Part III

HYDROGEOLOGIC INFORMATION

1) Regional Hydrogeologic Characteristics

As described in Illinois State Geological Survey Circulars 192, 198, 207, 212, 222, 225, 232, 248, Coop 1, etc., other sources or personal knowledge provide the following required hydrogeologic information.

1) A) Describe the major and minor surficial aquifers of the permit area and adjacent areas.

Please refer to *Attachment III-1.*

1) B) List the major and minor drift, bedrock valley, and buried bedrock valley aquifers of the area.

Please refer to *Attachment III-1.*

1) C) List the major and minor bedrock aquifers in the area.

Please refer to *Attachment III-1.*

1) D) List the generalized water yield, supply, and potential use of these aquifers.

Please refer to *Attachment III-1.*

2) Area Specific Hydrogeologic Characteristics

2) A) 1) Provide a description of the areal and structural geology of the permit, shadow area and adjacent areas for the deeper of either the stratum immediately below the lowest coal seam to be mined, or any aquifer below the lowest coal seam to be mined which may be adversely impacted by mining. Provide logs showing the lithologic characteristics including physical properties and thickness of each stratum and the location of groundwater where encountered. Provide location and elevations of test borings or core samplings on pre-mining land use map or other designated map.

Lithological Cross Section A-A', Cross Section B-B', and Cross Section C-C' depict the unconsolidated overburden in the permit and shadow areas. Lithological Cross Section D-D', Cross Section E-E', Cross Section F-F', and Cross Section G-G' depict the consolidated overburden in the permit and shadow areas. The lithological cross section drawings are included in the maps section of this application. Boring logs used to develop the cross section drawings are included in *Attachment III-2A1.*

The bedrock surface is covered by varying thickness of glacial deposits from the Quaternary period. Sediments of the Wisconsinan stage predominately exist in the northeast to east central Illinois. Illinoisan glacial deposits cover 90 percent of Illinois, and are extensive in the west and south of the Wisconsin movement limit. These Illinoisan and Wisconsinan deposits are covered with widespread Wisconsin loess.

The bedrock system at the Bulldog Mine site is from the Carbondale Formation of the

Pennsylvanian System. The bedrock is comprised of primarily sandstone, siltstone, claystone and shale, which make up 90 to 95 percent of the formation while less than 2 percent is comprised of coal, underclay and limestone.

The Pennsylvanian System is the youngest large bedrock system in the Illinois Basin. Within the Pennsylvanian System is the Carbondale Formation, which contains four major coal members. These coals, which include the Herrin No. 6 coal, make up 92 percent of the coal in the Pennsylvanian System. Abrupt lateral changes exist within the Carbondale Formation where sandstone occupies erosion channels.

The Bulldog Mine site is situated between the LaSalle Anticline Belt to the west and the Marshall Syncline to the east. No significant faults are present within the Bulldog Mine project area. However, along the LaSalle Anticline strata dip is about 20 percent. In most places the regional dip are extremely gentle at 10 to 30 feet per mile. The Herrin No. 6 coal seam across the Bulldog Mine reserve generally dips to the east toward the Marshall Syncline. This dip is roughly 6 to 20 feet per mile, or 0.1 to 0.4 percent.

Surface topography is relatively flat throughout the permit and shadow areas. Available borehole data indicates the top-of-bedrock topography ranges from 23 to 156 feet below ground surface. The consolidated overburden ranges from 209 to 342 feet in thickness. Total overburden thickness within the shadow area above the Herrin No. 6 coal ranges from 344 to 377 feet, but can be as shallow as 318 feet or as deep as 383 feet. The Herrin No. 6 coal seam within the shadow area typically ranges from 5 to 7 feet thick, and is generally thicker to the north.

Over much of the Bulldog Mine site, the immediate floor material (underclay) consists of a gray mudstone to silty mudstone, and is typically 2 to 10 feet thick. Limestone, silty shale, or sandstone units typically underlie the underclay floor.

2) A)2) Provide chemical analyses of each stratum down to and including the deeper of either the stratum immediately below the lowest coal seam to be mined or any aquifer below the lowest coal seam to be mined which may be adversely impacted by mining.

The analyses shall identify those strata that may contain acid or toxic-forming or alkalinity-producing materials and determine their content.

Unconsolidated overburden samples were collected from borehole B-6. Consolidated overburden samples were collected form borehole SA116-181426. Both boreholes (locations shown on the *Hydrology Map, Map A*) are located within the proposed permit area. A boring log, analytical results of acid-base accounting, and a cross-reference key to correlate the boring log with the lab analysis for the overburden samples obtained from each of the boreholes are presented in *Attachment III-2A2*.

A chemical analysis of the overburden obtained from the boreholes was performed to determine the net neutralization potential of the unconsolidated and consolidated overburden materials. Core samples were taken at various intervals and where a change in lithology occurred. The acid-base accounting method was used to identify potentially acid-producing material. Under the acid-base accounting method, total or pyritic sulfur and the neutralization potential are measured in each sample. The accounting balances the maximum potential acidity (calculated from immediately titratable sources in addition to the sulfuric acid equivalent calculated from total sulfur) against total neutralizers (from

alkaline carbonates, exchangeable bases, weatherable silicates or other rock sources capable of neutralizing strong acids as measured by the neutralization potentials) (West Virginia Surface Mine Drainage Task Force, 1978).

Fifteen unconsolidated strata layers exist in the overburden column near the location where the mine slope will be developed. One-hundred percent of the unconsolidated overburden materials exhibited an excess of tons calcium carbonate equivalent per 1000 tons of unconsolidated material.

Forty-eight consolidated strata layers were sampled in the overburden that exists above the Herrin No. 6 coal seam. Five underburden layers were sampled in the strata below the Herrin No. 6 coal seam.

Forty-four of the forty-eight consolidated overburden strata layers totaling 286.7 feet thick exhibit a weighted average of positive 107.00 tons calcium carbonate equivalent per 1000 tons of material. Only four of the forty-eight consolidated overburden strata layers negative tons calcium carbonate equivalent per 1000 tons of material. The negative calcium carbonate material totaling 26.6 feet thick exhibit a weighted average of negative 35.05 tons calcium carbonate equivalent per 1000 tons of material.

The eight layers of strata that exhibit negative net neutralization potential makeup only 8.5% of the total consolidated overburden column. These strata layers exist at depths greater than 285 feet below the surface. This material blended with the excavated overburden material that demonstrates positive net neutralization potential and used as a base to provide a solid foundation across the mine site. Considering the overall calcareous nature of the consolidated overburden, and the blending that will occur during the slope development process, special material handling techniques are not considered necessary in the interest of prevention of contamination of groundwater and surface water supplies.

A discussion regarding waste material generated by coal processing at this mine site is included in Part IV(6)(A) of this application.

2) A) 3) Provide coal seam(s) name and number and an analysis of the coal seam(s) as to total sulfur and pyritic sulfur. On the pre-mining land use, operation, or other designated map show all coal crop lines and the strike and dip of the coal to be mined.

Total sulfur and pyritic sulfur forms for the Herrin No. 6 coal seam are shown in *Attachment III-2A3*. The data listed in the attachment was obtained from borehole SA116-181426. The borehole location is illustrated on the *Hydrology Map, Map A*. The drillers log for borehole SA116-181426 is included in *Attachment III-2A2*.

Borehole data available to the permittee does not identify the presence of any coal crop or subcrop lines in or near the shadow area. However, the location of the La Salle Anticline is illustrated on the *Shadow Area Map, Map S*, and on the coal isopach maps.

2) A) 4) For room and pillar mining operations, the thickness and engineering properties of clay or soft rocks such as clayshale, if any, in the stratum immediately above and below each coal seam to be mined.

The thickness and engineering properties of these materials are included in *Attachment IV-3A3* of this application.

2) A) 5) Applicants may request that the Department waive in whole or in part the information required under questions 2 thru 4 above. Waiver requests should be submitted to the Department for review prior to submission of an application. Applications containing unapproved waiver requests may result in prolonging the application review or in application denial.

A waiver for information required under questions 2 through 4 above is not requested.

2) B) Ground Water Information

2) B) 1) Provide the location on the hydrologic map or other designated map, and ownership of existing wells, springs, and other ground water resources for the permit area and adjacent area.

The location of all known water wells within the permit and adjacent areas are shown on the *Hydrology Map, Map A*. Well logs obtained from the Illinois State Geological Survey website for forty-five of the known water wells in the area are included in *Attachment III-2B1a*.

The following table lists pertinent information relating to each well. The Well ID Numbers listed below reference the individual well locations shown on the *Hydrology Map, Map A*. The well use, aquifer type and static level information listed in the table was obtained from the following sources, well logs listed with the Illinois State Geological Survey website, well owner responses to the applicant's water resources survey, or the ground water database at the Illinois State Water Survey website.

There are no known springs or other water resources within or adjacent to the permit area.

Table III-A
Private Water Wells

Well ID Number	Sec., Twp., Rng.	Owner Listed on Well Log	Well Depth	Aquifer Type	Static Level
1	6 – 17N – 13W	Maddox, Clarence	40'	UN	~
2	18 – 17N – 13W	Terry, Ralph	50'	UN	~
0130	18 – 17N – 13W	Craddock, Steve	81'	UN	38.5'
4	18 – 17N – 13W	Partenheimer, Jeff	80'	UN	17'
5	1 – 17N – 14W	Chew, Todd #1	100'	UN	14'
0057	2 – 17N – 14W	Jenkins, Bobbi	32'	UN	~
0060a	3 – 17N – 14W	Waters, Dean	40'	UN	3.49
8	12 – 17N – 14W	Rowand, Russell	30'	UN	11'
0062d	14 – 17N – 14W	1st Natl. Bank Chicago	49'	UN	8.2'
10	23 – 17N – 14W	1st Natl. Bank Chicago	39'	UN	13'
Shreeves 17-14-25	25 – 17N – 14W	Shreeves, Bruce	65'	UN	10.2
12	27 – 17N – 14W	Allerton	50'	UN	~
13	27 – 17N – 14W	Allerton, Village of #3	54'	UN	12'
14	27 – 17N – 14W	Allerto	48'	~	15'
15	19 – 18N – 13W	Taylor, John L.	118'	BR	18'
16	31 – 18N – 13W	Trisler, James	46'	UN	~
0241	31 – 18N – 13W	Thomas, Richard	68'	BR	8.6'
18	2 – 18N – 14W	Anders, Larry	42'	UN	20'
19	2 – 18N – 14W	Krukewitt, Don	61'	BR	18'
20	3 – 18N – 14W	Hess, Scott	33'	UN	10'
21	4 – 18N – 14W	Wolf, Terry	80'	UN	~
22	11 – 18N – 14W	Bryan, Bruce	42'	UN	~
23	13 – 18N – 14W	Cradock, William	36'	UN	~
24	13 – 18N – 14W	Prior, Loren	62'	UN	13'
0250	13 – 18N – 14W	Clark, Carol	60'	UN	25'
26	14 – 18N – 14W	Parrish, J.J.	65'	UN	9'
27	14 – 18N – 14W	Dallas, Derek & Charity	140'	BR	4'
28	14 – 18N – 14W	Wienke, James	45'	UN	~
29	14 – 18N – 14W	Wienke, James	38'	UN	~
30	14 – 18N – 14W	Rool, W.D.	41'	UN	2'
31	16 – 18N – 14W	Krukewitt, Charles	50'	UN	~
0124	24 – 18N – 14W	Miller, Douglas C.	36'	UN	8.39
33	25 – 18N – 14W	Brown, Marlin	51'	BR	7'
0085a	27 – 18N – 14W	Happ, Dennis	36'	UN	~
0085b	27 – 18N – 14W	Smith, Mrs. or Allen Carter	175'	UN	~
36	27 – 18N – 14W	Richards, Rodney	86'	DRY	NA
37	28 – 18N – 14W	Place, Carl #1	105'	~	~
38	28 – 18N – 14W	Place, Carl #2	60'	UN	5'
0091a	34 – 18N – 14W	Edgar, Kizer	38'	UN	~
40	34 – 18N – 14W	Unknown	154'	~	~
0091b	34 – 18N – 14W	Mohr, Gerhart % Mohr Bros.	64'	BR	14'
42	35 – 18N – 14W	Warters, R.G.	140'	~	~
0018	35 – 18N – 14W	Easton, Keith	74'	UN	~
0044	36 – 18N – 14W	Tighe, Tim	204'	BR	14'
45	36 – 18N – 14W	Hackman, Thomas W.	90'	UN	~

Field descriptions for Table III-A

Aquifer Type - Aquifer well is finished within
BR – Bedrock
UN – Unconsolidated
NA – Not applicable, well is dry
~ – Unknown

Static Level - Non-pumping water level
Feet below land surface
NA – Not applicable, well is dry
~ – Unknown

Sunrise Coal conducted a water resources survey soliciting information regarding each of the listed wells from each resident and well owner of record within the permit and shadow areas. A water source data table that includes responses to the survey is included in *Attachment III-2B1b.*

As indicated in the water source data table, several well owners and residents chose not to respond to the survey. Twenty-six (26) owners agreed to allow collection of a well water sample for analysis performed by an independent laboratory. The analytical results are included in *Attachment III-2B1b.*

Table III-A above lists the presence of 45 wells within the permit and shadow areas. Respondents to the water resources survey, and visual inspection indicate an additional 41 wells exist within and adjacent to the Bulldog Mine. The type of aquifers supplying water to these wells are as follows; 43 wells receive water from unconsolidated deposits, 9 wells receive water from bedrock aquifers, and 1 well is dry. The aquifer for 33 wells is unknown and could not be determined mainly due to no response to the water resources survey from owners or residents of occupied dwellings. All of the wells are finished at depths well above the Herrin No. 6 coal seam, and therefore will not be affected by the underground mining operation.

2) B) 2) Provide a description of seasonal ground water quality including at a minimum the following:

pH
total dissolved solids
hardness
alkalinity
acidity
sulfates
total iron
total manganese
total chlorides

Attachment III-2D4a* provides a list of proposed groundwater monitoring constituents, which includes the above listed constituents. Seasonal groundwater quality for the monitoring constituents listed in *Attachment III-2D4a* is included in *Attachment III-2B3.

Attachment III-2B3 shows groundwater quality data taken to date from monitoring wells

near the site. From this data, little variation was noticed in pH levels of the groundwater present. Total Dissolved Solids concentrations were lower in the summer months as opposed to spring and winter months based on the average values of this data. Alkalinity measurements were also lower in the summer months. Hardness and Sulfate levels were noted to be lower in the winter months, with little variation between spring and summer months. Chloride levels were elevated in the spring months. Data on Manganese levels showed a very slight increase in the summer months, while little to no variation was observed in Iron, Acidity, and other trace elements. These observations were taken from averages of each trimester data. For a more detailed accounting of all collected data from each individual monitoring well, please see Attachment III-2B3.

2) B) 3) Provide a description of seasonal ground water quantity including at a minimum the appropriate rates of discharge or usage and the elevation of potentiometric surface of the coal to be mined, and in each water-bearing stratum above the coal to be mined, and in each water-bearing stratum below the coal to be mined which may be potentially impacted.

A potentiometric map of the shallow, surficial groundwater aquifer, and a description of seasonal groundwater quantity/quality are included in *Attachment III-2B3*. The map is based on seasonal groundwater monitoring results obtained from the six groundwater monitoring wells installed by the applicant. A discussion regarding each water-bearing stratum above and below the coal seam to be mined is also included in the attachment.

Additionally, *Attachment III-2B1a* contains well drilling reports obtained from the Illinois State Geological Survey website, which illustrate the depths of existing wells in the permit and surrounding areas. Table III-A above includes data that indicates the aquifer type and reported static water levels.

Forty-three (43) wells, ranging in depth from 23.5 to 100 feet, receive water from unconsolidated glacial till deposits of the Wisconsinan Aged Wedron Formation. These glacial till deposits may be capable of providing yields up to 500 gallons per minute. Although the Wedron Formation is locally more than 150 feet thick and averages about 60 feet thick, the distribution of sand and gravel aquifers is quite limited within. The principal aquifer is the Ashmore situated at the base of the Wedron in scattered locations throughout the region. Well records included in *Attachment III-2B1a* indicate sustained pumping rates ranging from 1 to 59 gallons per minute. Static water levels in the wells established in the unconsolidated deposits range from 2 feet to 38.5 feet below the ground surface.

Nine (9) wells in the area are finished in the sandstone or limestone bedrock aquifer, ranging in depth from 51 to 204 feet. Available well records indicate these deposits provide yields ranging from 3 to 25 gallons per minute. Static water levels were reported for 7 of these wells ranging from 4 feet to 18 feet below ground surface level.

The aquifer for 33 wells is unknown and could not be determined mainly due to no response to the water resources survey from owners or residents of occupied dwellings. One (1) well is dry. Depths that have been reported for these wells range from 48 to 175 feet. Static water levels reported for these wells range from 6.9 to 20.1 feet deep.

The attached well reports indicate that groundwater for domestic use is obtained from drilled wells finished in the unconsolidated materials or from drilled wells tapping the underlying sandstone and limestone bedrock formations. The wells tap stringers or lenses

of sand, and/or gravel contained in the unconsolidated materials above bedrock. The other wells tap into the bedrock sandstones and limestones. The yield of these wells is generally limited to less than one-hundred gallons per day, and may be only adequate for normal household uses.

Groundwater monitoring wells installed by Sunrise Coal in the unconsolidated deposits indicate water levels fluctuate seasonally in response to variations in precipitation recharge and some wells may go dry in the late summer or early fall. The general flow direction of these water-bearing deposits appears to be aligned with the present surface watercourses.

In summary, the probability of developing adequate groundwater supplies from the unconsolidated deposits, and from the sandstone and limestone bedrock is only fair. The drift is mainly composed of fine-grained materials. Substantial sand and gravel beds and bedrock deposits are scarce.

2) C) Surface Water Information

2) C) 1) Provide the name, location, ownership, and description of all surface water bodies, lakes, streams, impoundments, and springs within and adjacent to the proposed permit and shadow areas. Provide the location of any discharge or drainage into any surface water bodies listed above.

The location of all surface water bodies, lakes, streams, and impoundments within and adjacent to the proposed permit and shadow areas are shown on the *Hydrology Map, Map A, Pre- Mining Map* and *Shadow Area Map, Map S.* If known, the names of the water bodies are also shown on the maps. However, most of the streams and impoundments are unnamed. Ownership of the water bodies are shown on the *Pre-Mining Map, Map B* and the *Shadow Area Map, Map S.* No springs are known to exist within or adjacent to the proposed permit and shadow areas.

Six proposed impoundments (2 freshwater ponds, 2 treatment ponds, 1 sediment pond, and 1 fine refuse (slurry) pond) greater than 20-acre feet volume will be constructed at the Bulldog Mine site to support the mining operation. These impoundments are shown on the *Surface Drainage Map, Map D* and *Shadow Area Map, Map S.*

All of the identified water bodies are located in areas of unplanned subsidence. These water bodies are generally limited to wildlife habitat, fishing, hunting and other recreational uses. None of the surface water bodies are known to be used for domestic purposes.

2) C) 2) Provide for surface water bodies listed under 2)(c)(1) above information on surface water quality and quantity sufficient to demonstrate seasonal variation and water usage.

Area specific surface water quality and quantity information is currently being monitored at six locations shown on the *Hydrology Map, Map A.* The monitoring points are located in appropriate local drainage basins that receive surface runoff from the permit area, or runoff collected in agricultural drainage tile fields passing through the permit and adjacent areas. They are currently monitored on a monthly basis to provide seasonal variation.

Surface water runoff from the proposed permit area is located within a watershed that is

tributary to an unnamed tributary to Olive Branch tributary to Salt Fork.

2) C) 2) a) Water quality description shall include at a minimum, baseline information as follows:

pH
total suspended solids
total dissolved solids
alkalinity
acidity
sulfates
total iron
total manganese
total chlorides

Area specific surface water quality information is currently being collected at six (6) surface water monitoring points at the locations shown on the *Hydrology Map, Map A.* Because the ground surface in and around the permit area is flat and offers very little relief for surface water runoff the area is heavily tiled with agricultural drainage tiles. The drainage tiles collect most of the surface water and reduce overland flows of surface water runoff. Therefore, little opportunity exists to collect localized surface water runoff from any concentrated, open channel, surface drainageways. The surface water runoff conditions and designed drainage tile installations dictated that in order to collect surface water samples representative of the quality of surface water runoff from the permit area the monitoring points needed to be located in the nearest open channel drainageways both upgradient and downgradient from the proposed permit area. Based on that information the applicant chose the surface water monitoring locations shown on the *Hydrology Map, Map A.*

The monitoring points, designated SW-1, SW-2, SW-3, SW-4, SW-5 and SW-6 are analyzed for flow, ph, total suspended solids, total dissolved solids, acidity, alkalinity, sulfates, total iron, chlorides, total manganese, and hardness. These sample points are believed to be appropriately located in existing drainageways upgradient and downgradient from the proposed permit area to demonstrate seasonal variation of surface water quality and quantity, and water quality and quantity of surface water runoff collected in agricultural drainage tile fields.

Analytical data relating to surface water quality and quantity obtained from the six (6) stream sample locations are included in *Attachment III-2C2.* A discussion regarding seasonal variations of the surface water quality and quantity is also included in the attachment.

2) C) 2) b) Water quantity description shall include at a minimum base information on seasonal flow rates.

Surface water seasonal flow rates for the individual surface water monitoring sites are listed in *Attachment III-2C2.*

2) D) Protection of Hydrologic Balance

2) D) 1) The applicant shall provide a determination of the probable hydrologic consequences, (PHC) of the proposed shadow operations, on the proposed permit area, and adjacent areas with respect to

the hydrologic regime and water quality and quantity in surface and ground water systems under all seasonal conditions. The determination of PHC shall include findings on the following:

A discussion regarding the cumulative impact areas (CIA) for surface water and groundwater is included in *Attachment III-2D1. Surface Water/Groundwater Cumulative Impact Area, Map: SW/GW CIA* is included in the maps section of this permit.

2) D) 1) a) Will the proposed surface coal mining and reclamation operations have adverse impacts to the hydrologic balance;

The dominant regional aquifers near the proposed permit and shadow areas appear to be the glacial till deposits from the Quaternary period. These aquifers are capable of supporting small industrial and municipal well development with possible yields of 1 to 60 gallons per minute. The well depths in the glacial till deposits generally range from 30 to 100 feet below the surface. A few wells in the area tap into the shale, sandstone, or limestone bedrock aquifers at depths ranging from 51 to 204 feet below the surface. These wells are separated from the Herrin No. 6 coal seam by highly impervious materials ranging from 115 to 332 feet thick.

This site is an unplanned subsidence permit; however, any unforeseen subsidence following mining may cause temporary mineralization of shallow ground water. Because the water in saturated medium does not contain enough dissolved oxygen for significant oxidation, oxidation will occur primarily in the vadose zone. As water passes through this zone, concentrations of elevated dissolved solids decrease exponentially, reaching equilibrium concentrations after 3 to 10 pore volumes. Equilibrium concentrations will usually be similar to concentrations in natural ground water in the mining area. Local well inventories indicate the wells are typically completed in marginal glacial till deposits, or shallow bedrock aquifers. It would take a considerable amount of time for water to move even 150 feet laterally through this material. Recharge to these wells must be primarily from very local precipitation and snow melt. Although no adverse affects are anticipated on nearby wells, if any proven valid complaints are received, alternative water will be supplied.

Based on reports from other underground mines operating in Vermilion County, it is believed underground pumpage from the Bulldog Mine will be minimal. Due to the small volume of water anticipated to be pumped from the mine, the vertical separation of highly impervious materials between the underground mining operation and the shallow groundwater aquifers, and the marginal rate of flow through the local aquifers, it is anticipated the area of influence caused by drawdown will not cause any adverse impacts to the groundwater resource used for public or private consumption.

It is not likely the ground water quality will be impacted significantly during or after mining. If any problems should occur, only very local acidity or elevated metal concentrations are anticipated. If those problems do occur they should be short lived as ground water moving through and away from the proposed mining area will contact clays, shales and limestones. Shales and clays have high ion exchange and absorption capacities that will remove or buffer high metal concentrations. Contact with limestone containing a high net neutralization potential will eliminate any acidity problems. If ground water quality problems do occur, the natural geologic material will act as a filtering system and mitigate the problem in a very short distance.

Based on responses to a water resources survey, personal contact with property owners, visual observations of existing wells, an assumption that a well does exist because no other known water resource is available i.e. municipal water supply at occupied dwellings where the owner or resident did not respond to the water resources survey, and available well records it is believed a total of 86 private wells exist within the permit and shadow areas. Well records are available for 45 of these wells, and are included in *Attachment III-2B1a* of this application. Forty-three (43) wells are known to be finished in very thin sand and gravel, and sandy clay deposits. An additional 9 wells are finished in bedrock. The aquifer for 33 wells is unknown and could not be determined mainly due to no response to the water resources survey from owners or residents of occupied dwellings. One (1) well is dry. The sand and gravel wells within the shadow area range in depth from 23.5 to 100 feet deep. Well records and water samples indicate static water levels in the sand and gravel wells ranging from 2 to 38.5 feet deep. The bedrock wells range from 51 to 204 feet deep and exhibit static water levels from 4 to 8 feet below ground surface. The wells finished in unknown aquifers range from 48 to 175 feet deep. Well records and water samples indicate static water levels in these wells range from 6.9 to 20.1 feet deep. Several measures will be implemented at the Bulldog Mine to insure the unconsolidated sand and gravel deposits and the bedrock units will be protected from mining-related impacts, and the off-permit hydrologic balance will be maintained.

Protective measures will include installing compacted clay liners with a minimum thickness of four feet and a minimum hydraulic conductivity of 1×10^{-7} cm/sec. The compacted clay liners will be installed beneath the Refuse Impoundment, Treatment Pond #1, Treatment Pond #2, raw coal stockpile area, and the clean coal stockpile area.

Drainage structures/ditches that convey runoff water from coal processing or coal processing waste areas will also have bottom liners installed. These structures include Collector Ditch #5, Collector Ditch #6, Collector Ditch #7, and Collector Ditch #8. These liners will consist of compacted clay with a minimum thickness of four feet and a minimum hydraulic conductivity of 1×10^{-7} cm/sec. The permittee may choose to use an approved impermeable geomembrane liner, or a composite liner consisting of a combination of compacted clay and an approved impermeable geomembrane liner beneath the drainage structures/ditches in lieu of an all clay liner.

Other protective measures will include controlling surface runoff from areas affected by the mining operation. Properly engineered and constructed drainage ditches, freshwater ponds, treatment ponds, and a sediment pond will collect all surface water runoff from affected areas. In addition to containing sediments and other pollutants, the treatment ponds will act as holding cells for fresh water make-up for the coal preparation plant. Water will be pumped from the treatment ponds to the preparation plant and will be used for coal processing and cleaning. Water discharged from the preparation plant will be pumped back to the treatment ponds for reuse at the preparation plant. There will not be any overflow discharges from the treatment ponds except during extremely wet periods. Any overflow discharges that do occur from the treatment ponds will flow to the associated freshwater pond. If necessary, excess water contained in the freshwater ponds will be allowed to discharge. Water discharging from the freshwater ponds will be sampled at the appropriate NPDES outfall and analyzed at an IEPA approved laboratory in accordance with the approved NPDES permit for this facility.

Off-site surface drainage from up-gradient watersheds migrating through unaffected

areas within the surface permit boundaries will be collected and segregated from affected area runoff, which will help prevent off-permit impacts to the hydrologic balance.

Additionally, the proposed groundwater monitoring plan for this permit includes wells in and around the proposed permit, shadow and adjacent areas. Any variation in water quality will be apparent from analyses performed on samples obtained from these monitoring sites.

The extensive groundwater monitoring program that currently exists at this site, as well as additional monitoring wells that are proposed to be installed will be used as an aid in protecting the hydrologic balance. Currently, groundwater monitoring is being conducted at six existing groundwater monitoring wells located throughout the mine site. Analytical data obtained from the wells provides background water quality/quantity data that is used as a baseline to determine pre-mining conditions. The groundwater monitoring program outlined in *Attachment III-2D4a*, will likely be enhanced to include additional monitoring wells located near sedimentation control basins and the refuse impoundment. The additional well locations will be determined by IEPA, and will be installed at locations appropriate to determine impacts to the local groundwater system from these sites. Future groundwater monitoring data will provide an opportunity to compare pre-mining water quality/quantity with the water quality/quantity that exists at any time in the future. This data comparison will provide early detection and warning of any adverse impacts that may be occurring to the local groundwater system. Necessary modifications to the operations plan can be determined and implemented based on factual data collected from the monitoring wells. The groundwater monitoring program will be used as another tool to insure the thin, unconsolidated sand and gravel deposits, and bedrock units will be protected from mining-related impacts, and the off-permit hydrologic balance will be protected.

2) D) 1) b) Are acid forming or toxic forming materials present that could result in contamination of surface and/or ground water supplies;

Acid-base accounting data collected from boreholes B-6 and SA116-181426 indicate the overburden is highly positive in net neutralization potential. Fifteen (15) unconsolidated strata layers and forty-eight (48) consolidated overburden strata layers were sampled. As indicated in *Attachment III-2A2*, all of the unconsolidated material and forty-four (44) strata layers of consolidated material exhibited positive calcium carbonate equivalent per 1000 tons of material. Only four (4) layers of consolidated overburden ranging in depth from 285 feet to 351 feet below ground surface exhibited negative neutralization potential. These 4 layers exhibit neutralization potentials ranging from negative 7.7 to negative 74.8 tons calcium carbonate equivalent per 1000 tons of material. Several thick layers of limestone exist within the same depth range. The limestone layers exhibit neutralization potentials ranging from positive 262.95 to positive 812.56 tons calcium carbonate equivalent per 1000 tons of material.

Considering the overall calcareous nature of the consolidated overburden as indicated in *Attachment III-2A2*, it is not anticipated that any contamination will occur to the surface and/or ground water supplies as a result of this mining operation.

2) D) 1) c) Will the proposed surface coal mining and reclamation operations result in contamination, diminution or interruption of an underground or surface source of water within the proposed

permit or adjacent areas which is used for legitimate purposes; and

It is not expected this operation will result in contamination, diminution or interruption of any underground or surface water source within the proposed permit or adjacent areas.

The operating wells in the area that are finished in the unconsolidated deposits range from 23.5 feet to 100 feet below the ground surface. The wells finished in the consolidated deposits range from 51 to 204 feet below ground surface. The Herrin No. 6 coal seam ranges from approximately 318 feet to 383 feet below ground surface. Overall, the groundwater will be separated from the underground mining operation by a minimum of 100 feet of low permeability materials, which is expected to be more than sufficient to protect the local groundwater system.

Surface water will be protected by the extensive drainage control plan established for the surface disturbed areas. This plan provides a network of lined ditches and sedimentation control ponds that will treat surface water runoff prior to discharge from the permit area. Effluent water quality will be maintained and monitored in compliance with the N.P.D.E.S. permit for this site.

2) D) 1) d) What impact(s) will the proposed surface coal mining and reclamation operations have on including, but not limited to the following parameters:

i) Sediment yield from the disturbed area;
ii) Acidity;
iii) Total suspended solids;
iv) Total dissolved solids;
v) Flooding or stream flow alterations;
vi) Availability of surface and ground water; and

All affected area surface water runoff will be collected and used internally for coal processing, or on rare occasions discharged from approved N.P.D.E.S. outfalls. All affected area surface water runoff will be treated prior to discharge to insure compliance with effluent limitation standards prior to discharge from the permit area.

The operating wells in the area that are finished in the unconsolidated deposits range from 23.5 feet to 100 feet below the ground surface. The wells finished in the consolidated deposits range from 51 to 204 feet below ground surface. The Herrin No. 6 coal seam ranges from approximately 318 to 383 feet below ground surface. Overall, the groundwater will be separated from the underground mining operation by a minimum of 100 feet of low permeability materials, which is expected to be more than sufficient to protect the local groundwater system.

Surface water will be protected by the extensive drainage control plan established for the surface disturbed areas. This plan provides a network of lined ditches and sedimentation control ponds that will treat surface water runoff prior to discharge from the permit area. Effluent water quality will be maintained and monitored in compliance with the N.P.D.E.S. permit for this site.

Protective measures will include controlling surface runoff from areas affected by the mining operation. Properly engineered and constructed drainage ditches, freshwater ponds, treatment ponds, and a sediment pond will collect all surface water runoff from affected areas. In addition to containing sediments and other pollutants, the treatment ponds will act as holding cells for fresh water make-up for the coal preparation plant. Water will be pumped from the treatment ponds to the preparation plant and will be used for coal processing and cleaning. Water discharge from the preparation plant will be pumped back to the treatment ponds to reuse at the preparation plant. There will not be any overflow discharges from the treatment ponds except during extremely wet periods. Any overflow discharges that do occur from the treatment ponds will flow to the associated freshwater pond. If necessary, excess water contained in the freshwater ponds will be sampled at the appropriate N.P.D.E.S. outfall and analyzed at an IEPA approved laboratory in accordance with the approved N.P.D.E.S. permit for this facility.

It is not likely the ground water quality will be impacted significantly during or after mining. If any problems should occur, only very local acidity or elevated metal concentrations are anticipated. If those problems do occur they should be short lived as ground water moving through and away from the proposed mining area will contact clays, shales and limestones. Shale and clays have high ion exchange and absorption capacities that will remove or buffer high metal concentrations. Contact with limestone containing a high net neutralization potential will eliminate any acidity problems. If ground water quality problems do occur, the natural geologic material will act as a filtering system and mitigate the problem in a very short distance.

Acid-base accounting data collected from boreholes B-6 and SA116-181426 indicate the overburden is highly positive in net neutralization potential. Fifteen (15) unconsolidated strata layers and forty-eight (48) consolidated overburden strata layers were sampled. As indicated in *Attachment III-2A2,* all of the unconsolidated material and forty-four (44) strata layers of consolidated material exhibited positive calcium carbonate equivalent per 10000 tons of material. Only four (4) layers of consolidated overburden ranging in depth from 285 feet to 351 feet below ground surface exhibited negative neutralization potential. These 4 layers exhibit neutralization potential ranging from 7.7 to negative 74.8 tons calcium carbonate equivalent per 1000 tons of material. Several thick layers of limestone exist within the same depth range. The limestone layers exhibit neutralization potentials ranging from positive 262.95 to positive 812.56 tons calcium carbonate equivalent per 1000 tons of material.

Considering the overall calcareous nature of the consolidated overburden as indicated in *Attachment III-2A2*, it is not anticipated that any contamination will occur to the surface and/or ground water supplies as a result of this mining operation.

Based on responses to a water resource survey, personal contact with property owners, visual observations of existing wells, an assumption that a well does exist because no other known water resource is available i.e. municipal water supply at occupied dwellings where owner or resident did not respond to the water resources survey, and available well records it is believed a total of 86 private wells exists within the permit and shadow areas. Well records are available for 45 of these wells,

and are included in *Attachment III-2B1a* of this application. Forty-three (43) wells are known to be finished in very thin sand and gravel, and sandy clay deposits. An additional 9 wells are finished in bedrock. The aquifer for 33 wells is unknown and could not be determined mainly due to no response to the water resources survey from owners or residents of occupied dwellings. One (1) well is dry. The sand and gravel wells within the shadow area range in depth from 23.5 to 100 feet deep. Well records and water samples indicate static water levels in the sand and gravel wells ranging from 2 to 38.5 feet deep. The bedrock wells range from 51 to 204 feet deep and exhibit static water levels from 4 to 8 feet below ground surface. The wells finished in unknown aquifers range from 48 to 175 feet deep. Well records and water samples indicate static water levels in these wells range from 6.9 to 20.1 feet deep. Several measures will be implemented at the Bulldog Mine to insure the unconsolidated sand and gravel deposits and the bedrock units will be protected from mining-related impacts, and the off-permit hydrologic balance will be maintained.

The dominant regional aquifers near the proposed permit and shadow areas appear to be the glacial till deposits from the Quaternary period. These aquifers are capable of supporting small industrial and municipal well development with possible yields of 1 to 60 gallons per minute. The well depths in the glacial till deposits generally range from 30 to 100 feet below the surface. A few wells in the area tap into the shale, sandstone, or limestone bedrock aquifers at depths ranging from 51 to 204 feet below the surface. These wells are separated from the Herrin No. 6 coal seam by highly impervious materials ranging from 115 to 332 feet thick.

This site is a unplanned subsidence permit; however, any unforeseen subsidence following mining may cause temporary mineralization of shallow ground water. Because the water in saturated medium does not contain enough dissolved oxygen for significant oxidation, oxidation will occur primarily in the vadose zone. As water passes through this zone, concentrations of elevated dissolved solids decrease exponentially, reaching equilibrium concentrations after 3 to 10 pore volumes. Equilibrium concentrations will usually be similar to concentrations in natural ground water in the mining area. Local well inventories indicate the wells are typically completed in marginal glacial till deposits, or shallow bedrock aquifers. It would take a considerable amount of time for water to move even 150 feet laterally through this material. Recharge to these wells must be primarily from very local precipitation and snow melt. Although no adverse effects are anticipated on nearby wells, if any proven valid complaints are received, alternative water will be supplied.

Based on reports from other underground mines operating in Vermillion County, it is believed underground pumpage from the Bulldog Mine will be minimal. Due to the small volume of water anticipated to be pumped from the mine, the vertical separation of highly impervious materials between the underground mining operation and the shallow groundwater aquifers, and the marginal rate of flow through the local aquifers, it is anticipated the area of influence caused by drawdown will not cause any adverse impacts to the groundwater resource used for public or private consumption.

Also, please refer to the discussions above relative to groundwater. As stated, no appreciable diminution to the quality and/or quantity of ground water is expected to occur.

Continued monitoring of the ground water monitoring wells and surface water monitoring locations will insure that any impacts to water quality and quantity will be quickly determined and corrected.

2) D) 2) The Department will review permit revision applications to determine whether a new or updated PHC determination will be needed. Prior to submission of a permit revision application, applicants must contact the Department for this determination. Sufficient information on the proposed revision must be submitted with the request for the PHC determination to allow the Department to make its determination.

Sunrise Coal, LLC will comply with all Department rules and regulations, including contacting the Department prior to any permit revision application, and providing sufficient information on any proposed revisions to allow the Department to make appropriate determinations.

2) D) 3) Surface Water Monitoring Program

2) D) 3) a) Has an N.P.D.E.S. permit been applied for?
Yes __X__ No _____

2) D) 3) b) 1) Has an N.P.D.E.S. permit been obtained?
Yes _____ No __X__

If yes, give the permit number, the date issued, the expiration date, and the number of discharge points monitored. If additional discharge points are proposed by this application, list discharge numbers. Locate on the Water Monitoring Map and number all discharge points for the proposed permit area.

All proposed discharge points (outfalls) are numbered and illustrated on the *Surface Drainage Map, Map D.*

2) D) 3) b) 2) In accordance with 35 Ill. Adm. Code 406.101(b), is the applicant requesting that monitoring and reporting be on the basis of grab samples?
Yes __X__ No _____

2) D) 3) c) Are N.P.D.E.S. reports to be submitted to satisfy the reporting requirements?
Yes __X__ No _____

If yes, provide the NPDES monitoring program including sampling method, sampling frequency and parameters to be analyzed. If not, submit a proposed monitoring and reporting program. Discharge information sheet is given in Schedule A and/or form 2C or 2D. Schedule A should be completed for all proposed discharge points. An estimate of the expected discharge concentration for each listed parameter must be indicated (or marked N/A) and a basis for that estimation provided.

Sampling frequency and parameters to be analyzed are expected to be designated on the final N.P.D.E.S. permit. A Schedule A for the proposed outfalls is included herein.

If ammonia is to be utilized in wastewater treatment, indicate the discharge(s) resulting from this treatment and provide an estimate of the expected concentration (mg/l) of ammonia

nitrogen (as N) from the discharge(s).

Ammonia will not be utilized.

2) D) 3) d) Give a brief description of the water sampling and flow measurement equipment which will be used to monitor the discharges.

Flow measurement will be taken by measuring the flow depth and velocity and calculating the discharge rate at the time of sampling.

2) D) 3) e) List the name and address of the laboratories which will perform the effluent and ground water sampling analyses.

A specific laboratory has not been chosen at this time. However, effluent and groundwater sampling will likely be performed by RoseDale Services, Inc., 1125 E. Walnut Street, Boonville, IN 47601.

2) D) 3) f) Discuss the expected impact this mining operation will have on surface water flows and quality and the effect this will have on downstream water uses.

In the short term, surface water discharges from the mining operation may increase total dissolved solids. However, any increase should return to normal levels in the long term. The alkaline nature of the overburden will minimize the possibility of acid discharges. The flow peaks of discharge will be dampened by settling basins. Based on past and anticipated future downstream water use, the above-referenced impacts will not adversely affect the use of water downstream.

2) D) 3) g) Is this proposed mining area covered by existing IEPA Subtitle D permits?
Yes _____ No __X__

If yes,
2) D) 3) g) 1) List the permit number(s)

_____
_____
_____

2) D) 3) g) 2) Do the proposed mining boundaries exactly coincide with IEPA permitted boundaries?
Yes __X__ No _____
(If no, delineate the IEPA Subtitle D permitted boundaries on the Water Monitoring Map).

Although an N.P.D.E.S. permit has not been issued for this operation, the SMCRA surface permit boundaries are proposed to coincide exactly with the proposed N.P.D.E.S. permit boundaries.

2) D) 3) h) Are the TDS related conditions requested under 35 Ill. Adm. Code 406.203 (from water quality requirements of Subtitle 3 for the discharge of total dissolved solids, chloride, sulfate, iron and manganese)?
Yes __X__ No _____

If yes, provide the following:

2) D) 3) h) 1) Show that the discharge(s) will not cause an adverse effect on the environment in and around the receiving stream, by either:

2) D) 3) h) 1) a) Demonstrating that the discharge will contain a concentration less than or equal to 3,500 mg/l sulfate and 1,000 mg/l chloride; or,

Please refer to Schedule A for estimates of proposed discharges.

2) D) 3) h) 1) b) through actual stream studies.

2) D) 3) h) 2) Show that the discharge(s) will not adversely affect any public water supply.

No public water supplies located near the permit area utilize streams receiving water from the permit area as a water source.

2) D) 3) h) 3) Provide a detailed discussion of how you intend to comply with the good mining practices of 35 Ill. Adm. Code 406.204.

Compliance with 35 Ill. Adm. Code 406.204 relative to "Good Mining Practices" can be demonstrated by review of the surface water control plan submitted herewith in Part IV. Standard practices at the Bulldog Mine include the various measures outlined in Section 406.204, including the retention and control of waters exposed to surface materials, and control and treatment of water discharges from the site. Further measures such as contemporaneous reclamation, the use of temporary mulch crops on disturbed areas, and the surface water monitoring program will also assist in compliance with the referenced "Good Mining Practices".

As the Antidegradation Assessment for a NPDES permit to allow outfalls for this facility will require "Assessments of Alternatives for Less Increase in Loading or Minimal Environmental Degradation," a discussion detailing alternative analysis for the proposed increase in loading from the proposed outfalls is included herein. Following is the alternatives analysis discussion including all alternatives considered to the proposed discharges, and the justification for the option selected.

Approval of this permit application will provide the fuel for electric power generation necessary to sustain our culture and society. Sedimentation ponds proposed in the application are currently the only technically and economically reasonable sediment control measures available to avoid or minimize the extent of increase in pollutant loading.

The sedimentation ponds will capture stormwater runoff from the surface affected areas. Total suspended solids will settle in the ponds, but some amount, regulated by permit standards for mining, will remain. It is anticipated the solids concentration will be similar to, or better than that now present on unmined sites.

Suspended solids discharging from the sedimentation ponds will be incorporated into the natural load in the receiving streams. Some of the suspended solids will become part of the stream sediment and some will progress downstream in a suspended state. No adverse impacts on aquatic life or other stream uses are anticipated since the solids concentration will be similar or less than that now present from unmined sites.

All sedimentation ponds will be constructed utilizing best management practices, and are the only option available for controlling stormwater runoff. All technically and economically reasonable measures to avoid or minimize the extent of the proposed increase in pollutant loading have been incorporated into the proposed mining activity. The least intrusive alternative would be not to allow the natural resource to be mined; however, that is not an acceptable alternative given that this is a useful project to provide the community at large with badly needed employment and economic opportunities, and the need for this nation to allow a steady flow of electrical energy to consumers at a reasonable and affordable cost.

DISCHARGE LOCATION AND CHARACTERISTICS FOR NEW AND EXISTING MINES

SCHEDULE A

Discharge # **	001	002	003	
LATITUDE	39° 59' 21"	39° 58' 45"	39° 59' 05"	
LONGITUDE	87° 55' 01"	87° 54' 03"	87° 54' 03"	
QUARTER SECTION	Southwest	Northeast	Southeast	
SECTION	26	35	26	
TOWNSHIP	18 North	18 North	18 North	
RANGE	14 West	14 West	14 West	
COUNTY	Vermilion	Vermilion	Vermilion	
AVERAGE FLOW (MGD) if discharge does not result from precipitation	***	***	***	
MAX FLOW (MGD) if discharge does not result from precipitation	***	***	***	
SOURCE OF DISCHARGE (e.g. Pit Pumpage, processing plant circuit, Surface Runoff, etc.)	surface runoff, processing plant, pumpage	surface runoff, processing plant, pumpage	surface runoff, processing plant, pumpage	
SAMPLING METHOD (24 hr. composite, grab, est., etc.)	Grab	Grab	Grab	
ACIDITY (mg./l)	< ALK	< ALK	< ALK	
ALKALINITY (mg./l)	> ACID	> ACID	> ACID	
LEAD (mg./l)	NA	NA	NA	
IRON (mg./l)	3.0	3.0	3.0	
MANGANESE (mg./l)	0.8	0.8	0.8	
pH (range)	6.0 – 9.0	6.0 – 9.0	6.0 – 9.0	
ZINC (mg./l)	NA	NA	NA	
FLORIDE (mg./l)	NA	NA	NA	
TOTAL SUSPENDED SOLIDS (mg./l)	50	50	50	
SULFATE (mg./l)	1800	1800	1800	
TOTAL DISOLVED SOLIDS (mg./l)	NA	NA	NA	
CHLORIDE (mg./l)	400	400	400	
RECEIVING STREAM	UNNAMED	UNNAMED	UNNAMED	
TRIBUTARY TO	Olive Branch	Olive Branch	Olive Branch	
TRIBUTARY TO	Salt Fork	Salt Fork	Salt Fork	
TRIBUTARY TO	Middle Fork Vermilion River	Middle Fork Vermilion River	Middle Fork Vermilion River	

*If application is for NPDES permit USEPA form 2C or 2D may also be required.

**Discharge # should correspond with NPDES discharge number and shall be shown on the mine operations map.

***Outfall will discharge only in response to a precipitation event.

2) D) 4) Ground Water Monitoring Program

2) D) 4) a) Describe in detail a proposed monitoring plan that will measure the amount and duration of any changes to the ground water system resulting from the mining operation. Parameters to be monitored are given in Schedule B. Monitoring should be on a quarterly basis with reports due within one month of the end of each quarter as follows:

Quarter	Report Due
January, February, March	May 1
April, May, June	August 1
July, August, September	November 1
October, November, December	February 1

A detailed, comprehensive ground water monitoring program is included at *Attachment III-2D4a*. The attachment also includes the sampling and analysis plan (SAP) prepared and used by RoseDale Services, Inc. for groundwater well sampling and analysis.

2) D) 4) b) Provide a drilling log and completion information and/or a diagram of each well proposed as a monitoring well.

Groundwater monitoring well construction reports/drill logs for wells MW-1, MW-2, MW-3, MW-4, MW-5 and MW-6, and slug test data for each well are included in *Attachment III-2D4b*.

Slug tests were performed on each of the monitoring wells, and the data was analyzed by the Bouwer and Rice Method (1979) for Reducing Slug Test Data. Results of the slug tests indicate the unconsolidated glacial till hydraulic conductivities ranged from 2.61 x 10^{-6} centimeters per second (cm/sec) to 7.28 x 10^{-5} cm/sec. These values are within the hydraulic conductivity ranges ($10^{-6} - 10^{-4}$ cm/sec) of glacial till.

2) D) 4) c) Locate wells and springs, on or within 1/2 mile of the permit area and shadow area on a hydrologic map. If any of these wells are to be employed for monitoring, designate on hydrologic map and complete Schedule B.

All known water wells within ½ mile of the permit and shadow areas are shown on the *Hydrology Map, Map A*.

No springs are known to exist within the permit or shadow area.

All existing ground water monitoring wells are shown on the *Hydrology Map, Map A*. These wells are discussed in the response to question a) above and are included in Schedule B.

2) D) 4) d) Discuss any reported problems of maintenance, or ground water quantity and quality which have occurred at the wells and springs listed above.

No information concerning maintenance problems, or ground water quantity and quality has been reported.

2) D) 4) e) Will this operation have any discharges to, or pump water from abandoned underground mines?

Yes _____ No __**X**__

If yes, submit a detailed discussion.

Schedule B

Designated # (shown on map)	MW-1	MW-2	MW-3
Ownership: Name & Address	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802
Legal Location	Lat: 39° 59' 21" Lon: 87° 55' 11"	Lat: 39° 59' 21" Lon: 87° 54' 37"	Lat: 39° 58' 55" Lon: 87° 54' 37"
Ground Elevation (MSL)	676.6	674.5	681.8
Top of Casing Elevation (MSL)	679.7	677.8	683.8
Total Well Depth (ft)	29'	32'	38'
Type & Size of Casing	2" PVC	2" PVC	2" PVC
Type & Capacity of Pump	N/A	N/A	N/A
Pumping Rate (gpm)/drawdown (ft)	N/A	N/A	N/A
Type of Pipe	N/A	N/A	N/A
Point of Sampling	Bailer	Bailer	Bailer
Water Quality: Date of Sample	Mar 2, 2012	Mar 2, 2012	Mar 2, 2012
Water Elevation (MSL)	673.9	673.1	679.1
Aluminum (mg/l)	0.089	0.096	0.081
Antimony (mg/l)	<0.005	<0.005	<0.005
Arsenic (mg/l)	<0.002	<0.002	<0.002
Acidity (mg/1)	<10	<10	<10
Alkalinity (mg/1)	310	270	260
Barium (mg/l)	0.040	0.054	0.036
Beryllium (mg/l)	<0.005	<0.005	<0.005
Boron (mg/l)	0.18	0.18	0.25
Cadmium (mg/l)	<0.005	<0.005	<0.005
Chloride (mg/1)	8	10	10
Chromium (mg/l)	<0.002	<0.002	<0.002
Cobalt (mg/l)	<0.005	<0.005	<0.005
Copper (mg/l)	<0.002	<0.002	<0.002
Cyanide (mg/l)	<0.010	<0.010	<0.010
Fluoride (mg/1)	<0.1	<0.1	<0.1
Iron, Total (mg/1)	0.15	0.28	0.27
Iron, Dissolved (mg/1)	<0.1	0.16	0.15
Lead (mg/l)	<0.002	<0.002	<0.002
Manganese, Total (mg/1)	0.041	0.055	0.019
Manganese, Dissolved (mg/1)	0.022	0.032	<0.01
Mercury (mg/l)	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	<0.005	<0.005	<0.005
Nickel (mg/l)	<0.005	<0.005	<0.005
Phenol (mg/l)	0.066	<0.050	<0.050
Selenium (mg/l)	<0.002	<0.002	<0.002
Silver (mg/l)	<0.002	<0.002	<0.002
Sulfate (mg/1)	3	42	65
Thallium (mg/l)	<0.005	<0.005	<0.005
Vanadium (mg/l)	<0.002	<0.002	<0.002
Zinc (mg/1)	<0.005	<0.005	<0.005
Total Hardness (mg/1 CaCo3)	190	190	210
Total Dissolved Solids (ROE)	460	560	440
Field pH (su)	7.53	7.81	6.65
Field temperature (deg.C)	8.9	8.8	9.7

Schedule B

Designated # (shown on map)	MW-4	MW-5	MW-6
Ownership: Name & Address	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802	Sunrise Coal, LLC 1183 East Canvasback Drive Terre Haute, IN 47802
Legal Location	Lat: 39° 59' 08" Lon: 87° 54' 04"	Lat: 39° 58' 29" Lon: 87° 54' 37"	Lat: 39° 58' 29" Lon: 87° 54' 03"
Ground Elevation (MSL)	678.2	683.7	679.2
Top of Casing Elevation (MSL)	680.8	686.7	682.4
Total Well Depth (ft)	35'	45'	54'
Type & Size of Casing	2" PVC	2" PVC	2" PVC
Type & Capacity of Pump	N/A	N/A	N/A
Pumping Rate (gpm)/drawdown (ft)	N/A	N/A	N/A
Type of Pipe	N/A	N/A	N/A
Point of Sampling	Bailer	Bailer	Bailer
Water Quality: Date of Sample	Mar 2, 2012	Mar 2, 2012	Mar 2, 2012
Water Elevation (MSL)	673.2	679.6	675.6
Aluminum (mg/l)	0.069	0.076	0.067
Antimony (mg/l)	<0.005	<0.005	<0.005
Arsenic (mg/l)	<0.002	<0.002	<0.002
Acidity (mg/1)	<10	<10	<10
Alkalinity (mg/1)	350	270	270
Barium (mg/l)	0.043	0.048	0.042
Beryllium (mg/l)	<0.005	<0.005	<0.005
Boron (mg/l)	0.22	0.19	0.21
Cadmium (mg/l)	<0.005	<0.005	<0.005
Chloride (mg/1)	11	12	14
Chromium (mg/l)	<0.002	<0.002	<0.002
Cobalt (mg/l)	<0.005	<0.005	<0.005
Copper (mg/l)	<0.002	<0.002	<0.002
Cyanide (mg/l)	<0.010	<0.010	<0.010
Fluoride (mg/1)	<0.1	<0.1	<0.1
Iron, Total (mg/1)	<0.1	0.16	0.17
Iron, Dissolved (mg/l)	<0.1	<0.1	<0.1
Lead (mg/l)	<0.002	<0.002	<0.002
Manganese, Total (mg/1)	<0.01	0.027	0.038
Manganese, Dissolved (mg/l)	<0.01	<0.01	0.022
Mercury (mg/l)	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	<0.005	<0.005	<0.005
Nickel (mg/l)	<0.005	<0.005	<0.005
Phenol (mg/l)	<0.050	<0.050	<0.050
Selenium (mg/l)	<0.002	<0.002	<0.002
Silver (mg/l)	<0.002	<0.002	<0.002
Sulfate (mg/1)	80	42	49
Thallium (mg/l)	<0.005	<0.005	<0.005
Vanadium (mg/l)	<0.002	<0.002	<0.002
Zinc (mg/1)	<0.005	<0.005	<0.005
Total Hardness (mg/1 CaCo3)	200	220	150
Total Dissolved Solids (ROE)	600	440	450
Field pH (su)	7.46	7.68	6.66
Field temperature (deg.C)	9.9	9.3	9.6

2) D) 5) Identify the general land uses of the watersheds upstream of the proposed permit area and any potential pollution sources which could significantly affect the stream quality at the mine area.

The land uses of the watersheds upstream of the proposed permit area can generally be described as agricultural row crop fields. The only anticipated impact to stream quality from upstream watersheds may include the residual affect from exposure of surface water runoff to chemical applications of herbicides, pesticides and fertilizers on adjacent agriculture fields, and elevated total suspended solids concentrations caused by wind and water erosion. However, these impacts are expected to be minimal.

2) D) 6) Provide names and addresses of all public water supplies within ten miles of the proposed permit boundaries.

Name	Supply Location/Type (Surface or Well)	Distance from Permit Boundary (Miles)
Village of Sidney IL American Water-Champaign 201 Devonshire Drive Champaign, IL 61820	**Groundwater Wells - Purchased**	**8.1**
Village of Homer 314 W. Crittenden Street Homer, IL 61849	**Groundwater Wells**	**3.2**
Village of Ogden 101 W. Main St. Ogden, IL 61859	**Groundwater Wells**	**8.5**
Village of Fithian 201 N. Main St. Fithian, IL 61844	**Groundwater Wells**	**8.6**
Village of Fairmount 301 S. Main St. Fairmount, IL 61841	**Groundwater Wells**	**5.3**
Village of Sidell 206 Market St. Sidell, IL	**Groundwater Wells**	**5.8**
Village of Allerton 108 N. Vermilion Ave. Allerton, IL	**Groundwater Wells**	**4.2**
Village of Broadlands Embarras Area Water District 5 Ninth St. Charleston, IL 61920	**Groundwater Wells - Purchased**	**6.1**
Aqua Illinois-Indianola 322 N. Gilbert St. Danville, IL 61832	**Groundwater Wells**	**8.8**
Village of Muncie	**Water supply information could be not be found for Muncie. It is believed the Fithian wells located southeast of Muncie also supply water to Muncie.**	**9.3**

The Supply Location/Type information contained in this table was obtained from one or all of the following locations:

Illinois State Geological Survey at the following link, http://www.isgs.illinois.edu/ilwater
Illinois State Water Survey at the following link, http://www.sws.uiuc.edu/data/gwdb/
Drinking Water Watch at the following link, http://163.191.83.31/dww/index.jsp

The Village of Broadlands purchases groundwater from Embarras Area Water District who purchases groundwater from IL American Water-Champaign, 201 Devonshire Drive, Champaign, IL 61820.

The proposed surface drainage control plan, and surface and ground water monitoring plans are designed to insure this mining facility does not have an adverse impact to the public water supplies listed above. Several miles separate the public water supplies from the permit area. The mileage separation adds further assurance that the public water supplies will be protected from adverse impacts.

2) D) 7) Discuss the possible effects that this mining operation will have on the above-listed public water supplies and explain what precautions will be taken to prevent an adverse impact from occurring.

Public water supplies within ten miles of the permit boundaries are limited to community groundwater wells finished in sand and gravel aquifers. *Attachment III-2D7* includes a community water supply well location map and available logs obtained from Illinois State Geological Survey records for active municipal water wells. Several of the wells listed in *Attachment III-2D7* were drilled several decades ago and are most likely inactive and abandoned. Because a well record does exist for these old municipal wells, they are included in the attachment.

Available well logs indicate the municipal water wells in the area are typically finished in the unconsolidated, surficial sand and gravel water bearing strata ranging from 20 to 131 feet deep. A few of the municipal wells are finished in bedrock deposits consisting of sandstone or fractured shale and limestones at depths ranging from 72 to 220 feet below ground surface. The Herrin No. 6 coal at this site occurs at depths typically 330 to 380 feet below ground surface. The sand and gravel aquifer is separated from the Herrin No. 6 coal seam by a minimum of approximately 200 feet of highly impermeable materials including limestone, sandstone, siltstone, claystone and shale. The bedrock deposits are separated by the lower underground mining activity by a minimum of approximately 80 feet of impermeable materials consisting of limestone, sandstone, siltstone, claystone and shale. In addition to the vertical separation, the municipal groundwater supplies are separated from the mining area by several miles of horizontal separation as indicated on the table at Part III(2)(D)(6).

Based on the elevation difference between the surficial sand and gravel, and bedrock aquifers and the Herrin No. 6 coal seam, and the horizontal distance separation between the well locations and the Herrin No. 6 coal seam, it is believed no adverse impacts will occur to the public groundwater supplies.

2) D) 8) Locate on the hydrologic map or other designated map all private water supplies and private water wells within 1/2 mile of permit area and within the permit and shadow areas itself.

All known private water supplies and private water wells within ½ mile of the permit area, and within the permit and shadow areas are shown on the *Hydrology Map, Map A.*

2) D) 9) Locate on the hydrologic map existing surface and ground water discharges into underground

mines.

There are no known existing surface and ground water discharges into underground mines.

2) D) 10) Provide the locations of water supply intakes for current users of surface water flowing into, out of, and within a hydrologic area defined by the Department.

No current users of surface water supplies are known to exist into, out of, and/or within the hydrologic area of the Bulldog Mine.

Bibliography

Kempton, Morse, and Visocky, June 1982. *Hydrogeologic Evaluation of Sand and Gravel Aquifers for Municipal Groundwater Supplies in East-Central Illinois*. Illinois State Geological Survey.

Piskin, Bergstrom, 1975. *Glacial Drift in Illinois: Thickness and Character.* Revision of Circular 416, Illinois State Geological Survey.

Marino, Osouli, May 2012. *Roof Overburden, Pillar and Floor Conditions for the Allerton Coal Reserve*. Marino Engineering Associates, Inc.