Stream Reconstruction Construction Schedule

1. The stream corridor will be formed (graded) at the time of backfilling and grading. DMRM requires that for the specified method of mining of this area, backfilling and rough grading will be completed within 180 days following coal removal.
2. When specified, headwater source ponds will be constructed concurrently with stream reconstruction.
3. The corridor is defined as a swath roughly 20' to 100' in width which will function as the floodplain or flood prone area. The swath generally follows the stream's premining horizontal location.
4. Depending upon the pit sequence within a watershed and specifically with respect to a stream channel, backfilling and grading of multiple pits may be necessary before a stream corridor is completely graded.
5. Once a corridor is graded, it will be resoiled. Resoiling will be completed on graded areas during the first appropriate planting/growing season following the completion of grading unless precluded by climatic conditions. Resoiling should normally occur between April 1 and October 1.
6. Grasses and legumes will be planted within 30 days following the completion of resoiling unless precluded by climatic conditions.
7. Once re-vegetated, the corridor will be observed for naturally occurring erosional channels resulting from precipitation and runoff. The operator will develop the erosional channels with earthmoving activities to construct a channel that resembles a natural channel.
8. It may be necessary to re-soil and re-seed again following channel development.
9. At this stage the channel is ready for monitoring.

Wetland Mitigation Construction Schedule

The schedule for wetland mitigation is dependent upon the location of the mitigation area. For example, mitigation may occur at any of the following locations:

- abutting a pond (either sediment or existing impoundment),
- in a former a sediment pond,
- within the floodplain of a reconstructed stream,
- within the floodplain of a natural stream, or
- within any area not listed above, provided adequate hydrology is available

The schedule for wetland mitigation must be consistent with the reclamation schedule of areas that surround or influence the mitigation site. For example, converting a sediment pond into a wetland cannot occur until the pond is no longer needed for sediment control purposes. This generally occurs once DMRM has determined vegetation in the affected watershed of the pond is successfully established. In the case of a wetland abutting a pond or within the floodplain of a natural stream, the development of that wetland must fit the logistics of the mining operation. It is impracticable to develop a wetland until mining activities advance to within a reasonable proximity to the subject pond or stream. Additionally, wetlands created within the floodplain of a reconstructed stream will follow

the schedule of stream reconstruction. Wetlands constructed in other areas, will follow the schedule of backfilling, grading, re-soiling and seeding addressed for stream reconstruction.

SITE MAINTENANCE

Oxford will provide long term protection for the mitigation areas on the Adamsville SW Mine Site, including on-site protection throughout the monitoring period. Site Maintenance and management during mining and post mining will be conducted by Oxford Mining employees and/or subcontractors. An annual monitoring report, described below under Monitoring Requirements, will be submitted to the U. S. Army Corps of Engineers and Ohio EPA prior to December 31st of each monitoring year to fulfill permit conditions. Specifications for any necessary repairs will be developed as needed for the site.

At the end of the five-year monitoring period, stream and wetland mitigation areas should meet or exceed its proposed categorizations. If, at the end of the 5-year monitoring period, the Corps and/or Ohio EPA determine that the mitigation areas have not met the proposed categorizations, the applicant will coordinate with the agency to determine what action should be taken to further enhance the mitigation areas.

PRESERVATION OF RESTORED/RECLAIMED STREAMS/WETLANDS

Mitigation will occur on-site. A protective covenant will be placed on mitigation areas to provide long term protection. To Oxford's knowledge, the potential mitigation areas do not contain any pre-existing easements/ownership rights that may preclude them as an acceptable mitigation site.

The form of conservation easement is submitted in Appendix H.

PERFORMANCE STANDARDS

Performance standards for the mitigation areas will be to attain the quality equal to or greater than the pre-mining conditions. Performance will be evaluated by functional assessment including completion of an ORAM (V.5.0) for the mitigation wetland area. The ORAM (v.5.0) will be used as a quantitative tool to measure reconstructed wetland performance. Biologists will provide their professional opinion of the reconstructed wetland functions as they relate to the pre-mining conditions. The goal of the mitigated wetlands is to achieve Category 2 status by the end of the five year monitoring period.

Reconstructed stream channels will be monitored annually for stability and an annual assessment of aquatic function will be determined. The assessment be used to document the recovery of stream functions associated with substrate, bankfull width and pool depth. The goal of stream mitigation for this site, at a minimum, is to achieve a comparable value for each of the reconstructed stream channels associated with the project to that of pre-mining status.

MONITORING REQUIREMENTS

A. General Requirements

Monitoring Reports: Annual reports containing the data listed in the appropriate subsections below shall be submitted to Ohio EPA for each of five consecutive years following completion of mitigation. Include current contact information for the permittee and/or agent. The first annual report is due to Ohio EPA by December 31 of the first full year following completion of mitigation. All subsequent reports shall be submitted by December 31st of each of the subsequent monitoring years.

The permittee may include any additional information that he or she believes relevant for Ohio EPA's consideration. Site visits shall be conducted during April 1 and October 31. Site visits shall be conducted at least three months apart.

Photographs shall be included in each annual report for the duration of mitigation monitoring as follows:

1. An adequate number of fixed observation points shall be selected per distinct mitigation area, to provide representative overviews of each distinct mitigation area.

2. Photographs shall be taken from these points at the same position and angle during the growing season of each monitoring year. The fixed observation points shall be marked on the base map with photograph number and directional arrow.

3. Additional photographs of areas of interest within each distinct mitigation area shall be provided in each monitoring report. Areas of interest include, but are not limited to, plant communities, open water areas, areas dominated by invasive species, unvegetated areas, erosional areas, unstable areas, developing shrub/forest areas, in stream structures, other structures, wildlife usage, easement encroachments, sediment deposition, floodplain development, habitat development, wildlife usage, corrective action areas, conservation signage, etc. The locations of these photographs shall be marked on the base map.

4. 3rd Year Site Visit: The permittee shall arrange a mitigation site visit with USACE during the growing season after the second year report has been submitted. The purpose of this site visit is to determine if the mitigation project has been constructed in accordance with the mitigation plan. If necessary, USACE may make recommendations to improve any of the components of the mitigation. The permittee is responsible for undertaking any reasonable modifications identified by USACE.

5. 5th Year Site Visit: The permittee shall arrange a mitigation meeting and mitigation site visit with USACE during the growing season after the fourth year report has been submitted. The purpose of the site visit is to determine if the mitigation project has met the performance criteria provided in Part E below.

B. Wetlands

1. Physical Measurements (Years 1, 3, and 5): The permittee shall submit a plan view for all wetland mitigation areas. The diagram shall be on paper no larger than 11" by 17".

2. Soils Monitoring (Years 1, 2, 3, 4, and 5): The permittee shall conduct a minimum of one soil probe/soil test pit per acre. Munsell color, texture, and hydric soil characteristics shall be recorded.

3. Hydrology Monitoring (Years 1, 2, 3, 4, and 5): The permittee shall submit water level data. If wetlands are not inundated or saturated at the surface during the monitoring periods, then a pit shall be dug to determine the depth of the water below the wetland surface.

4. Wetland Delineation (Years 1, 3, and 5): During the growing season of monitoring years 1, 3, and 5, the permittee shall conduct a delineation of the wetland component of the wetland mitigation areas in accordance with the United States Army Corps of Engineers 1987 Wetland Delineation Manual (or successor document).

C. Streams

1. Physical Measurements (Years 1, 3, and 5):
   a. Year 1: The first year annual report shall contain a plan view as built diagram for the entire length of each of the reconstructed streams. The plan view, being of an appropriate scale, will determine sinuosity, meander length, belt width, radius of curvature, and meander arc length. The diagram shall be on paper no larger than 11" by 17".
   b. Years 3 and 5: The third and fifth year annual reports shall contain the same information listed above for the year 1 monitoring report but shall be limited to either a two hundred foot stream segment, or a segment of stream containing approximately two meander lengths, whichever is greater for each reconstructed stream.

2. Physical Observations (Years 1, 2, 3, 4, and 5): Annual observations of the entire length of each of the reconstructed streams shall be included in the annual report. Observations shall include signs of excessive bank erosion, sedimentation, headcutting, aggradation, degradation, or entrenchment.

3. The permittee shall assess stream habitat for each reconstructed stream using the most current version of the chosen method available at the time the assessment is performed. The assessments shall be provided in the annual report.

4. Water Chemistry Monitoring: The permittee shall submit a copy of the Ohio Department of Natural Resources Division of Mineral Resource Management Quarterly Monitoring Report Sheet that coincides with the monitoring report submitted for that year and continue to do so until no longer required by ODNR DMRM.

5. Hydrology Monitoring (Years 1, 2, 3, 4, and 5): The permittee shall submit water level data. Estimated water flow shall be determined in each of the reconstructed stream channels.

6. Vegetation Monitoring (1, 2, 3, 4, and 5): The permittee shall submit a percentage of survivorship of all tree and shrubs planted.

BEST MANAGEMENT PRACTICES FOR CONSTRUCTION

All sediment controls that are utilized will be kept in place during mining activities and until the site has been stabilized and reclaimed. All areas disturbed during mining will be seeded to encourage the establishment of a vegetative cover and decrease erosion potential.

LONG-TERM MANAGEMENT PLAN

Site maintenance and management during mining and post mining will be conducted by Oxford Mining and/or subcontractors. Specifications for any necessary repairs will be developed as needed for the site. The need for maintenance of mitigation areas within the five year monitoring period will be determined during the annual field visits. Each mitigation area will be evaluated annually for the tree planting mortality, grazing and the presence invasive plants. Maintenance activities related to these issues will be developed and scheduled as needed to ensure the long term success of the mitigation areas.

ADAPTIVE MANAGEMENT PLAN

A. General: If constructed streams and wetlands are not performing as proposed in the mitigation plan and as required by the end of the fifth year of monitoring, the monitoring period may be extended. The permittee may also be required to revise the existing mitigation plan or seek out additional mitigation areas, which may be located off-site. The number of years for which monitoring is

required may be reduced or increased based on the effectiveness of the mitigation.

B. Vegetation, Streams and Wetlands:

1. Planting woody, riparian and wetland vegetation: Vegetation will be replanted as needed. It may be necessary to alter the spacing, planting rate, specie and/or locations.

2. Channel restoration: Additional gravel riffles, rock rip rap, and grading will be performed as needed to achieve a stable channel or to add diversity to substrate and/or channel geometry.

3. Wetlands: In the event that vegetative cover is deemed inadequate following the third season of monitoring, replanting of any significant bare spots will be undertaken. If other factors such as hydrology are deemed inadequate, corrective measures will be undertaken to adjust water inflow/outflow so as to improve hydrologic conditions. Off-site mitigation, either within close proximity to the mine site, within the same watershed or at a wetland bank, may be necessary.

FINANCIAL ASSURANCES

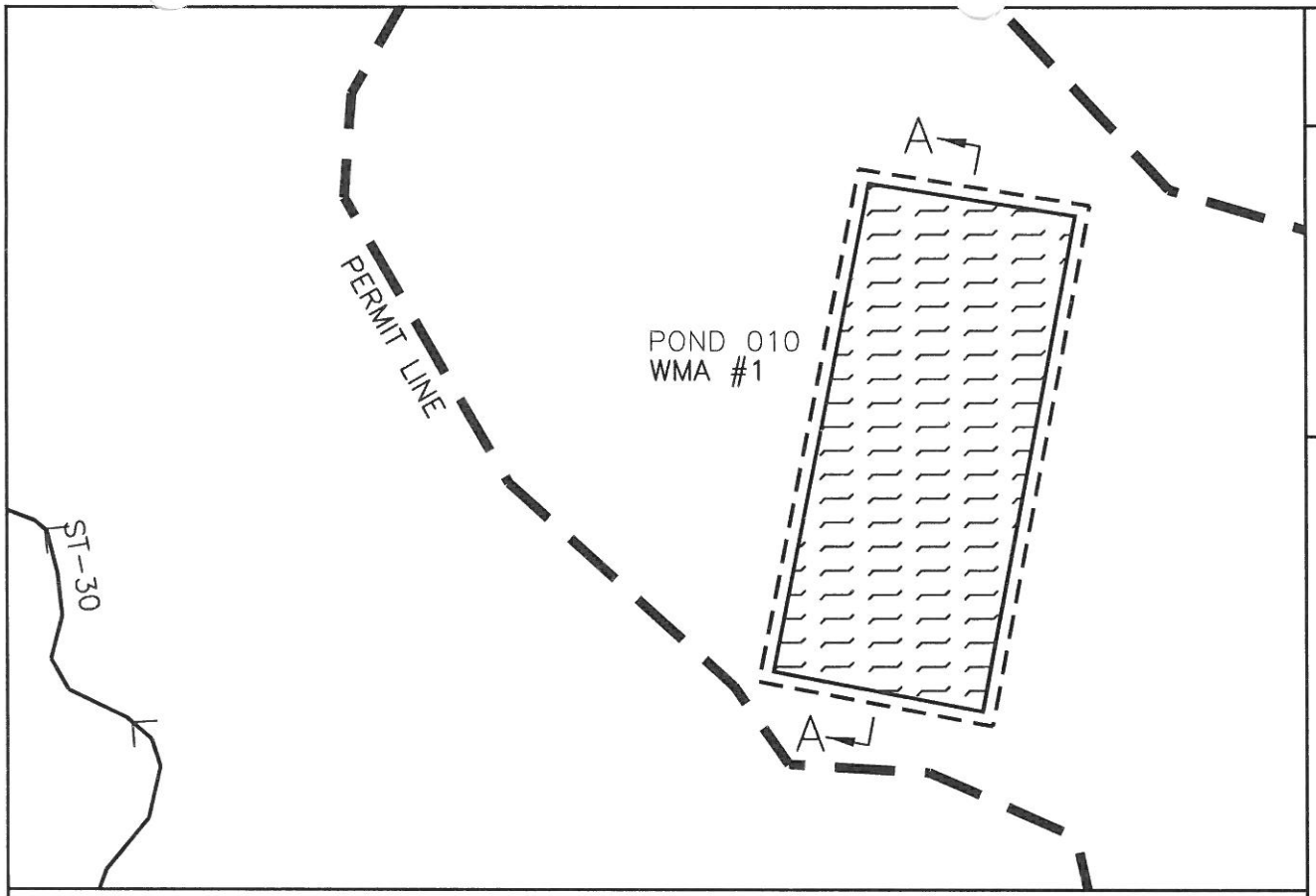
Oxford Mining Company, LLC is a locally owned and operated surface mining company. From its founding in 1934, Oxford has focused on acquiring steam coal reserves that can be efficiently mined with evermore modern, large-scale equipment. The company markets coal primarily to large utilities with coal-fired, base-load scrubbed power plants under long-term coal sales contracts. The company's three producing mines produce slightly more than 400,000 tons in 2010. Relying on its loyal, dedicated, non-union workforce of approximately 60 employees, Oxford, has persevered through boom and bust to remain committed to producing high quality coal and meeting all reclamation obligations.

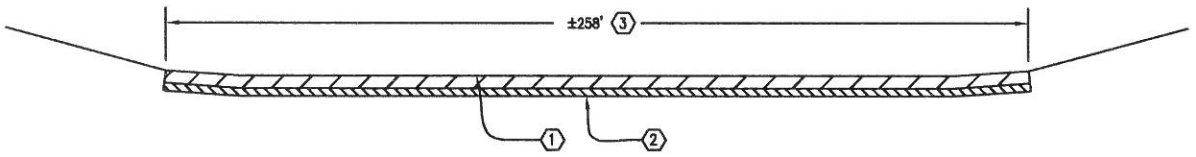
CONCLUSIONS

This permit application requesting authorization for impacts to waters of the United States on a mineral extraction project is herewith submitted for Oxford Mining Company, LLC This document provides information that addresses permit requirements for a Section 404 - Individual Permit from the U. S. Army Corps of Engineers and a Section 401 Water Quality Certification from the Ohio Environmental Protection Agency. An alternatives analysis in the form of information required by Ohio's Anti-Degradation Rule is also provided. Information requested by the USACE and Ohio EPA was presented for Preferred Design, Minimal Degradation, and Non-Degradation alternatives and mitigation techniques were proposed for site impacts. The alternative for which this 401-404 proposal for authorization is sought is the Preferred Alternative.

A mitigation plan is presented in which all mitigation will take place on-site. Stream mitigation will occur in their approximate pre-mining locations. Two wetland mitigation areas (WMA #1, WMA #2) totaling 1.09 acre, are proposed to be constructed within temporary sediment ponds 008 and 010.

The mining and reclamation plan together with the measures proposed in this request for 401 and 404 authorization demonstrates that Oxford Mining cannot only extract the coal in an environmentally safe manner, but also achieve on-site mitigation and return the land to productive use.





SECTION A–A
N.T.S.

MITIGATIVE WETLAND AREA WMA #1

OXFORD MINING COMPANY, LLC
ADAMSVILLE SW MINE SITE
SECTION 401 AND 404 AUTHORIZATION

LEGEND

- PROPOSED PERMIT LINE
- POND 001 — PROPOSED POND
- WETLAND MITIGATION

SCALE: 1" = 100'

NOTES

MITIGATIVE WETLAND AREA (WMA #1):
Mitigation will occur in proposed sediment Pond 010, due east of ST–30. Reclamation grading will restore the pre–mining watershed to ensure adequate hydrology to WMA #1. Wetland mitigation will occur concurrently with completion of the mining process.

Mitigative Wetland Area (WMA #1):
Post–mining WMA #1 watershed = ±20 acres
Surface area = 0.66 ac. (min).
Top of substrate = ±El. 846.50'

KEYNOTES

(1) Substrate: Substrate shall be either on–site hydric soil or consist of organic rich loam and silt loam soils or a combination thereof. Soils shall have adequate texture and organic matter to retain moisture, allow diffusion of oxygen and carbon dioxide, and retain nutrients for absorption through the plant roots.

Place and spread substrate to a total thickness of 9". Do not compact.

The hydric soils will be removed and stockpiled prior to their disturbance. Soils will be protected from erosion until they are re–distributed.

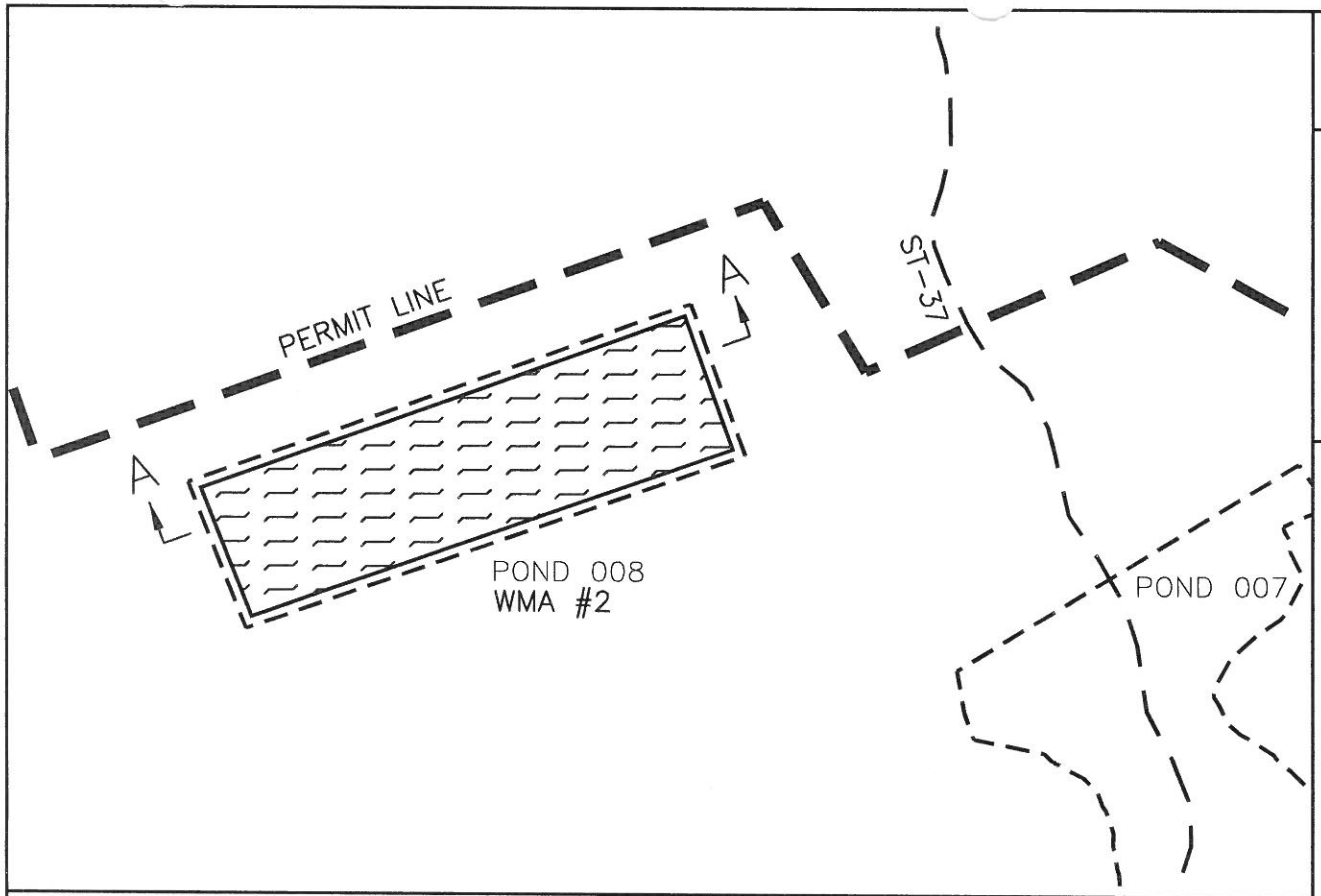
(2) Liner: Material used to construct the liner shall be non–toxic, non–acidic clay or shale material obtained on–site.

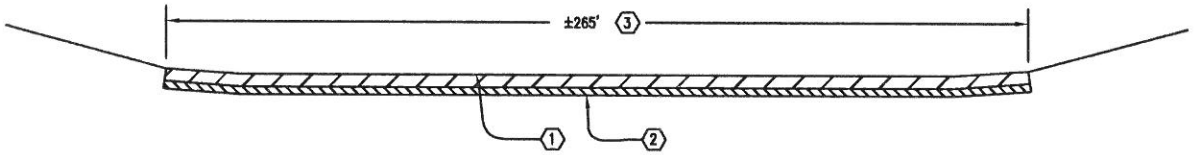
Liner material shall be placed in 6" max. loose lifts and compacted by repetitious passes of heavy earthmoving equipment. Total thickness shall not be less than 6".

(3) Planting: The planting plan is specified in the permit application.

JURISDICTIONAL WETLAND MITIGATION PLANS

Linn Engineering, Inc. 740–452–7434
Civil Engineering Consultants
P.O. Box 2086 Zanesville, Ohio 43702–2086





SECTION A–A
N.T.S.

MITIGATIVE WETLAND AREA WMA #2

OXFORD MINING COMPANY, LLC
ADAMSVILLE SW MINE SITE
SECTION 401 AND 404 AUTHORIZATION

LEGEND

PROPOSED PERMIT LINE

POND 001 PROPOSED POND

WETLAND MITIGATION

SCALE: 1" = 100'

NOTES

MITIGATIVE WETLAND AREA (WMA #2):
Mitigation will occur in proposed sediment Pond 008, due east of ST–37 and northeast of proposed sediment Pond 007. Reclamation grading will restore the pre–mining watershed to ensure adequate hydrology to wma #2. Wetland mitigation will occur concurrently with completion of the mining process.

Mitigative Wetland Area (WMA #2):
Post–mining WMA #2 watershed = ±11 acres
Surface area = 0.44 ac. (min).
Top of substrate = ±El. 780.50'

KEYNOTES

(1) Substrate: Substrate shall be either on–site hydric soil or consist of organic rich loam and silt loam soils or a combination thereof. Soils shall have adequate texture and organic matter to retain moisture, allow diffusion of oxygen and carbon dioxide, and retain nutrients for absorption through the plant roots.

Place and spread substrate to a total thickness of 9". Do not compact.

The hydric soils will be removed and stockpiled prior to their disturbance. Soils will be protected from erosion until they are re–distributed.

(2) Liner: Material used to construct the liner shall be non–toxic, non–acidic clay or shale material obtained on–site.

Liner material shall be placed in 6" max. loose lifts and compacted by repetitious passes of heavy earthmoving equipment. Total thickness shall not be less than 6".

(3) Planting: The planting plan is specified in the permit application.

JURISDICTIONAL WETLAND MITIGATION PLANS

Linn Engineering, Inc. 740–452–7434
Civil Engineering Consultants
P.O. Box 2086 Zanesville, Ohio 43702–2086

APPENDIX F

Riparian Corridor / Wetland Buffer - Trees

Wetland Seed Mixture

RIPARIAN CORRIDOR/WETLAND BUFFER – TREES	
Botanical Name	**Common Name**
Acer saccharinum	Silver Maple
Acer saccharum	Sugar Maple
Betula nigra	River birch
Carya spp.	Hickory(s)
Celtis occidentalis	Common hackberry
Cercis Canadensis	Eastern redbud
Crataegus phaenopyrum	Washington hawthorne
Crataegus crusgalli	Cockspur hawthorne
Fagus grandifolia	Beech
Fraxinus pennsylvanica	Green ash
Fraxinus Americana	White ash
Gleditsia triacanthos 'inermis'	Honeylocust
Hamamelis virginiana	Common witchhazel
Liriodendron tulipifera	Tulip poplar
Liquidambar styraciflua	Sweetgum
Platanus occidentalis	Sycamore
Populus deltoids	Eastern cottonwood
Prunus serotina	Black cherry
Quercus alba	White oak
Quercus palustris	Pin oak
Quercus rubra	Red oak

Note: Final planting quantities and species types will be dependent on market availability at the time of planting.

SUPPLEMENTAL WETLAND SEED MIX

Elymus virginicus	Virginia Wild Rye
Carex vulpinoidea	Fox Sedge
Verbena hastata	Blue Vervain
Heliopsis helianthoides	Ox-Eye Sunflower
Juncus effusus	Soft Rush
Scirpus atrovirens	Green Bulrush
Euthamia graminifolia	Grass Leaved Goldenrod
Gylceria grandis	American Mannagrass
Carex lurida	Lurid/Shallow Sedge
Eupatorium perfoliatum	Boneset
Scirpus polyphyllus	Many Leaved Bulrush
Aster umbellatus	Flat Topped White Aster
Carex comosa	Cosmos/Bristly Sedge
Carex lupulina	Hop Sedge
Scirpus cyperinus	Wool Grass
Vernonia gigantea	Giant Ironweed
Eupatorium fistulosum	Joe Pye Weed
Eupatorium maculatum	Spotted Joe Pye Weed
Veratrum viride	False Hellebore
Bromus latiglumis	Wild Brome Grass
Carex scoparia	Blunt Broom Grass
Geum laciniatum	Rough Avens
Helenium autumnale	Common Sneezeweed
Zizia aurea	Golden Alexanders
Cinna arundinacea	Wood Reedgrass
Ludwigia alternifolia	Seedbox
Mimulus ringens	Square Stemmed Monkey Flower
Penthorum sedoides	Ditch Stonecrop
Pycnanthemum tenuifolium	Narrowleaf Mountain Mint
Juncus acuminatus	Sharp Fruited Rush
Sanguisorba canadensis	Canadian Burnet
Nuphar advena	Spatterdock
Potamogeton nodosus	Long-leaved Pond Weed
Nelumbo lutea	American Lotus
Glyceria grandis	Tall Mannagrass
Scirpus polyphyllus	Many-leaved Bulrush

SEED AT 15 LBS PER ACRE OR 1/3 LB. to ½ LB. PER 1000 SQ. FT.

Note: Final planting quantities and species types will be dependent on market availability at the time of planting.

APPENDIX G

Threatened and Endangered Species

Archaeological and Cultural Resources

Inventory of Bat Species

Adamsville West Area
Muskingum County, Ohio

June 2010

Submitted to

Linn Engineering Incorporated
Engineering Consultants
534 Market Street
P.O. Box 2086
Zanesville, Ohio 43702-2086
740-452-7434

Prepared by

Tragus Environmental Consulting, Inc.
37 North Highland Avenue
Akron, Ohio 44313
330-472-7013

TRAGUS
ENDANGERED SPECIES CONSULTANTS

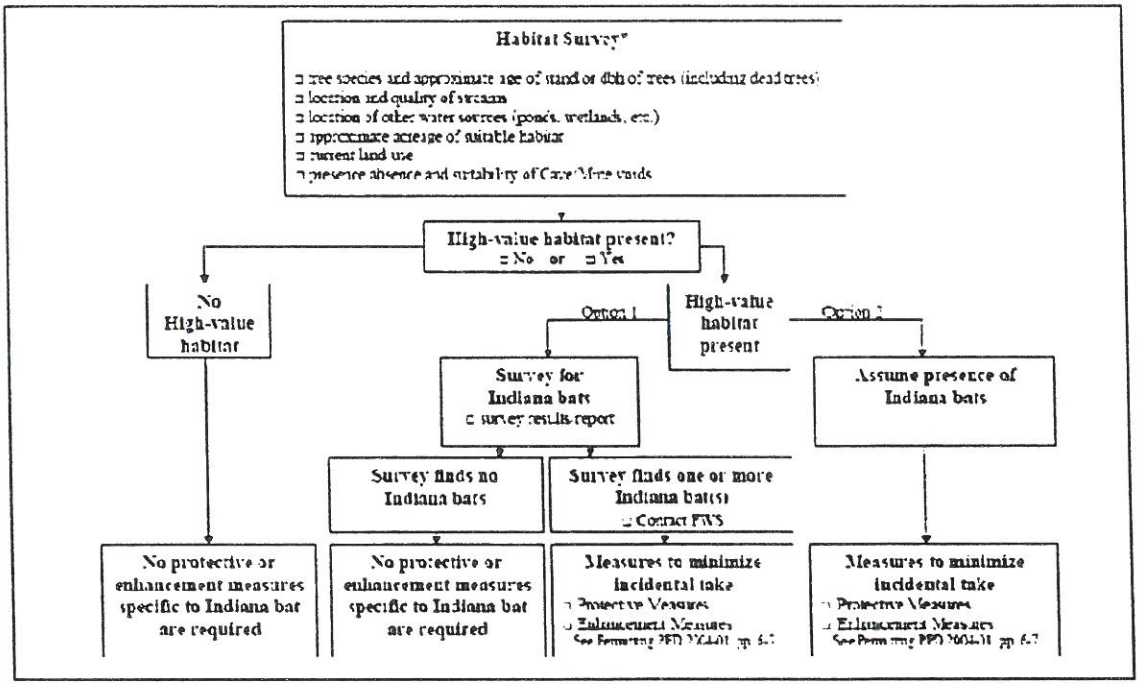
Survey Team

Mike Johnson – Lead Field Biologist
Michelle Malcosky – Lead Field Biologist
Marlo Perdicas – Lead Field Biologist
Jason Whittle – Field Biologist
Heidi Raynor – Field Biologist
James Hale – Field Assistant
David Blackie – Field Assistant

Introduction

The Adamsville West area is located in Muskingum County and is within the boundaries of the Tri-Valley Wildlife Area. The site is approximately 972-acres and composed of mostly forested habitat with recovered strip mine ponds, natural rock ledges, wetlands, and streams. As the property is part of a State of Ohio Wildlife Area, additional coordination was required. Special permits were obtained from The State of Ohio and the project was coordinated with Melissa Moser, Jennifer Windus, and Mike Zaleski with the Ohio Department of Natural Resources Division of Wildlife.

Effective May 15, 2004, the Ohio Department of Natural Resources, Division of Mineral Resources Management and the United States Fish and Wildlife Service, established a Policy Procedure Directive (PPD) for the protection of the state and federally endangered Indiana bat on proposed mining sites in Ohio. This study was implemented to comply with this process as indicted in the flow chart below:



This report details the results of intensive habitat investigations and results of a mist-netting survey to document the potential presence of Indiana bat from the proposed mine site.

Indiana Bat (Myotis Sodalis) – Natural History Summary

The known range of the federally endangered Indiana bat *(Myotis sodalis)* covers all of Ohio. This rare species is a migratory hibernator, and caves and abandoned mines are the exclusive winter habitat or hibernacula. Moreover, the species appears highly selective in its choice of caves, occupying only those that have stable winter temperatures.

Following hibernation, female bats disperse (March-May) and can potentially be found throughout Ohio. After emerging from winter hibernation, females migrate to summer maternity roosts to rear their young. Indiana bat is highly specific concerning maternity roost selection. Maternity roosts are almost exclusively trees with characteristics that include exfoliating bark or open cavities larger than a fist. *Carya ovata* (shagbark hickory) is commonly cited as the classic maternity roost tree for this species. Furthermore, maternity roosts usually need to be positioned so as to receive sufficient amounts of direct sunlight to provide thermal conditions necessary for the rapid development of young (Humphrey, et al., 1977) (Kurta, et al., 1993). Trees at the edges of streams or in beaver ponds, standing alone in fields or fence-rows, or in forest clearings are usually chosen, as they tend to receive more sunlight than a tree in the middle of a dense woods or forest.

There is evidence that many bats return to the same watershed each year (Humphrey, et al., 1977). The inadvertent destruction of all suitable roosting trees within a watershed or large geographical area can play a major role in the decline of this species. If a pregnant female migrant returns to a traditional roost watershed to find no suitable roosting trees, she faces additional energy drains in searching for a suitable site at a time when she is already stressed from hibernation, migration, and the energy demands of pregnancy. These additional stresses may be sufficient to cause her own mortality or that of her offspring.

Indiana bat forages over wooded areas and riparian and floodplain forests near small to medium sized streams (Humphrey, et al., 1977). Riparian corridor use may be more a function of availability than preference, since clearing has left fewer habitats in upland areas.

Deforestation has been cited as a cause of decline for this species. Tree cutting during the summer brooding season is especially destructive and can impact entire colonies. Currently, the U.S. Fish and Wildlife Service (USFWS) restricts the cutting of potential maternity roost trees between April 1 and September 30. The removal of trees outside of this time period can be conducted with minimal impact to the species. If circumstances necessitate the cutting of trees within this restricted period, a mist-netting survey is required to document the status of this species within the area of concern.

Habitat Survey - Results

Habitat surveys were performed April 6 and April 25, 2010. Special emphasis was placed on locating rock ledges, caves, or abandoned mine openings that might serve as suitable habitat for hibernating bats. In addition, Melisa Moser from the Ohio Department of Natural Resources was contacted regarding the possibility of previously documented caves. No such features were noted in Ohio's database. No caves, ledges, or mines were discovered that could potentially serve as hibernacula for bats. Mike Zaleski from Ohio Department of Natural Resources was also contacted with questions pertaining to the possibility of small caves or deep rock crevices. Mr. Zaleski provided a map with areas that might support these types of habitats. Special emphasis was placed on investigating these areas. No caves, rock crevices, mine openings were found that might support hibernacula and it is unlikely that the site supports hibernacula for Indiana bat.

With the exception of access roads and a few agricultural areas, the majority of the site supports moderately mature forested habitats. Deep ravines, seeps, springs, and natural rock ledges are common features of the site. In many areas, lush native wildflowers and natural vegetation

dominate the understory. Portions of the site have been mined in the past but the state of recovery is markedly advanced. A small stream flows west along the northern perimeter of the property. This is the only significant riparian corridor on the site. Smaller streams flowing through ravines are present but do not support conditions suitable for flight corridors. A few strip mine ponds and narrow wetlands exist on the site. Many of these areas have been enhanced by beaver impoundments.

The site is extensively crossed by a series of access road networks and utility lines. These areas represent the best netting habitat on site. Portions of the site have been mined in the past.

The majority of the forest on the project area is fairly well developed and of moderately mature age. Although autumn olive and multiflora rose are abundant, the site has fewer invasive species than is often noted on previously mined lands.

Common trees noted for this site include American beach, locust, paw paw, cucumber magnolia, tulip tree, silver maple, red maple, sugar maple, ash, red oak, white oak, shagbark hickory, American elm, red bud, bass wood, cottonwood, sycamore, and black cherry. Many of these tree species support characteristics necessary for maternity colonization by Indiana bat.

Overall bat habitat on the subject property is good to excellent.

Mist-Netting Survey - Results

Mist-Netting Techniques

Current guidelines issued by the USFWS indicate that a minimum of 32 net-nights are required for a project of this size. Guidelines further indicate that a prevalence of suitable weather must persist throughout the course of the investigation. Strong winds, precipitation, and temperatures below 10 degrees Celsius (50 degrees Fahrenheit) may deter bats from flying and foraging for insects.

This study completed 33 net-nights over a 4 night period which meets the minimum guidelines required for compliance purposes. Wind conditions were favorable and there was no precipitation on either night. Temperatures were normal for this time of year.

Mist-netting procedures followed guidelines developed by the Indiana Bat Recovery Team (Brady, et al., 1983) and endorsed by the U.S. Fish and Wildlife Service (USFWS). Sites were selected as described below. At each site, a tier of low-visibility nylon mist nets was erected across likely flyways and other areas where bat activity was anticipated or otherwise noted. When possible, nets were erected to sufficient height and width to entirely block off the flight corridor. Nets were secured to a rope-and-pulley system suspended from telescoping poles (Kunz, 1988). Nets were erected during the twilight hours and monitored every 15-20 minutes for a five-hour period. All mist nets were constructed of 50-denier/2-ply (1.5-inch mesh) nylon.

Data Collection

Basic biological data were collected from all bats netted, including species identification, ear, tragus, forearm length, gender, age (juvenile or adult), weight in grams, and reproductive condition (if discernible). All bats were released at the site of capture. Additional information recorded includes the climatalogical conditions, date, time of capture, lunar phase, and percent cloud cover. Species identification was based on the keys described by Belwood (1998).

Site Selection and Descriptions

Potential flight corridors were identified based upon field reconnaissance conducted during daylight hours. Potential flight corridors within this study included the access roads that run through the site, wetlands, and headwater stream corridors. A hand-held ultrasound detector (ANABAT) and a pair of infrared binoculars were used to monitor bat activity at the site and to identify additional areas for the placement of mist nets.

A description of each netting station is provided in Appendix C. Appendix A includes a map showing locations of netting sites. Appendix B includes photographs of each net location.

May 20, 2010 (total net nights = 6)

May 20th was characterized as cloudy with rain showers early in the morning and afternoon. By nightfall, the skies cleared. Lunar phase was ¼ full. There was no wind or breezes throughout the evening. Temperatures ranged from 72 degrees when nets were raised (8:30 PM) to a low of 60 degrees when the nets were lowered for the evening (1:30 AM). Overall netting conditions were excellent. Nets 1-6 were set along haul roads and access paths and monitored throughout the evening.

May 21, 2010 (total net nights = 0)

Severe thundershowers moved into the area and all work was suspended. Nets from the previous night were secured and left on-site.

May 22, 2010 (Net nights = 12)

May 22 was characterized as warm and sunny. Lunar phase was nearly ½ full and high on the horizon. Temperatures ranged from 75 degrees when the nets were raised (8:30 PM) to about 65 degrees at the time nets were lowered (1:30 AM).

All nets from May 20 were monitored for a second event. In addition, Nets 7-12 were erected over access roads at the NE section of the project area.

May 23, 2010 (Net nights = 6)

May 23 was characterized as warm and sunny. Temperatures ranged from nearly 80 degrees when nets were raised for the night (8:30 PM) to a low of 70 when the nets were lowered for the evening (1:45 AM). Nets 7-12 from the previous evening were left in place and monitored for a second event. Nets 1-6 were dismantled.

June 11, 2010 (Net nights = 9)

June 11 was warm and sunny. Temperatures ranged from 80 degrees when nets were first raised (8:45 PM) to about 70 degrees when nets were lowered for the evening (2:00 AM). The lunar phase was new with partial cloud cover. There was no wind. Netting conditions were excellent. Nine nets were set at various locations including roads and ponds on the western portion of the site and a perennial stream that flows alongside Gilbert Road and the northern border of the project area.

Results

A total of 40 bats were captured over a period of four nights (33 net-nights). The level of effort for this study meets the minimum range that would typically be required for a site of this size. Five species of bat were captured during the course of this investigation. Little brown bat, big brown bat, and red bat are considered a common species while the northern long-eared bat is less commonly encountered and typical of larger forested areas. Tri-colored bats are less frequently encountered but still considered common to this region. No state or federally listed species were noted during this study.

Despite the history of disturbance, there is ample, high quality habitat for bats at this site.

No natural caves, mine openings, or subsidence areas were noted during the course of this investigation.

Appendix A
Maps of Study Area

Appendix A

Map showing location of project area.