

MARYLAND DEPARTMENT OF THE ENVIRONMENT

Land and Materials Administration • Bureau of Mines
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APPLICATION FOR MINING OPERATIONS MODULE III GEOLOGIC AND HYDROLOGIC INFORMATION

Permit Application No.: _____ Date: _____

1. **GENERAL**

- 1.1 Was the Bureau contacted to review preliminary geological and hydrologic information to assist in development of monitoring and data collection plans for this application?
☐ YES ☐ NO
- 1.2 Were other State or Federal agencies contacted regarding available information on geology, hydrology, water quality and quantity, or other pertinent information pertaining to the permit and adjacent area?
☐ YES ☐ NO
- 1.3 Has the Bureau waived the requirement that a chemical analysis be included in the Overburden Analysis?
☐ YES ☐ NO ☐ REQUEST ATTACHED

2. **SITE GEOLOGY**

- 2.1 Attitude of rock strata, including coal:
Strike _____ and Dip of _____ Coal Seam(s)

- 2.2 If the Bureau has not waived the requirement to provide chemical analysis, provide the results of a chemical analysis of the overburden to assess the acid and/or toxic producing potential of the overburden. Label Attachment III-2.2.
- 2.3 Provide the results of an analysis of the coal seam to be mined. At a minimum, indicate the sulfur content of the coal. Label Attachment III-2.3.
- 2.4 Provide geologic column(s), from drilling data and other available information, on the accompanying Geologic Column or similar form. Complete a form(s) for each test boring, highwall, or test pit sampled. The column(S) should extend down to and include the stratum immediately below the lowest coal seam to be mined. Label Attachment III-2.4.

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2.5 Using information from the geologic column(s), construct a scaled geologic cross-section perpendicular to strike at a scale which clearly delineates all strata down to and including that immediately underlying the lowest coal to be mined. If the area is underlain by underground mines stratigraphically deeper than the proposed operation, show the approximate stratigraphic position of the mines. The cross-section shall extend a sufficient distance beyond the permit boundaries to show the natural surface drainage system(s), and indicate:

- a) Surface topography;
- b) Permit boundaries;
- c) Existing surface water bodies and streams;
- d) Water bearing strata and aquifers;
- e) Active or abandoned, surface or underground mines;
- f) Existing areas of spoil or waste and non-coal waste dams and embankments;
- g) Depths to which strata will be disturbed for each coal seam;
- h) Thickness of each strata; and
- i) Gross lithology of each strata.

Label Attachment III-2.5.

3. GROUND WATER HYDROLOGY

3.1 In a narrative describe the pre-mining general ground water hydrology for the permit and adjacent area, including:

- a) A description of the geologic structure;
- b) The location of the proposed permit area with respect to the geologic structure;
- c) An indication whether the permit area is: (1) a recharge or discharge area, (2) under-drained by deep mines, or (c) has high ground water levels; and
- d) The existence of known or anticipated aquifers, including lithology and thickness, relative location, and areal extent.

Label Attachment III-3.1.

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- 3.2 Describe the plan used to monitor ground water, for pre-mining water quality and quantity, and to develop the determination of hydrologic characteristics of the area. Label Attachment III-3.2. Show the location of the ground water monitoring point(s) on the mine map.
- 3.3 Complete a Water Monitoring Data Form for each sample site. Label Attachment III-3.3.

4. SURFACE WATER HYDROLOGY

4.1 In a narrative, describe the general surface water hydrology for the permit and adjacent area, including:

- a) A description of the surface water hydrologic system identifying:
- 1) the name of the watershed(s) in which mining activities will occur,
 - 2) the acreage of the watershed(s),
 - 3) general land uses within the watershed(s) by percentage of area,
 - 4) stream channel characteristics (grade, width and depth, nature of bed and banks, etc.) of the main stem and any tributary which will be affected by or receive discharge from, the mining activities,
 - 5) the name, or a description, of any surface water bodies that exist within the watershed(s),
 - 6) the existence and nature of any discharges into the surface water system within the watershed,
 - 7) a prediction of the peak flows of the 2, 10, and 25 year storms for the existing watershed, and
 - 8) a prediction of the average annual and monthly discharges for the existing watershed;
- b) A description of the climatological factors that are representative of the area, including the average seasonal and annual precipitation, and seasonal temperature ranges; and
- c) A description of any existing activities or factors which may affect the results of monitoring within the watershed(s).

Label Attachment III-4.1.

4.2 Describe the plan used to monitor surface water for pre-mining water quality and quantity and to determine the hydrologic characteristics of the area. Label Attachment III-4.2. Show the location of the surface water monitoring points on the mine map.

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- 4.3 Complete a Water Monitoring Data Form for each sample point. Indicate the minimum, maximum and average discharge conditions for each monitoring station on the Surface Water Discharge Data Form (or a similar form providing the same information). Label Attachment III-4.3.

5. PUBLIC AND PRIVATE WATER SUPPLIES

- 5.1 Identify all private water supply users within 1000 feet of the permit area and all public water supply systems within the watershed. Show the location of all identified users on a map and indicate the type of supply (well, spring, surface water reservoir, etc.). Attach a Water Supply Inventory Form for each. Label Attachment III-5.1.

- 5.2 If a public supply is identified, provide:

- a) A physical description of the system, including available quantity of water;
- b) The quality of the supply;
- c) The number of users and demand; and
- d) The known or suspected aquifer, if a well.

Label Attachment III-5.2.

6. DATA EVALUATION

(All laboratory analysis of overburden and water must be performed in accordance with the requirements of 26.20.02.02.A & F).

- 6.1 In a narrative, provide an analysis of the overburden evaluation its potential to become acid, toxic, or to produce other problems. At a minimum, consider the following:
- a) The presence of highly erodible or sediment producing strata, i.e. shale, claystone or mudstone;
 - b) The presence of bone coal, roof shales, or other potential pyrite containing strata, described as dark grey, black, or carbonaceous;
 - c) The presence of pyrite that is visible to the unaided eye or under low power magnification;
 - d) The presence of strata identified as limestone, or strata that exhibit fizz when contacted by cold, dilute hydrochloric acid;
 - e) Mine sites of comparable geology and setting that can be used for comparison of the impacts of mining; and

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6.1 (Continued)

- f) Results of chemical analysis of overburden, e.g. acid-based accounting, acidity-alkalinity comparisons.

Label Attachment III-6.1.

6.2 In a narrative, provide an evaluation of the results of ground water monitoring and data collection including:

- a) The nature of occurrence, quality, and measured quantity of ground water;
- b) Known uses;
- c) Ground water flow direction;
- d) Seasonal variation in quality and quantity;
- e) Observed characteristics related to previous mining; and
- f) The capacity of the mine area to provide recharge to the ground water system.

Label Attachment III-6.2.

6.3 In a narrative, provide an evaluation of the results of surface water monitoring and data collection, including:

- a) The quality and quantity of monitored flows;
- b) Known uses;
- c) The occurrence of storm related and seasonally related variances in water quality and quantity;
- d) The occurrence of seasonally related variances in base flow quality and quantity;
- e) The relationship between estimated and measured flow;
- f) Observed characteristics related to previous or existing coal mining operations; and
- g) The effect of existing activities, or other factors within the area, on monitoring data; including landuse, climatological, and geologic factors.

Label Attachment III-6.3.

7. PROBABLE HYDROLOGIC CONSEQUENCES OF MINING

7.1 In a narrative, describe the probable impacts of mining on the surface and ground water hydrology of the permit and adjacent area. Consider in the discussion, the proposed operation's impacts on the existing hydrologic balance, including

- a) Surface water runoff volume;
- b) Erosion and sedimentation;
- c) Water quality;
- d) Drainage pattern/stream channel changes;
- e) Ground water recharge capacity;
- f) Seasonal variation in surface water baseflow quality and quantity;
- g) Seasonal variations in ground water quality and quantity; and
- h) Water supplies and uses.

Label Attachment III-7.1.

7.2 Identify alternate sources of water supply for all users which will, or may potentially, be affected by the proposed operation. For each alternative supply, answer the following questions.

- a) What is the quality of the alternative supply compared to the existing supply?
- b) What is the quantity of the alternative supply compared to the existing supply?
- c) What is the anticipated cost of the alternative supply compared to the existing supply?

Label Attachment III-7.2.

8. HYDROLOGIC RECLAMATION PLAN

8.1 Describe the measures to be taken to minimize/mitigate the potential adverse impacts of mining identified in the determination of the probable hydrogeologic consequences of mining, including:

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8.1 (Continued)

- a) The plan for handling overburden;
- b) The plan for handling surface water run-off;
- c) The plan for restoring recharge capacity; and
- d) The plan for replacement of impacted water supplies.

Label Attachment III-8.1.

- 8.2 Provide a plan to monitor ground and surface water in the permit and adjacent area. The plan shall be sufficient to determine the occurrence of mine related impacts, should any occur. Label Attachment III-8.2.