased and cemented holes to the active portion of VP Number 5 mine. Hole 5-HLMR2 is not in use.

As shown, these three (3) holes are located well outside of the sealed area of VP Number 5 mine that would receive the injected fluids and would provide no meaningful monitoring data for the area to receive the injected fluids.

ISLAND CREEK COAL COMPANY
VIRGINIA DIVISION
DRAWER L
OAKWOOD, VIRGINIA 24631

August 26, 1993

Ms. Karen D. Johnson, Chief
UIC Section (3WM43)
Drinking Water/Groundwater
Protection Branch
United States Environmental
Protection Agency
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

RESPONSES TO
NOTICE OF DEFICIENCY
FOR
ISLAND CREEK COAL COMPANY
PERMIT APPLICATION VAS2D926BBUC

Dear Ms. Johnson:

Island Creek Coal Company is submitting the enclosed responses to the March 1993 Notice of Deficiency for EPA Permit Application VAS2D926BBUC.

The responses to the Notices of Deficiencies are provided by the revised and or new pages for the Form 4 Attachments of the original permit application submittal. The responses are identified as follows:

NOD	RESPONSE
Cover Page	New Cover Page
Attachment A	New Page 3A
Attachment B	New Page 7A

NOD	RESPONSE
Attachment C	New Pages 9A and 9B
Attachment E	New Page 12A
Attachment G	New Pages 15A, 15B, 15C, 15D 15E, 15F, 15G, and 15H
Attachment K	New Page 21A
Attachment O	New Pages 25A and 25B
Attachment P	New Pages 26A, 26B, and 26C
Appendix B	New Pages 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, and 3I
Appendix G	New Pages 1, 2, 3, 4, 5, and 6
Appendix H	New Page 1
Appendix I	New Pages 1 and 2
Appendix J	Insertion, Complete Well Log Data Report
Appendix K	New Page 2
Drawing 91-56-1	Revision
Drawing 91-56-4	Revision
Drawing 91-56-1	New Map

The responses to the Notice of Deficiencies are enclosed. The responses should be included into the original permit application submittal as indicated above. Further, the enclosed responses will provide the information requested.

Should you have questions or require further information, please contact Mr. Gerald Ramsey of Island Creek Coal Company.

Sincerely,

Richard R. Rieger

Richard R. Rieger
Vice President, VA Operations

RRR/ngc

xc: Mr. Gerald Ramsey, Island Creek
Mr. Larry Rine, MSES Consultants, Inc.
Mr. Byron T. Fulmer, Virginia Gas and Oil

FORM 4

PERMIT APPLICATION

FOR

CLASS II-D INJECTION WELL

UNDERGROUND INJECTION

OF

BRINE WATER

ISLAND CREEK COAL COMPANY
DRAWER L
OAKWOOD, VIRGINIA 24631

MSES PROJECT NO. 91-56

DECEMBER, 1992

MSES Consultants, Inc.
609 West Main Street
P.O. Drawer 190
Clarksburg, West Virginia 26302-0190
(304) 624-9700

MSES
Environmental & Engineering Consultants

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LIST OF APPENDICES

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A	Summary of Well Information Within One Mile Radius of V.P. Number 5 Mine
B	Water Supply Inventory Chart and List of All Sources Within 1/4 Mile Radius of V.P. Number 5 Mine
C	Computer Printouts of Well Log Data for Various Wells Within One Mile Radius of V.P. Number 5 Mine
D	Technical Data Sheet and Material Data Safety Sheet for Halliburton's ANHIB Material Used as a Corrosion Inhibitor in the Casing Annulus
E	Summary of Results - Coal Seam Water Collected From Pocahontas #3 Coal Seam
F	Occidental Petroleum Corporation, 1991 Annual Report and 1991 Annual Report on Form 10-K

LIST OF DRAWINGS

LIST OF DRAWINGS

Drawing	Title
91-56-1	Area of Review and Map of Wells
91-56-2	Cross Section A-A^1
91-56-3	Cross Section B-B^1
91-56-4	Schematic Diagram of Proposed Injection Well and Injection Flow Schematic

INTRODUCTION

FORM 4

PERMIT APPLICATION
FOR
CLASS II-D INJECTION WELL
UNDERGROUND INJECTION
OF
BRINE WATER

ISLAND CREEK COAL COMPANY
OAKWOOD, VIRGINIA

1.0 INTRODUCTION

Island Creek Coal Company, is submitting this Form 4 Permit Application for a Class II-D Injection Well for disposal of brine water produced from methane production holes and coalbed methane wells developed in connection with its mining operations. The produced fluids will be injected into a previously mined area.

By choosing an area of the mine that is structurally low, has been sealed, and contains good confining beds, the waters will, with relative ease and safety, be disposed of in what is essentially an underground vessel that once held the same type water. Mechanically this will be accomplished without a need for applying injection pressure nor with a need for further altering subsurface formations.

An injection well is proposed that will not only provide a conduit for brine waters to be deposited in the sealed mine limits, but is also positioned as a key monitoring point. The injection well is at a mine elevation where brine water will flow to lower elevations

and any water accumulation at that point will indicate a full disposal reservoir, though short of contacting the actual mine seals. Monitoring this well plus a nitrogen injection well (previously used to control a fire) will enable Island Creek to chart the progress of filling the sealed mine void and have a check point for capacity fill up.

Surface installations will be very simple which will reduce risks of surface spillage. Brine waters will be transported to the injection well and immediately deposited into the sealed mine void from the transport tanker. This process enables constant monitoring while injection is taking place. No pressure is needed since water is being emptied into a void. Filtering and settling are not necessary since there is no concern of clogging rock pores with debris.

2.0 PERMIT APPLICATION

This permit application will present the necessary information and supporting documentation for permitting the disposal of coal seam water into Island Creek Coal Company's V.P. Number 5 Mine under U.S. EPA injection well classification II-D.

FORM 4
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

Form 4 UIC

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT APPLICATION
(Collected under the authority of the Safe Drinking Water Act, Sections 1421, 1422, 40 CFR 144)

Forms Approved. OMB No. 2040-0042. Expires 8-31-89

I. EPA ID NUMBER

		T/A	C
U			

READ ATTACHED INSTRUCTIONS BEFORE STARTING
FOR OFFICIAL USE ONLY

Application approved mo	day	year	Date Received mo	day	year	Permit/Well Number	Comments

II. FACILITY NAME AND ADDRESS

Facility Name: V.P. Number 5 Mine
Street Address: Drawer L
City: Oakwood | State: VA | ZIP Code: 24631

III. OWNER/OPERATOR AND ADDRESS

Owner/Operator Name: Island Creek Coal Company
Street Address: Drawer L
City: Oakwood | State: VA | ZIP Code: 24631

IV. OWNERSHIP STATUS *(Mark 'x')*

☐ A. Federal ☐ B. State ☒ C. Private
☐ D. Public ☐ E. Other *(Explain)*

V. SIC CODES

1211

1311

VI. WELL STATUS *(Mark 'x')*

☐ A. Operating — Date Started: mo / day / year
☐ B. Modification/Conversion

VII. TYPE OF PERMIT REQUESTED *(Mark 'x' and specify if required)*

☒ A. Individual ☐ B. Area

Number of Existing wells	Number of Proposed wells
0	1

...p. Number 5 Mine

VIII. CLASS AND TYPE OF WELL *(see reverse)*

A. Class(es) *(enter code(s))*	B. Type(s) *(enter code(s))*	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
II	D		One injection well

IX. LOCATION OF WELL(S) OR APPROXIMATE CENTER OF FIELD OR PROJECT

C	A. Latitude Deg	Min	Sec	B. Longitude Deg	Min	Sec	Township	Range	Sec	1/4 Sec	Feet from	Line	Feet from	Line
II	37	11	02	82	04	54								

X. INDIAN LANDS *(Mark 'x')* ☐ Yes ☒ No

XI. ATTACHMENTS

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)
FOR CLASSES I, II, III (and other classes) complete and submit on separate sheet(s) Attachments A — U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application:

XII. CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title *(Type or Print)*	B. Phone No. *(Area Code and No.)*
Gene Shockey - Vice President and General Manager of Island Creek Coal Company, Virginia Division	703-498-8200
C. Signature	D. Date Signed

EPA Form 7520-6 (2-84)

ATTACHMENTS

FORM 4

ATTACHMENT A

AREA OF REVIEW

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT A

AREA OF REVIEW

1.0 INTRODUCTION

Island Creek Coal Company's V.P. Number 5 Mine is located in South Grundy District, Buchanan County, Virginia.

The area of review is considered to cover a fixed radius of 1/4 mile beyond the maximum limits of the sealed V.P. Number 5 mined out area in which the brine water will be injected. All information presented and mapping provided are based upon the sealed limits of the V.P. Number 5 Mine.

On some selective mapping, a radius of one mile beyond the sealed limits of V.P. Number 5 Mine will be considered as the area of review, when required by this permit application.

Drawing 91-56-1 identifies the V.P. Number 5 Mine area of review.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT A

AREA OF REVIEW

2.0 VOLUMETRIC CAPACITY OF MINE VOID

The volumetric capacity of that portion of VP-5 mined out area intended for use as a disposal area for brine water has been calculated based on known information before the mined out area was sealed. Consideration was given to unmined portions or pillars. Additionally, consideration was given to larger mined areas with compensation for roof collapse. In such cases a 40 percent void space factor was used to compensate for the existence and expansive characteristics of collapsed debris.

With these considerations, the volume capacity was calculated at 278 million gallons. An average daily flow rates of 28,800 gallons per 24 hour period would indicate a potential life expectancy of 9,654 days, or approximately 26 years.

FORM 4

ATTACHMENT B

REVIEW AREA AND WELL INFORMATION

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT B

REVIEW AREA AND WELL INFORMATION

1.0 INTRODUCTION

Drawing 91-56-1 is a topographic map that identifies the area within a radius of one (1) mile and 1/4 mile of the sealed limits of V.P. Number 5 Mine. This drawing provides the following information:

- V.P. Number 5 Mine - The sealed mine workings define the limits of the area proposed to receive the brine waters. Island Creek previously removed brine waters from the coal seam in this area and now proposes to inject similar water into this sealed confined area. All information shown by Drawing 91-56-1 is based on a one (1) mile radius around the proposed V.P. Number 5 Mine sealed disposal area.

- Intake and Discharge Structures - A surficial reconnaissance of the one mile radius, along with State and Federal records reviewed, showed that no water intake or discharge structures were present.

- Hazardous Waste Facilities - A surficial reconnaissance of the one (1) mile radius, along with State and Federal records reviewed, showed that no hazardous waste treatment, storage, or disposal facilities were present.

- Well Information - Drawing 91-56-1 provides the number, name, and location of all producing, abandoned, dry holes and injection wells located within a one (1) mile radius of V.P. Number 5 Mine.

- Surface Features - The surface bodies of water, springs, mines (surface and deep), quarries, residences, roads, and other pertinent surface and subsurface features are identified and located by Drawing 91-56-1.

- Geologic and Hydrogeologic - The location, type, and source of drinking water are provided within a 1/4 mile radius of V.P. Number 5 Mine. There are no public water supplies in the area. This information was collected by Island Creek during a March, 1980, door-to-door canvas of the area. Also shown are the known fault areas.

2.0 MINE V.P. NUMBER 5

On December 24, 1983, Permit Number 1400497 was issued for the V.P. Number 5 Mine owned by Island Creek Pocahontas Company, a wholly owned subsidiary of Island Creek Coal Company.

The Pocahontas #3 coal seam lies approximately 1200 feet to 2000 feet below ground surface at the V.P. Number 5 Mine. The Pocahontas #3 coal was actively mined from the now sealed area during the 1980s. With mining activity complete, a portion of V.P. Number 5 Mine was sealed. That portion is identified in Drawing 91-56-1 and is being designated as the area intended for disposal of brine water.

3.0 SURROUNDING WELLS

A total of fifty-six (56) well locations exist within the one (1) mile radius of V.P. Number 5 Mine. A total of fifty-three (53) wells penetrated the Pocahontas #3 formation: twelve (12) are vertical ventilation holes; seventeen (17) are plugged exploration core holes; nineteen (19) are coalbed methane wells; five (5) are miscellaneous wells used for physical mining needs and three (3) wells were never drilled. Drawing 91-56-1 locates these wells and

identifies the type of well. A summary of these wells is provided by Appendix A.

4.0 WATER SOURCES

A surface survey was conducted from March 18 through 20, 1980, by Bob Brown and Gerald Ramsey of Island Creek. The surficial reconnaissance was conducted to identify water wells, springs, and other drinking water supplies within a 1/4 mile radius of the V.P Number 5 Mine limits.

Sixteen (16) water sources were identified during the survey. Appendix B lists the water sources, owner and addresses, and pertinent water supply data. Drawing 91-56-1 identifies and locates these water sources.

5.0 MINING ACTIVITIES

Drawing 91-56-1 identifies surface and deep mining activities that have taken place within a 1/4 mile radius of the sealed limits of V.P. Number 5 Mine that is designated for brine disposal.

5.0 FAULTS

A review of State geologic records would indicate that no faults are known to exist within a one (1) mile radius of V.P. Number 5 Mine.

The closest known faults, in relationship to the V.P. Number 5 Mine are the Little Pawpaw Fault, lying approximately 28,000 feet to the southwest and the Keen Mountain Fault lying approximately 28,000 feet to the east-northeast.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT B

REVIEW AREA AND WELL INFORMATION

7.0 WATER SOURCE INVENTORY

As a supplement to Section 4.0 of this attachment, a surface survey of groundwater users was conducted on April 26 and 27, 1993 by Mr. Jeff Boord and Mr. Joe Pernell of MSES Consultants, Inc. The surficial reconnaissance was conducted to identify water wells, springs, and other drinking water supplies within a 1/4 mile radius of the VP 5 mined out area proposed for use as the disposal area.

The inventory conducted consisted of a door-to-door canvassing of the surface area encompassed by the mined out area and a radius of 1/4 mile extending beyond the mined out area limits. The information obtained from the April 26 and 27, 1993 reconnaissance is provided by "Appendix B, New Pages 2A through 2D and 3A through 3E." Drawing 91-56-1 Rev. 1 identifies and locates these water sources.

FORM 4

ATTACHMENT C

EXISTING WELLS WITHIN AREA OF REVIEW

FORM 4

ATTACHMENT C

EXISTING WELLS WITHIN AREA OF REVIEW

1.0 WELL DATA

Provided by Appendix A is a summary of well data for a one (1) mile radius from V.P. Number 5 Mine. These wells are located by Drawing 91-56-1. Appendix C provides reprints of pertinent well data and geologic well summaries.

2.0 WELLS WITHIN AREA OF STUDY

Within the area extending 1/4 mile beyond the sealed limits of V.P. Number 5 Mine are seven (7) coal exploration core holes, sixteen (16) vertical ventilation holes, and one (1) dry hole originally intended for coalbed methane production (Drawing 91-56-1 and Appendices A and C).

3.0 CORRECTIVE ACTION

Collected brine water will be injected into the sealed portion of V.P. Number 5 Mine by the proposed injection well. Injection will be by gravity flow at atmospheric pressure into the sealed area of V.P. Number 5 Mine. The location of the proposed injection well is shown by Drawing 91-56-1. There is no need to inject the water under pressure, as the coal seam water will be entering an underground void. Additionally there is no need to have temporary

surface storage facilities.

Should any injection resistance be encountered, liquid fill up occour, or casing fail, injections will be stopped immediately. Immediate shut down is possible as injections will be manually conducted and visually monitored due to the method of injection.

If the injection well cannot be stabilized and problems encountered cannot be corrected to the satisfaction of the State and Federal agencies, then the injection well will be plugged as outlined in Attachment Q.

Additionally, one of the existing wells within the 1/4 mile radius of V.P. Number 5 Mine may act as a monitoring point for injected fluid levels, thereby providing a safety check system. Should it become necessary, or required by Federal, State or Local officials to plug this well, then Island Creek Coal Company shall do so in accordance with applicable State regulations.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT C

EXISTING WELLS WITHIN AREA OF REVIEW

4.0 PROPERTY OWNERS

The names and addresses of record of property owners overlaying and within one-quarter mile of the proposed area under study have been supplied by Island Creek Coal Company and are listed by Appendix G. Included in Appendix G is a map with reference number corresponding to drawing 91-56-5.

5.0 EXPLORATION CORE HOLE PLUGGING DATA

The exploration core holes within the limits of the mine void have been plugged. Plugging information and plugging dates are listed in Appendix H. Also included is plugging information for all exploration core holes within a one mile radius of the facility boundary. Three of the holes, which are outside of the sealed portion of the mined out area intended as the storage area, were pilot holes for what now are shafts to the mine. These are exploration core holes L-221, L-222, and L-223.

DEFICIENCY QUESTIONS

ATTACHMENT C

6.0 VENTILATION AND OTHER HOLES

Appendix I provides summaries for ventilation, test, nitrogen injection, rock dust and water supply holes. This information includes casing and cementing programs for open holes and plugging information for those wells that have been plugged.

Discussions regarding Attachment P will address the utilization of wells for monitoring or plugging.

Of the holes listed, VVH-187 is nearly one mile from the facility boundary and will not be further addressed. Holes 5HLMR2, 5H20BH (water supply) and 5RKDST (rock dust) are outside of the sealed limits of the proposed disposal area, updip geologically. It is intended to keep these holes open and active.

FORM4

ATTACHMENT E

UNDERGROUND DRINKING WATER SOURCES

MSES

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FORM 4

ATTACHMENT E

UNDERGROUND DRINKING WATER SOURCES

1.0 UNDERGROUND DRINKING WATER SOURCES

No known public supplies of underground drinking water sources occur within the 1/4 mile radius of the sealed limits of V.P. Number 5 Mine.

An inventory of private supplies of underground drinking water sources was conducted by Island Creek from March 18 through 20, 1980, and accompanies this report as Appendix B. The deepest well is owned by Island Creek, and the groundwater supply is from an unnamed sandstone lying between the Upper Seaboard and Greasy Creek coal seams approximately 300 feet below the surface. Most water wells derive their water supplies from 60 feet to 150 feet depths.

In general, sandstone holding the deepest fresh drinking water source of this area lies at a depth shallower than 400 feet and is greater than 1000 feet above the sealed limits of V.P. Number 5 Mine.

The gravity injection of the coal seam water and numerous confining layers provide extraordinary safety factors to protect and separate the fresh water sources from the brine water poured into the sealed part of V.P. Number 5 Mine.

2.0 HYDROGEOLOGIC CONDITIONS

Most of the rocks close to the surface in Buchanan County, Virginia, are of Pennsylvanian Age, and consist mostly of sandstone, siltstone, shale and coal beds. Groundwater is produced from permeable sandstone layers and from fractures and bedding planes between rock layers.

Groundwater yield in Buchanan County is from aquifers that are generally above 300 to 400 feet below ground surface. Shales usually provide very small quantities of water, coal produces some water, and sandstones generally store and produce water from the voids between the grains of sand. However, the voids between sandstone grains in this area are often filled with recemented mineral matter, clay and silt-size particles, and mica flakes that reduce their ability to hold and transmit water. Fractures and fissures in the rocks provide the source for most of the groundwater in this area but are often closed at depths below 400 feet due to the weight of the overlying strata. This greatly diminishes both the volume and the flow of groundwater from depths greater than 400 feet. Additionally, the water below 400 feet becomes increasingly salty.

Groundwater in this coalfield area of Buchanan County is typically slightly acidic and somewhat hard containing iron and compounds of sulfur. Methane and hydrogen sulfide gases commonly occur in the groundwater and often require well venting to prevent dangerous accumulation.

The 1980 inventory of drinking water sources found water supplies varying in depth from a surface spring to a maximum of 305 feet. Yields are generally relatively low, with three being reported in gallons per minute of 2, 4.8, and 25.

The majority of the water wells in Buchanan County are drilled to provide three (3) to ten (10) gallons per minute. Water wells are generally 50 to 250 feet deep and are located in valleys where there is normally enough groundwater for domestic consumption.

The 1980 drinking water inventory would be representative of the conditions as they exist in 1992.

3.0 REFERENCE SECTION

The following is a listing of the data sources used to generate this groundwater review:

- Buchanan County Groundwater - Present Conditions and Prospects, by Susan Epps, Southwestern Regional Office, Virginia State Water Control Board, Bureau of Water Control Board, Bureau of Water Control Management, Richmond, Virginia, Planning Bulletin No. 311, October, 1978.

- Geology of the Prater and Vansant Quadrangles, Virginia, by Jack E. Nolde, Martin L. Mitchell, and Joan K. Polzin, Virginia Division of Mineral Resources Publication 52, Charlottesville, Virginia, 1984.

- Stratigraphy and Coal Beds of Upper Mississippian and Lower Pennsylvanian Rocks in Southwestern Virginia, by Marshall S. Miller, Virginia Division of Mineral Resources Bulletin 84, Charlottesville, Virginia, 1974.

- Private Water Supply Inventory, by Bob Brown and Gerald Ramsey, for Island Creek Coal Company V.P. Number 5 Mine, Permit #0400552, March, 1980.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT E

UNDERGROUND DRINKING WATER SOURCES

4.0 LOWERMOST USDW

The lowermost USDW has been identified as being 400 feet below land surface. The formation containing the lowermost USDW is an unnamed geologic formation.

FORM 4

ATTACHMENT G

GEOLOGICAL INFORMATION

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FORM 4

ATTACHMENT G

GEOLOGICAL INFORMATION

1.0 INJECTION ZONE

The formation selected to receive the collected brine water is known geologically as the Pennsylvanian Age Pocahontas #3 coal seam. Brine injection will occur into a mine void space created by removal of the Pocahontas #3 coal seam.

The Pocahontas #3 horizon lies approximately 1200 feet to 2000 feet below ground surface and ranges roughly from 200 feet above to 125 feet below mean sea level. This coal seam (and mine void height) is about five (5) feet thick and is dipping in a northwestern direction.

2.0 CONFINING ZONES

Lying directly over the Pocahontas #3 coal seam are Pocahontas shales and siltstones of low permeability. Due to mining and overburden stresses, these could be fractured and broken; however, this is further overlain by a competent and dense, thick quartz arenite which in turn is overlain by Pennsylvanian Lee Formation shales. This sequence provides structural competence and permeability barriers that will limit the upward migration of liquids. Drawings 91-56-2 and 91-56-3 provide a geologic cross-section east-west and north-south respectively across the 1/4 mile

radius and sealed V.P. Number 5 Mine area.

Beneath the Pocahontas #3 coal seam are Pocahontas shales and siltstones that are considered to be impermeable and provide a barrier for liquid migration downward.

Lateral migration of liquid is limited by the extent of the mine itself.

Of great importance is the fact that no pressure will be exerted upon injection waters. The waters will flow into the coal mine void by gravitational forces, eventually seeking a level that is lower than the mine floor at the sealed ports.

3.0 FRACTURE PRESSURE

Actual fracture pressures have not been physically measured at the site and are not of great significance in this case since no pressure will be exerted upon the injection fluids. Considering that the Pocahontas #3 once contained brine waters, it is reasonable to assume that it has withstood pressures equal to hydrostatic water pressure levels from surface. In this case, that pressure should be in excess of 560 pounds per square inch (PSI) at the shallowest point. Hydrostatic pressures exerted from liquid levels at the high point of the mine should be less than 350 PSI. Full hydrostatic pressure levels should never be reached as injected water levels will not be above a level that is about 1300 feet below ground level.

A few coalbed methane wells in the surrounding unmined area have hydraulically fractured the coal seams prior to producing methane. Pressures necessary to "break down" or initiate fracturing of this seam are reportedly in excess of 2000 PSI.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT G

GEOLOGICAL INFORMATION

4.0 VERTICAL CONFINEMENT

Appendix J provides a well log of D shaft pilot hole. The D shaft pilot hole is located within the VP 5 mining area some one and three-fourth miles northeast of the sealed mined out area intended to be used as the disposal area. This D shaft pilot hole is updip geologically of the area under study and is similar in character as to well logs provided by Appendix C obtained from within the area of review.

Segments of the D shaft pilot hole's core were analyzed from 300.6 feet to 1,780.8 feet. The portion of the D shaft pilot hole's core that was tested extends from the lowermost USDW to 80.8 feet below the Pocahontas #3 coal seam (base of disposal area).

Appendix K provides a summary of the testing and results obtained for the 1,480.2 feet of core analyzed. A review of this analytical information shows along the length of the core the porosities ranged from 0.8 percent (1780.0 to 1780.8 feet) to 7.5 percent (477.3 to 477.9 feet) with an average porosity of

3.3 percent. Permeabilities were measured both vertically and horizontally along the test section of 300.6 feet to 1780.8 feet. A total of twenty-four test segments were measured with twenty-two having vertical permeabilities of less than 0.01 millidarcys with the remaining two test segments demonstrating vertical permeabilities of 0.03 (1422.4 to 1423.2 feet) and 0.07 (477.3 to 477.9 feet) millidarcys. A total of fourteen test segments demonstrated horizontal permeabilities of 0.01 millidarcys or less with the remaining ten test segments ranging from 0.02 (781.0 to 781.5 feet) to 0.07 (477.3 to 477.9 feet) millidarcys.

This testing information indicates that the confining units above the disposal area have a very low porosity and permeability (both horizontal and vertical). The confining units underlying the disposal area have very low porosity and permeability (both horizontal and vertical). Therefore no migration of fluids is foreseen vertical or horizontal within the upper and lower confining zones.

5.0 HORIZONTAL PERMEABILITY - MINE PORTS

Horizontal permeabilities of overburden and underburden material have been discussed in the immediately preceding section, Attachment G, Section 4.0, and supplemented by Appendices J and K.

The VP 5 mined out area to receive the brine water was sealed utilizing construction material complying with provisions of M.S.H.A. 30 CFR, 75.329-2. The following is a basic outline describing that permanent seal.

5.1 Seals were built on four developmental corridors in their entirety prior to final sealing of the area.

5.2 Seals were constructed on two main corridors, quality measurements taken, then final seals were completed of those corridors.

5.3 Inspection of the seals was conducted by a certified person.

5.4 Vertical ventilation holes were closed by valves at the top with the ability to be opened if pressure build-up was detected and pressure relief was necessary.

Seal construction consists of two wooden and brattice cloth walls for containment and the filling of the cavity between the walls with foamed cement Tekseal (by Celtite Technik) four feet thick, using a 200 PSI mix as approved by M.S.H.A. Loose material from roof, ribs and floor was first removed so that the seal was on solid ground at least ten or more feet from the corner of the pillars, protected

from adverse roof and floor conditions by no less than two rows of timbers on 4-foot centers. Uprights for the back wall were set on no more than 4-foot centers and 1 inch by 6 inch plyboards were nailed horizontally across the uprights with about one and one half inch spacing between boards. Good quality brattice cloth was hung over interior walls of the formwork with six to nine inches of lap on the ribs and about four inches of lap on the roof and floor, secured with nails or spads. The front wall was constructed in a similar manner with insertions of test and water pipes and valves. Also, a temporary hole was cut in the front wall, enabling a person to make direct placement of the foam cement to insure a solid fill, and was sealed when foam cement pumping was completed.

A test pipe, for pressure differentials and gases, was installed using a copper or plastic tube extending at least 40 feet into the sealed area. Tube placement specifications were: minimum of 6 inches below roof level but not more than 1/3 the height of the seal, parallel to roof and rib with elevation and distance from the rib having the highest elevation at least 1/5 the length of the seal but not more than 1/4 the length of the seal, with its outlet valve able to resist a static pressure of 75 PSI.

A water pipe was installed to drain the inby face of the seal, extending into the open portion of the mine. This is a 3-inch pipe placed a distance from the rib of at least 1/5 but not more than 1/4 in the length of the seal. It has a water filled trap at least 4 feet from the end of the pipe that is constructed with four 90° elbow fittings. The bottoms of the traps are at least one foot below the outlet. Piping is metal, corrosion resistant and equivalent to at least Schedule 40.

6.0 FORMATION FRACTURING

Actual subsidence predictions, studies and altered predictions were made on the nearby VP 6 (on adjacent properties about 4½ miles southeast of the VP 5 mine that should have similar subsidence characteristics to the VP 5 mine. VP 6 studies indicate a maximum subsidence of 1.5 feet with diminishing effects with distance from the largest unsupported mined out areas. Horizontal to vertical movement of 0.242 was used in prediction formulas, though measurements indicated less severe actual strains. Based on these studies (D'Appolonia - May 1990 and March 1991 and John T. Boyd Company - August 1991), the angle of draw would be 12.0 degrees assuming 2,000 feet of overburden and an extraction thickness of 73 inches, which would

result in a limit of subsidence of 425 feet or less outside of large unsupported mined out areas.

Based upon Island Creek's past studies and information, cracking may occur 300 feet above large unsupported mine void areas. The actual affect is the expectance of some collapse of overlying incompetent shales and sandstones. Associated with this collapse is an expansion of material debris due to overburden pressure release and altered compaction with accompanied bridging due to angular stacking of debris material.

This phenomenon along with the competency of the massive quartz arenite contributes to control of height of fracture occurrence. Referring to cross section drawings 91-56-2 and 91-56-3, the heavy dashed lines above the area marked "Water Injection Zone" gives some approximation of a likely extent of potential infiltration by injected disposal water.

Further consideration given to drawings 91-56-2 and 91-56-3 plus core information in Appendix G, it is noted that above the Pocahontas #3 mined out area is a sequence of shales, siltstones and sandstones that are likely materials for collapse into mine voids. Above that sequence is the dense, competent and thick quartz arenite. Should fracturing occur in the quartz arenite,

the tendency for collapse in the quartz arenite and overlying strata is greatly reduced due to thickness and competency of the quartz arenite. Fracturing above should be absorbed by plasticity and expansive qualities of the overlying interbedded shale and siltstone sequence. Cracking or fracturing effects are expected to be confined below the Lee shale that was designated as the upper confining zone. It is further noted that the stratigraphic sequence above the Lee shale consists of basically impermeable shales and sandstones and siltstones having very low porosities and permeabilities. Therefore, the entire sequence between possible fresh water aquifers and the Lee shale should provide a tight pack of material that is not conducive to transmitting water upwardly. This is especially so if pressure is kept to a point that gravity is a prominent factor. This should not be a problem as it would take approximately 600 PSI of pressure, without resistance, to lift brine water from the injection zone up to the fresh water level.

Well records previously submitted in the original permit application did include all wells in the area that could have penetrated potential zones of influence by mining activities. That information does include wells that reached total depth before reaching the Pocahontas #3 coal seam.

7.0 FUTURE DRILLING AND MINING

Neither Island Creek Coal Company nor any other company has plans for future drilling in this area.

There are no plans for any mining below the Pocahontas #3 and it is considered that there would be no future potential of mining below that zone.

There are no present plans for mining above the Pocahontas #3 in this area. With the existence of potentially minable coal above the Pocahontas #3, given certain economic conditions, and the realization that there will be various management changes and likely changes in corporate direction, it is possible that mining plans could be considered for this area sometime in the future. However, such mining considerations would only be given to areas above drainage, above any potential zone of influence by the disposal plan and only with prior consent of the United States Environmental Protection Agency and all other Federal, State and Local governing bodies.

FORM 4

ATTACHMENT H

OPERATION INFORMATION

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FORM 4

ATTACHMENT H

OPERATING INFORMATION

1.0 OPERATION DATA

The proposed injection well will penetrate the void space created by V.P. Number 5 Mine and provide a conduit for the injection of brine water. This proposed location and the sealed area of V.P. Number 5 Mine are illustrated on Drawing 91-56-1. The proposed injection well will be located at the upper-most elevation of the sealed portion of V.P. Number 5 Mine's structurally low area.

2.0 FLOW RATES

The average and maximum daily rate and volume of brine waters to be injected are placed at:

- Average daily flow – 38,900 gallons per 24 hours
- Maximum daily flow – 86,400 gallons per 24 hours

The water injection reservoir consisting of a mine void is at or near atmospheric pressure; hence, gravitational forces will provide sufficient energy to inject the brine.

3.0 ANNULUS FLUIDS

The annulus between the injection tubing and formation protection casing will be filled with a mixture of water and a corrosion

inhibitor. This annulus fluid will consist of fresh water with 2.5 gallons per 1,000 gallons of fresh water of Halliburton ANHIB corrosion inhibitor (see Appendix D for Technical Data and Material Safety Data Sheets).

4.0 INJECTION FLUID

Appendix E provides test results from samples collected from methane production holes. The holes are located in Buchanan County, Virginia, and are considered to be representative samples of recovered coal seam waters that will be reinjected into the sealed V.P. Number 5 Mine area.

FORM 4

ATTACHMENT I

TESTING PROGRAMS

MSES

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FORM 4

ATTACHMENT I

TESTING PROGRAM

1.0 FORMATION TESTING PROGRAM

Since the brine water is being gravity flowed into an existing mine void rather than a rock formation, testing for fluid pressure, estimated fracture pressure, and physical and chemical characteristics of the injection zone are not applicable.

Drilling of the proposed injection well will consist of a program where casing will be installed to a point just above the V.P. Number 5 Mine void. That casing will be cemented from its bottom point back to surface. Mechanical integrity testing of the casing and cementing program will be conducted.

FORM 4

ATTACHMENT J

STIMULATION PROGRAM

MSES

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FORM 4

ATTACHMENT J

STIMULATION PROGRAM

1.0 STIMULATION PROGRAM

The proposed injection well will have no stimulation program. Stimulation is not necessary due to the gravitational injection of coal seam water into the sealed V.P. Number 5 Mine void area.

FORM 4

ATTACHMENT K

INJECTION PROCEDURES

MSES

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FORM 4

ATTACHMENT R

INJECTION PROCEDURES

1.0 INJECTION PROCEDURES

The injection procedures are graphically illustrated by Drawing 91-56-4.

A tank truck will arrive at the proposed injection well site carrying collected brine water. Physical injection and tank unloading will take place in an area surrounded by an earthen dike for purposes of containing any potential spillage. The brine water will be drained directly from the tank truck into the 4 1/2-inch injection tubing for further deposit into the sealed V.P. Number 5 Mine area. The 4 1/2-inch tubing will not be pressurized, so that water will fall into V.P. Number 5 Mine by gravitational forces and those same forces will distribute throughout the structurally low elevations of the sealed mine area (Drawings 91-56-2 and 91-56-3).

Brine water will fill the mine void areas and in certain portions of the lower mine elevations may have some penetration into the immediate overlying siltstone and shale strata. This is to be expected, especially in areas having fractures and fissures. However, the overlying stratigraphic sequence does provide containment.

The annular space between the 4 1/2-inch injection tubing and 8 5/8-inch casing will be filled with a mixture of corrosion inhibitor and water. Considering the lower open void and non-pressurized environment, any integrity failure can be easily detected by a loss of annular fluid. Annular fluid level will be monitored during each injection.

2.0 INJECTION FACILITIES

Drawing 91-56-4 is a schematic illustrating the injection facilities. The facility is simple due to a lack of need for pressurization and the injection into a sealed mine void. This environment eliminates a need for temporary surface storage or settling and filtration systems. Without injection into a rock matrix and the concern of plugging that matrix, settling and filtration are not necessary.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT K

INJECTION PROCEDURES

3.0 SECURITY

The proposed injection site at VP-5 mine will be constructed with a chain-link fence surrounding the actual injection well site with a locked gate entry. Additionally, the well head will be constructed so that it is fitted with a cap that will be secured by a keyed lock.

FORM 4

ATTACHMENT L

PROPOSED INJECTION WELL
CONSTRUCTION

MSES
Environmental & Engineering Consultants

FORM 4

ATTACHMENT L

PROPOSED INJECTION WELL

1.0 DRILLING AND WELL CONSTRUCTION PROCEDURES

The proposed injection well is illustrated in Drawing 91-56-4. A review of this schematic diagram will provide the following information:

- The well will be drilled to a depth of about 1305 feet, ending in the sealed mine area created by mining the Pocahontas #3 coal seam.
- 11 3/4-inch casing will be set to a depth of approximately 500 feet and cemented along its entire length to ground surface. This will seal and protect fresh water aquifers.
- 8 5/8-inch casing will be set through the Lee Formation lower quartz arenite member and will be cemented its entire length. This will provide a seal across formation unconformities and upper coal seams while affording additional protection to aquifers.
- Drilling inside the 8 5/8-inch casing will penetrate the sealed V.P. Number 3 Mine area. The 4 1/2-inch tubing will be set on a packer that will be placed inside the lower portion of the 8 5/8-inch casing. A 4 1/2-inch tailpipe will extend below the 8 5/8-inch casing into the sealed V.P. Number 5 Mine area.
- The annular space between the 4 1/2-inch tubing and 8 5/8-inch casing will be filled to the surface with a mixture of fresh water and corrosion inhibitor.
- Casing and tubing head equipment will be fitted so that the well can be shut-in with valves, yet access will be easy for checking the annulus liquid level and for easy coal seam water disposal into the 4 1/2-inch tubing.
- A 2-inch pipe vent will tie into the 4 1/2-inch injection tubing to prevent pressure build-up in the tubing.

2.0 LOGGING

High resolution density, gamma ray and caliper logs will be run prior to setting the 11 3/4" casing and 8 5/8" casing. After cementing the 8 5/8-inch casing, a cement bond log and gamma ray log will be run. These logs will check the cement bonding across the 8 5/8-inch casing to rock formations and check lithologic correlations.

3.0 MATERIALS

Drawing 91-56-4 provides a schematic of drilling, casing and cementing plans.

FORM 4

ATTACHMENT M

CONSTRUCTION DETAILS

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT M

CONSTRUCTION DETAILS

1.0 CONSTRUCTION DETAILS

Drawing 91-56-4 provides a schematic layout of the surface facilities and subsurface details of the proposed injection well.

FORM 4

ATTACHMENT O

WELL FAILURES

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT O

WELL FAILURES

1.0 WELL FAILURES

The operation of the proposed injection well into the sealed V.P. Number 5 Mine area will be conducted manually and continuously monitored during all injection operations.

Injection of brine water will be by gravity flow directly from a tank truck into the sealed V.P. Number 5 Mine via the 4 1/2-inch tubing and a connecting hose. Since the injection zone is a void, there will be no standing water in the well and therefore no well pressure to monitor.

Any failure in the system would likely be in the form of lost annular fluid or liquid accumulation in the well. Should a failure occur, the well would be shut-in, all injection operations would stop "IMMEDIATELY" and no additional water would be transported to the injection well site. If the problem could not be readily corrected or immediate danger existed regarding unsatisfactory migration then the following will be undertaken:

- Reduce and stabilize any fluid pressure build-up in the well. Water may be returned to surface tanks for proper disposal at other permitted locations.
- With water pressure stabilized, the injection well, or any water level monitoring point so requiring, will be plugged as outlined by Attachment Q.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT O

WELL FAILURES

2.0 WELL FAILURE SHUT-IN

The tank truck driver will be required to perform the following duties before, during and after the injection of fluid into the 4 1/2 inch injection tubing:

- Before Injection:
  - Observe and record fluid level between 8 5/8 and 4 1/2 inch annulus.
  - Record pressure on the 4 1/2 inch injection tubing.
- During Injection:
  - Connect tank truck to 4 1/2 inch injection tubing, start fluid flow. Check for connection leaks.
  - Visually observe the fluid level between the 8 5/8 and 4 1/2 inch annulus and monitor the 4 1/2 inch tubing pressure.
- After Injection:
  - Disconnect tank truck from 4 1/2 inch injection tubing, drain hose into well.
  - Observe and record fluid level between 8 5/8 and 4 1/2 inch annulus.
  - Record 4 1/2 inch injection tubing presseure.

The fluid level between 8 5/8 and 4 1/2 inch annulus should remain constant at all times. A loss or increase in the fluid level would indicate a leak in the 4 1/2 inch injection tubing and the tank truck driver would stop injection of fluid and shut-in the well. The pressure on the 4 1/2 inch injection tubing should be zero at all times. A negative or positive pressure reading would indicate a blockage or back-up pressure in the tubing. Tank truck driver would stop injection and vent the well.

Since the injection into the well is directly from the tank truck with no storage tanks or pumps on site, the tank truck driver will be the observer, detector, and the means of stopping injection and shutting in the well.

FORM 4

ATTACHMENT P

MONITORING PROGRAM

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT P

MONITORING PROGRAM

1.0 MONITORING OF INJECTION WELL

The injection well will be continuously monitored while injection is taking place. Each individual will first check the annulus between the 4 1/2-inch tubing and 8 5/8-inch casing to make sure that no leakage has developed, then they will watch for water accumulation in the well bore. Additionally, each individual will check the condition of the surface dike to ensure the ability to contain any potential spillage.

2.0 MONITORING WELLS

Well number 5 NIT 2 was originally drilled for nitrogen injection to extinguish a mine fire. This well is an open conduit to the sealed portion of V.P. Number 5 Mine and, along with the proposed injection well, will provide a system that will monitor brine accumulation in the well bore and check for disposal reservoir fill up that enables shut-down prior to brine water contact with the mine seals. The locations of these holes are shown by Drawing 91-56-1. Water levels will be monitored at least once per calendar quarter and fluid accumulation amounts and patterns will be charted.

FORM 4

DEFICIENCY QUESTIONS

ATTACHMENT P

MONITORING PROGRAM

3.0 MECHANICAL INTEGRITY TEST

Once the 4 1/2 inch tubing and packer are set in the injection well, the following mechanical integrity test will be undertaken to prove the mechanical integrity of the 8 5/8 inch by 4 1/2 inch annulus and packer:

- Mechanical Integrity Testing Pressure:
  - The minimum mechanical integrity testing pressure will be 300 psig.
- Estimated Duration of the Test:
  - Mechanical integrity test - one (1) hour after desired test pressure is obtained.
- Mechanical Integrity Testing:
  - The pressuring of the 8 5/8 inch by 4 1/2 inch annulus with the test duration being recorded by pressure chart with pressure verified by a dead weight tester.
  - The pressure will be monitored for one (1) hour, minimum, and with no loss of pressure during this time period, the test will be terminated.
  - Should a loss of pressure or the inability to establish the desired minimum test pressure occur, all testing will cease. The problem will be corrected and testing resumed based upon the concurrence of U.S. EPA, Region III's representative present during the testing.

The mechanical integrity testing will be witnessed by the U.S. EPA, Region III and Island Creek Coal Company. With the successful completion of the mechanical integrity test, the pressure chart will be signed and dated by those witnessing the test.

4.0 MONITORING WELLS

The injection well and hole NIT2 will be used to monitor fluid levels within the mine void. To supplement these monitoring points the existing cased holes within and around the mine void will be used as monitoring points. These holes are:

- NIT1.
- 5-ASHFT (L-223).
- 5-BSHFT (L-221).

A monitoring point is being proposed for the southern limits of the mined out area of VP 5 mine. This mined out area is sealed and is adjacent to the proposed disposal area. This area will not receive any injection fluids and will serve as an excellent monitoring point to detect any migration of fluids from the intended disposal area. This monitoring point is proposed and would have to be drilled after permit is issued. The drilling and completion of this proposed monitoring point would be the same as outlined for the proposed injection well.

The locations of the existing proposed monitoring points and the additional proposed monitoring point are located and identified by Drawing 91-56-1 Rev. 1

5.0 MINED OUT AREA SEALS

The mined out area into which the brine water is to be injected is sealed as outlined by Deficiency Questions Attachment G Section 5.0. This same section outlines the methods which will be utilized to monitor the integrity of the seals, and liquid levels behind the seals.

FORM 4

ATTACHMENT Q

PLUGGING AND ABANDONMENT PLANS

FORM 4

ATTACHMENT Q

PLUGGING AND ABANDONMENT PLAN

1.0 PLUGGING AND ABANDONMENT PLAN

The following plugging and abandonment plan will be employed should the injection well or any monitor point require plugging:

- Move in service rig and rig up.
- Release the packer and pull tubing (if it exists). If tubing cannot be pulled, it would be cut off just above the packer and then pulled.
- Set a cast iron bridge plug as near as possible to the bottom of the 8 5/8-inch casing.
- Fill casing from bridge plug to surface with Class A cement with 2 percent calcium chloride, 2 percent bentonite gel and 1/8 pound per sack cellophane flakes.
- Install top on 8 5/8-inch casing and connect a 2 inch vent.
- With the plugging and abandonment of any well, all surface equipment and facilities will be removed and the well site reclaimed and vegetated.

Form Approved, OMB No. 2040-0042, Approval expires 8-31-88

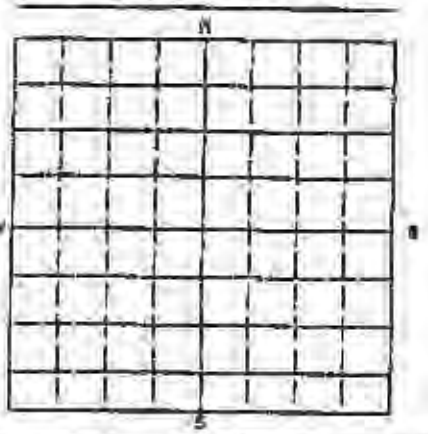
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

EPA PLUGGING AND ABANDONMENT PLAN

NAME AND ADDRESS OF FACILITY
V.P. Number 5 Mine
Drawer L
Oakwood, Virginia 24631

NAME AND ADDRESS OF OWNER/OPERATOR
Island Creek Coal Company
Drawer L
Oakwood, Virginia 24631

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT — 640 ACRES



STATE: VA
COUNTY: Buchanan
PERMIT NUMBER: Proposed Well

SURFACE LOCATION DESCRIPTION
¼ OF ¼ OF ¼ SECTION TOWNSHIP RANGE

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT
Surface Location Longitude 82° 04' 54" Latitude 37° 11' 02"
_____ ft. from (N/S) _____ Line of quarter section
and _____ ft. from (E/W) _____ Line of quarter section

TYPE OF AUTHORIZATION
- ☒ Individual Permit
- ☐ Area Permit
- ☐ Rule

Number of Wells 1

Lease Name

WELL ACTIVITY
- ☐ CLASS I
- ☒ CLASS II
  - ☒ Brine Disposal
  - ☐ Enhanced Recovery
  - ☐ Hydrocarbon Storage
- ☐ CLASS III

CLASS II-D

Well Number Proposed Well

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT(LB/FT)	TO BE PLG IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
11 3/4	42 #/FT	500'	500'	15"
8 5/8	24 #/FT	1260'	1260'	10 5/8"
4 1/2	10.5 #/FT	1305'	0	7 7/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- ☐ The Balance Method
- ☒ The Dump Bailer Method
- ☐ The Two-Plug Method
- ☐ Other

CEMENTING TO PLUG AND ABANDON DATA	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	8 5/8"						
Depth to Bottom of Tubing or Drill Pipe (ft.)	1260						
Sacks of Cement To Be Used (each plug)	370						
Slurry Volume To Be Pumped (cu. ft.)	78						
Calculated Top of Plug (ft.)	Surface						
Measured Top of Plug (if tagged ft.)	Surface						
Slurry Wt. (Lb./Gal.)	15.6						
Type Cement or Other Material (Class III)	Class A						

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
NONE			

Estimated Cost to Plug Wells

Estimated cost of $10,000.00

CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

NAME AND OFFICIAL TITLE (Please type or print)	SIGNATURE	DATE SIGNED
Gene Shockey - Vice President and General Manager of Island Creek Coal Company Virginia Division		

EPA Form 7520-14 (3-84)

FORM 4

ATTACHMENT R

FINANCIAL RESOURCES

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT R

FINANCIAL RESOURCES

1.0 FINANCIAL RESOURCES

Island Creek Coal Company will be the financially responsible party. Island Creek Coal Company is a subsidiary of Occidental Petroleum Corporation. As such, its financial reports are consolidated with the financial statements of Occidental Petroleum Corporation. Occidental Petroleum Corporation's 1991 Annual Report and 1991 Annual Report on Form 10-K are provided by Appendix F.

CHIEF FINANCIAL OFFICER'S LETTER

U.S. Environmental Protection Agency
Underground Injection Control
Class II Injection Well Operators

This letter contains information submitted as evidence of financial responsibility for the Environmental Protection Agency's underground injection control requirements.

Submitted to: Regional Administrator
Environmental Protection Agency Region III

841 Chestnut Building, Philadelphia, PA 19107
(Address of EPA Regional Office)

Submitted for: Island Creek Coal Company
(Legal name of owner or operating company)

Drawer L, Oakwood, VA 24631
(Business address of owner or operator)

Type of organization: Corporation
(Individual, joint venture, partnership, or corporation)

Date of incorporation: _____

State of incorporation: Delaware

Submitted by: Jo Ellen Drisko
(Name of Chief Financial Officer)

Island Creek Coal Company
(Name of firm)

250 West Main Street, Lexington, KY 40575
(Business address)

I ~~hereby~~ certify that the financial information contained on the following pages is correct and derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year ended December 31, 1991.

_____ _____
(Signature of Financial Officer) (Date)

I. (Firm name) Island Creek Coal Company is the owner or operator of Class II injection wells in the following states within EPA Region III:

State names: Virginia

II. This firm guarantees the plugging and abandonment of injection wells owned or operated by the following subsidiaries:

Subsidiary name:	Subsidiary address:

III. Parent company is (X) required ( ) not required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

IV. The fiscal year of this firm ends on (month/day) December 31. The financial information contained in this letter is derived from parent company's independently audited, year-end financial statements for the latest completed fiscal year ended (date) 1991.

The name and address of the accounting firm auditing these financial statements:

Arthur Andersen & Co. (Name of auditing firm)

Los Angeles, California (Address of auditing firm)

V. The dollar amounts below are stated in ( ) actual ( ) thousands of dollars.

Financial Information

Balance Sheet Information:

1.	Current Assets	See Note
2.	Total Assets	" "
3.	Current Liabilities	" "
4.	Total Liabilities	" "
5.	Net Worth or Stockholders' Equity	" "

Income Statement Information:

6.	Depreciation, Depletion, and Amortization	" "
7.	Net Income	" "

Calculations:

8.	Total Liabilities less Current Liabilities (Item 4 - Item 3)	" "
9.	Depreciation, Depletion, and Amortization plus Net Income (Item 6 + Item 7)	" "
10.	Current Assets less Current Liabilities (Item 1 - Item 3; indicate negative numbers with parentheses)	" "
11.	Current Liabilities divided by Net Worth (Item 3 ÷ Item 5; round to two decimal places)	" "
12.	Total Liabilities less Current Liabilities, all divided by Net Worth (Item 8 ÷ Item 5; round to two decimal places)	" "
13.	Depreciation, Depletion, and Amortization plus Net Income, all divided by Total Liabilities (Item 9 ÷ Item 4; round to three decimal places)	" "
14.	Current Assets less Current Liabilities, all divided by Total Assets (Item 10 ÷ Item 2; round to two decimal places, indicate negative numbers with parentheses)	" "

NOTE: This information is consolidated in parent company's financial statements.

VI. Based on the information in Part V, the company meets or does not meet the financial ratio requirements, as indicated.

	Yes	No
1. Current Liabilities ÷ Net Worth less than 1.0 (Item V-11 less than 1.0)	See Note	
2. Long-Term Liabilities ÷ Net Worth less than 2.0 (Item V-12 less than 2.0)	"	"
3. Net Income greater than zero. (Item V-7 greater than 0)	"	"
4. Net Income + depreciation, depletion and amortization total ÷ total liabilities greater than 0.10 (Item V-13 is greater than 0.10)	"	"
5. Working Capital ÷ Total Assets greater than -0.10 (Item 14 greater than -0.10)	"	"

VII. This firm ( ) has ( ) has not received a rating by either Standard and Poor's or Moody's.

The current bond rating of most recent issuance of this firm	Not Applicable	
	"	"
The name of the rating service		
The date of issuance of bond	"	"
The date of maturity of bond	"	"

	Yes	No	Not Available
VIII. This firm's bond rating by Standard and Poor's is AAA, AA, A, or BBB			X
This firm's bond rating by Moody's is Aaa, Aa, A, or Baa			X

NOTE: This information is consolidated in parent company's financial statements.

FORM 4

ATTACHMENT T

EXISTING EPA PERMITS

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT T

EPA PERMITS

1.0 EXISTING EPA PERMITS

Island Creek Coal Company has been issued the following Virginia NPDES permits for their facilities:

- VP1 -- 0080492
- VP2 -- 0091232
- VP3 -- 0080496
- VP4 -- 0080498
- VP5 -- 0080497
- VP6 -- 0080494
- Beatrice -- 0080493
- Sawmill -- 0080341
- VP1 -- VA0065536
- VP4 -- VA0071137
- VP5 -- VA0065626
- VP6 -- VA0066010

FORM 4

ATTACHMENT U

DESCRIPTION OF BUSINESS

MSES

Environmental & Engineering Consultants

FORM 4

ATTACHMENT U

DESCRIPTION OF BUSINESS

Island Creek Coal Company is a leading U.S. coal producer with productive capacity of approximately 22 million tons per year. Underground mines account for approximately 95 percent of this capacity.

Island Creek produces coal for both domestic and foreign markets; steam coal, sold to utility and industrial customers, and metallurgical coal, sold to foundry coke and steel producers. Island Creek is among the 15 largest U.S. coal producers and among the country's three leading coal exporters.

Island Creek Coal Company's Virginia Division is located in the southwestern sector of Virginia in Buchanan County. The division's four operating mines produce from the same premium-quality Pocahontas No. 3 coal seam. This coal is noted for its superior coking characteristics - low ash, low sulfur and low volatility for increased coke yield. It is widely exported in addition to being used domestically. This coal is also used in selected utility boilers by virtue of its high Btu value, low sulfur, low ash, and cost competitiveness.

Since the founding in 1902, Island Creek has been strongly committed to fulfilling its customers' needs for quality steam and metallurgical coals. Accompanying that commitment is Island Creek's tradition of excellence in providing service and value.