Wetland Services

I n c o r p o r a t e d

3880 Trigg-Turner Road
Corydon, Ky. 42406
270-860-8141
www.wetlandservices.net

Regulatory
- Delineation ◇
- Permitting ◇
- Mitigation ◇
- Monitoring ◇

Restoration
- Site Analysis ◇
- Survey & Design ◇
- Construction ◇
- Planting ◇
- Maintenance ◇

6NOV12

To: Danita LaSage
Department for Natural Resources
Division of Mine Permits
2 Hudson Hollow
Frankfort, KY 40601

Re: Rose France Amendment 1 Mine (RFA1)
Oxford Mining Company – Kentucky, LLC (Oxford)
ACOE Permit #LRL-2009-768A-dah
WQC #
Kentucky Division of Mine Permits (KDMP) # 889-0153-AM-1

Dear Danita:

Enclosed please find an application package for a Section 401WQC Permit application. The application is formatted in PDF with bookmarks that include: 1) Cover Letter/Page, 2) 404/401 Applications, 3) Project Purpose, 4) Practicable Alternative Analyses (PAA), 5) Geology, 6) Biology and Water Quality 7) Mitigation, 8) Material Handling and Reclamation 9) Stream Plan, 10) Wetland Plan 11) Declaration of Restrictive Covenants, 12) Cumulative Impacts Analysis (CIA), and 13) Maps.

Please contact me anytime with questions or comments regarding this submission as we seek to facilitate the application. One hard copy and one CD have been included in our initial submission.

Sincerely,

Rick Liggett
Wetland Services, Inc.
270-454-0900

cc: Sean Jones, Oxford Mining Company – Kentucky, LLC

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- Maintenance ◇

12SEP12

To: Devetta Hill, Project Manager, Regulatory Branch
U.S. Army Corps of Engineers (ACOE)
Regulatory Branch West
PO Box 489
Newburgh, Indiana 47629-0489

Re: Rose France Amendment 1 Mine (RFA1)
ACOE Permit #LRL-2009-768-A
Oxford Mining Company – Kentucky, LLC (Oxford)
Kentucky Division of Mine Permits (KDMP) # 889-0153-Amendment-1

Dear Devetta:

This letter is in response to your request dated June 1, 2012 for additional information required before making a jurisdictional determination at RFA1.

1. Aquatic Rapid Assessment Survey, Copperhead: The report has been revised and is attached. The Biology Monitoring report was also amended to reflect these changes as well as five years of monitoring in lieu of ten.

2. Pg. 40
   a. Table 2: Total wetland impacts were calculated using measurements to the hundredth of an acre, but they were rounded to the tenth. The table has been revised to illustrate this.
   b. This language was taken from a section of the Missouri Protocol that is used in part to describe a fully functional stream. While we recognize the Missouri Protocol is no longer used to assess streams or calculate mitigation, this descriptor ensures that there will be no more than one stream impact, i.e. culverts, pipes, or other manmade modifications 30’ in length per 0.5 mile of mitigation stream.

3. Pg. 92
   a. Stream Success Criteria RBP was changed from ten years to five.
   b. Riparian Vegetation: The word averaged was removed.
   c. Volunteer Species: The last sentence was removed.
   d. Diversity: Percent diversity was changed from 40% to 30%.

4. Pg. 93: Wetland Success Criteria, Diversity: Percent diversity was changed from 40% to 30%.

5. Pg.96: All tables/exhibits have been updated to reflect five years of monitoring not ten years.

6. Finally, a revised stream plan has been included. After meeting with the mine engineer, it was determined that a re-design was necessary to accommodate post mining contours and tie-in points. All the necessary linear footage and wetland acreage will still go on-site.

Please contact me anytime with questions or comments regarding this submission as we seek to facilitate the application.

Sincerely,

Rick Liggett
Wetland Services, Inc.
270-454-0900

cc: Sean Jones, Oxford Mining Company – Kentucky, LLC

13APR12

Enclosed please find an application package for a Section 404 Individual Permit (IP). The application is formatted in PDF with bookmarks that include: 1) Cover Letter/Page, 2) 404 Application, 3) Project Purpose, 4) Practicable Alternative Analyses (PAA), 5) Geology, 6) Biology Report 7) Mitigation, 8) Material Handling and Reclamation 9) Stream Plan, 10) Wetland Plan 11) Declaration of Restrictive Covenants, 12) Monitoring, 13) Cumulative Impacts Analysis (CIA), and 14) Maps. We have compartmentalized our application, so future submissions based on your comments will only include those sections that receive regulatory comment.

Please contact me anytime with questions or comments regarding this submission as we seek to facilitate the application. One hard copy and one CD have been included in our initial submission.

Sincerely,

Rick Liggett
Wetland Services, Inc.
270-454-0900

cc: Sean Jones, Oxford Mining Company – Kentucky, LLC

404/401 Permit Applications

Rose France Amendment 1 Surface Mine

ACOE Permit # LRL-2009-768-A
WQC
KDMP Permit # 889-0153-Amendment-1

March 2012

Central City, KY

For:

Oxford Mining Company – Kentucky, LLC.
3060 Cleaton Rd
Central City, KY. 42330

By:

Wetland Services
3880 Trigg-Turner RD
Corydon, KY 42406
270-860-8141

Commonwealth of Kentucky
Department for Natural Resources
Division of Mine Permits

Application for Water Quality Certification for Surface Coal Mining Activities

The Clean Water Act Section 401 Water Quality Certification (WQC) program in Kentucky ensures that activities which may involve a discharge into waters of the Commonwealth which require federal permit or license are consistent with Kentucky's water quality standards in 401 KAR Chapter 5. The Energy and Environment Cabinet has authorized the Department for Natural Resources to issue water quality certifications related to surface coal mining operations. The project may not start until all necessary approvals are obtained. For questions concerning the WQC process, contact the WQC Coordinator at (502)-564-2320.

1. **Applicant Name:** Oxford Mining Company-Kentucky, LLC
   Mailing Address: 3060 Cleaton Road
   Central City, KY 42330
   Contact Person: Rick Parks
   Telephone No: (270) 754-2815 ext. 29
   E Mail Address: RParks@oxfordresources.com

2. **Consultant Name & Address:** Wetland Services, 3880 Trigg Turner Rd.
   Corydon, KY 42406

   Telephone No. (270) 454-0900
   E Mail Address: rl@wetlandservices.net

3. **Provide a brief description of the proposed activity and stream impact.**
   Oxford is proposing to place fill material in waters of the U.S., including wetlands and streams in order to develop a new surface coal mining operation to recover coal from the RFA1 surface mine reserve area. Best management practices will be used to aid in sediment control in the permit area. All mining areas will be returned to approximate original contour. The life of the mining operation is projected to be 2-3 years. The surface mining will include complete removal and replacement of surface material, topography, drainage features, and other water bodies.

4. **Project Location Information:**

   County Muhlenberg ; **USGS Quadrangle Name** Central City East

   Nearest Community & Road Intersection: Central City & Hwy 70 & Hwy 2107

   Longitude 37.26296 **Latitude** -87.09672 **(Approximate center of the project area)**

5. **List the names of all streams affected by the proposed project:**
   See attached.

6. **For each affected watershed provide the acreage above the toe of the lowest permanent structure.**
   Watershed 1: 227-acres

7. **For each affected stream provide the linear feet of impact, whether the impact is temporary or permanent and indicate if the stream reach is classified as ephemeral, intermittent, or perennial.**
   See attached.

8. **Provide the acreage of wetlands that would be impacted:** 14.3-acres

9. **Beginning at the nearest intersection of two public roads, provide directions to the project site:**

   The permit area is located southeast of Central City, Kentucky. The boundary lies just East of Hwy 431, south of the Wendell H. Ford Western Kentucky Parkway. From east bound on the Western Kentucky Parkway, take the Central City exit, Hwy 431, and proceed south. The entrance is approximately 2-miles, turn left onto St. Hwy 2107. The site gate is approximately 1.5 miles on the right and is marked by a white gate. Check in is required.

10. **Has application been submitted to the U.S. Army Corps of Engineers for this project? Yes** X **No** ____. **If yes, indicate type of application:**

    NW 12 ____ **NW 14** ____ **NW 21** ____ **NW 27** _____ **NW 49** _____
    NW 50 ____ **Individual** X

11. **Provide the following permit numbers associated with this mining activity: SMCRA Permit No.** 889-0153-AM-1 **, KPDES No.** KYG046498

12. **The following attachments must be provided:**

    a. A watershed map showing all ponds and hollowfills to scale with all intermittent, and perennial stream reaches clearly identified.
    b. A 7.5 minute topographic map delineating the proposed project area.
    c. A copy of the complete Compensatory Mitigation Plan

List all other plans and profiles included with this application:
See attached.

I hereby request approval for construction across or along a stream as described in this application and supporting attachments. All of the information provided with this application is true and accurate to the best of my belief and knowledge.

Applicant's Signature:

See original signed hard copy **, Date: _____**

If signed by applicant's agent, attach power of attorney

SUBMIT APPLICATION AND ATTACHMENTS TO:

WQC COORDINATOR
DIVISION OF MINE PERMITS
#2 HUDSON HOLLOW
FRANKFORT, KENTUCKY 40601

U.S. ARMY CORPS OF ENGINEERS

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

(33 CFR 325)

OMB APPROVAL NO. 0710-0003
EXPIRES: 31 AUGUST 2012

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME
First - Richard Middle - E. Last - Parks
Company - Oxford Mining Company-Kentucky, LLC
E-mail Address - rparks@oxfordresources.com

8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Rick Middle - Last - Liggett
Company - Wetland Services, Inc.
E-mail Address - rl@wetlandservices.net

6. APPLICANT'S ADDRESS:
Address- 3060 Cleaton Road
City - Central City State - KY Zip - 42330 Country - USA

9. AGENT'S ADDRESS:
Address- 3880 Trigg Turner Rd
City - Corydon State - KY Zip - 42406 Country - USA

7. APPLICANT'S PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax
270-754-2815 Ext 29 270-754-2825

10. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax
270-454-0900

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Wetland Services, Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

Richard E. Parks 4-10-12
SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)
Rose France Amendment 1

13. NAME OF WATERBODY, IF KNOWN (if applicable)
UNT of Pond Creek

14. PROJECT STREET ADDRESS (if applicable)
Address 2900 State Route 2107
City - Central City State- KY Zip- 42330

15. LOCATION OF PROJECT
Latitude -N 37.26296 Longitude: -W -87.09672

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)
State Tax Parcel ID Municipality
Section - Township - Range -

17. DIRECTIONS TO THE SITE

The permit area is located southeast of Central City, Kentucky. The boundary lies just East of Hwy 431, South of the Wendell H. Ford Western Kentucky Parkway. From east bound on the Western Kentucky Parkway, take the Central City exit, Hwy 431, and proceed south. The entrance is approximately 2-miles, turn left onto St. Hwy 2107. The site gate is approximately 1.5-miles on the right and is marked by a white gate. The contact person is Sean Jones and his phone number is 270-619-2143. Check-in is required.

18. Nature of Activity (Description of project, include all features)

See attached.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

See attached.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Surface coal mining.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 14.3-acres

or

Linear Feet 6,243-ft intermittent 4,391-ft ephemeral

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See attached.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list)

a. Address- See attached.

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
KDOW	KPDES	KYG046498			
KDMP	401				
KDMP	SMCRA	889-0153-AM-1			

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Richard E. Barton 4-10-12 Rick Leggett 4-10-12

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Property Owners List

Name	Address	City	State	Zip
Rogers Brothers Coal Co. c/o James L. Rogers III	200 Coconut Palm Rd.	Vero Beach	FL	32963
John K. Vaught & Lisa Michelle Vaught	1704 State Route 1379	Central City	KY	42330
Oxford Mining Company-Kentucky, LLC	544 Chestnut St. PO Box 427	Coshocton	OH	43812

Adjoining Property Owners List

Name	Address	City	State	Zip
Deering Mall	380 Holt Rd.	Central City	KY	42330
Rogers Brothers Coal Co. c/o James L. Rogers III	220 Coconut Palm Rd.	Vero Beach	FL	32963
Viola Simonds	Holt Rd.	Central City	KY	42330
Johnny H. Bard	620 Holt Rd.	Central City	KY	42330
Gladys Carender Vincent	PO Box 142	Powderly	KY	42367
John Davis/Jerry Boyd	856 Holt Rd.	Central City	KY	42330

Project Purpose

Description of Work: The proposed project, which is currently being reviewed by the Kentucky Department of Natural Resources (KDNR) under the Surface Mining Control and Reclamation Act (SMCRA) (KDNR permit #889-0153 Amendment No. 1), would require the placement of fill material into "waters of the United States (U.S.)" located within the Plum Creek – Pond Creek watershed, specifically within 12-digit Hydrologic Unit Code (HUC) watershed 051100030404. The total area within the project boundary is approximately 226-acres. This project will recover coal from a surface area of approximately 214-acres located in Muhlenberg County, Kentucky, southeast of Central City. All economically recoverable coal would be removed during the excavation of the area, processed, and sold. The area would be returned to approximate original contours, covered with stockpiled soil material, revegetated, and returned to approved post-mine land use through the SMCRA process.

Some coal will be sold raw and some will be processed. The coal to be processed will be taken to a nearby mine where the preparation plant has already been built. Storage yards and other attendant features may also be found there. The design requisites for RFA1 include the use of best management practices and proper post-mine reclamation to minimize impacts to the environmental resources.

Water Dependency Determination: The proposed activity is not water dependant. However, multiple project alternatives which included a no action alternative, alternative locations, and alternative methods were considered in determining this proposal as the preferred alternative.

Proposed Work: The proposed excavated area and operation would directly impact 6,243-ft of intermittent streams and 4,391-ft of ephemeral streams, 5.6-acres of Palustrine forested (PFO) wetland, 3.2-acres of Palustrine Scrub Shrub (PSS), and 5.4-acres of Palustrine emergent (PEM) wetland, and 2.5-acres of open water.

Avoidance and Minimization Information: The project footprint has been reduced to minimize impacts to adjacent, potential jurisdictional "waters of the U.S.". Along the southern boundary of the proposed mine site, Oxford has surface and mineral rights to economically recoverable coal reserves where there are existing streams, wetlands, and open waters. Alternatives were considered, however due to the layout of the mine, operational features, the location of the resource, and location of jurisdictional waters, a mining plan that did not discharge dredge or fill material was not achievable. Oxford has however, where possible, chosen to avoid waters to reduce impacts to potential "waters of the U.S.". Total avoidance and minimization consists of approximately 962-ft of intermittent stream, 773-ft of ephemeral stream, 0.9-acres of PFO and 0.3-acres of PEM.

When determining if a surface mining method is practicable for an identified coal reserve, many factors must be considered: the depth of the coal seam(s), the amount of coal reserves, current technology, and market conditions. After evaluating these factors, it was determined that an overburden to coal ratio average of 10.6:1 was the highest economically feasible ratio that would make this operation practicable. There are an estimated 1.9-million tons of coal within the 214-acre reserve. Of the 1.7-million tons being recovered, 849,237-tons are #10, 488,627-tons are #11, and 404,293-tons are #12.

Oxford investigated alternative mining practices for reducing impacts to "waters of the U.S." and determined that surface mining was the most practicable alternative for this site.

There are several different methods commonly used in the coal mining industry to recover the coal resource from its natural geologic setting. These methods include: surface mining, auger mining, underground mining, and thin-seam mining. Each of these alternative methods has certain advantages and disadvantages as well as inherent limitations where they can be successfully utilized. Each reserve area is unique in the geologic conditions it presents and these conditions generally limit the alternatives available to the mining operation.

Avoiding and minimizing impacts by mining would consist of the excavation of smaller pits in between aquatic resources. This is not practicable because of the size of the project area as well as the increased operational costs and additional earth handling making the economic viability questionable. It would also reduce the amount of coal produced, slow production, and impair Oxford's ability to meet the project's need. Some of the aquatic resources proposed to be impacted may be avoided directly, however hydrologic changes caused by the surrounding mining would indirectly affect them due to their location throughout the site. Some potential indirect effects would be dewatering via ground water interactions removed by open adjacent highwalls, loss of surface water interactions as all surface waters would be diverted away from avoided streams and wetlands to meet water quality standards. Additionally, this would fragment the reclamation landscape. This fragmentation may result in connectivity issues with the aquatic resources between the reclaimed landscape and the unmined areas which would impact the functions and values of the avoided areas. This alternative is not environmentally preferable due to the inability to solve all hydrologic and ecological connectivity issues.

Compensatory Mitigation: For the unavoidable impacts, Oxford has proposed to restore 6,243-ft of intermittent stream and 2,196-ft of ephemeral stream on the project site during the reclamation process. Existing streams were assessed utilizing the Environmental Protection Agency's (EPA) Rapid Bio-assessment Protocol (RBP II) for wadeable and headwater streams, and a macroinvertebrate Index of Biotic Integrity (MBI) developed by the Kentucky Division of Water's (KYDOW) Standard Operating Procedures for collecting macroinvertebrates in headwater and wadeable streams. These assessments are to be compared to the restored streams after construction and monitoring is complete in order to assess the functionality of the restored streams. The proposed stream restoration would replace low quality Rosgen A, B, and G-type streams with intermittent and ephemeral Rosgen C-channels that would score in the suboptimal range utilizing the RBP method as in the pre-impact assessment. The restored streams would be considered an ecological lift in primary function as compared to the existing streams. These functions include aquatic habitat and movement, water conveyance, sediment transport, water sources for terrestrial animals, and supporting the food web by organic material contribution. Natural channel design methods would be used to restore the mitigation streams. A riparian buffer consisting of native trees and shrubs would be planted along either side of both the streams where native trees are not currently present. The width of the buffer will be 100-ft per side. Rosgen C-type streams include log vanes, J-hooks, pools, root wads, and/or cross vane structures to stabilize the channels, lower velocities, and create varied habitats in the form of riffles, runs, and pools.

Oxford will mitigate unavoidable impacts to wetlands by restoring a total of 25.4-acres of PFO wetland. Wetland mitigation would begin during the reclamation process. Wetland restoration would occur on-site adjacent to the stream restoration. The mitigation wetland would obtain hydrology from groundwater, precipitation, and overbank flooding from the adjacent stream mitigation. The wetland would be planted with a variety of hard mast producing hardwood tree species as well as an herbaceous mix. PFO wetland impacts would be mitigated at a ratio of 3:1 and both PSS and PEM wetlands would be mitigated at a ratio of 1:1.

During monitoring, Oxford will utilize the Rosgen Classification of Natural Rivers methodology, the EPA RBP II for wadeable and headwater streams, and MBI to assess the mitigation stream and compare them to the impacted waters.

Existing Conditions: The area of this project drains to Pond Creek which is in the Plum Creek – Pond Creek Watershed. The property is located on 226-acres in Muhlenberg County Kentucky, southeast of Central City.

The existing streams on-site were classified and evaluated utilizing the RBP methodology. The average overall scores by flow regime were: ephemeral – 89, intermittent – 108.

The area of this project is located on unnamed tributaries of Pond Creek in the Plum Creek – Pond Creek Watershed. The Plum Creek – Pond Creek Watershed has been extensively impacted by logging, agriculture, and mining. Development type impacts also exist in the watershed and include industrial, commercial, residential, and transportation. These various impacts have contributed to Pond Creek being on the 303d list of impaired streams. The Plum Creek – Pond Creek Watershed is a twelve digit (051100030404) HUC watershed located in central western Kentucky (see HUC Map). The watershed encompasses approximately 21,249 acres in Muhlenberg County. Approximately half (50.6%) of the watershed is classified as forest. Development, grassland, and agriculture comprise about 38% of the watershed (see CIA).

There are 21 ephemeral streams and 19 intermittent streams located within the JD Boundary. All assessed streams were identified.

23 wetlands were identified within the JD Boundary. The total cumulative wetland area was 15.4-acres. 7% of the wetlands are being minimized due to a reduction in the mining operation.

2 open waters were found on-site. Both will receive impact.

ALTERNATIVES ANALYSIS

Criteria: The following tables illustrate the impacts to jurisdictional "Waters of the U.S.".

Issue	Measurement and/or Constraint
Wetlands	14.3-acres of direct impact
Intermittent Streams	6,243-ft of direct impact
Ephemeral Streams	4,391-ft of direct impact
Open Waters	2.5-acres of direct impact

The following tables illustrate impacts or avoidance to jurisdictional "Waters of the U.S." by waters type, individual resource segment, size of the resource segment, size of impact to the resource segment, and the specific type of constraint.

Stream	Total Length	Impact	Constraint
7LS1A-5	378	378	Direct – Open Mining
7LS1I	363	363	Direct – Open Mining
7LS1A4-1	238	238	Direct – Open Mining
7MS1D	132	132	Direct – Open Mining
7MS1-8	94	94	Direct – Open Mining
7MS1A2	192	192	Direct – Open Mining
7MS1C1	204	204	Direct – Open Mining
7MS1C1-1	92	92	Direct – Open Mining
7MS1F	661	661	Direct – Open Mining
7LS1J	104	104	Direct – Open Mining
7LS1A1	568	63	Minimization
7MS1A1-1	190	0	Avoidance
7MS1G	503	503	Direct – Open Mining
7MS1C-6	198	198	Direct – Open Mining
7MS1C-7	204	204	Direct – Open Mining
7MS1A4	118	118	Direct – Open Mining
7MS1-3	778	778	Direct – Open Mining
7MS1A-3	462	462	Direct – Open Mining
7NS1E	141	141	Direct – Open Mining
7LS1-7	127	127	Direct – Open Mining
7MS1-6	105	105	Direct – Open Mining
7MS1C-5	221	221	Direct – Open Mining
7MS1C-1	183	183	Direct – Open Mining
7MS1-5	1066	1066	Direct – Open Mining
7MS1H	177	177	Direct – Open Mining
7MS1	301	0	Avoidance
7LS1A	513	300	Minimization
7MS1C-2	133	133	Direct – Open Mining
7MS1C	143	143	Direct – Open Mining
7MS1-1	219	41	Minimization
7MS1B	454	184	Minimization
7MS1A3	167	167	Direct – Open Mining
7LS1C-4	398	398	Direct – Open Mining
7MS1A-2	199	199	Direct – Open Mining
7MS1C-3	231	231	Direct – Open Mining

7MS1A-1	620	620	Direct – Open Mining
7MS1A-4	475	475	Direct – Open Mining
7MS1-4	548	548	Direct – Open Mining
7LS1A1A	210	132	Minimization
7MS1-2	259	259	Direct – Open Mining

Wetland	Total Acres	Impact	Constraint
PFO	6.5	5.6	Direct –Open Mining
PEM	5.7	5.4	Direct – Open Mining
PSS	3.2	3.2	Direct – Open Mining

Open Water	Total Acres	Impact	Constraint
Pond	2.5	2.5	Direct – Open Mining

Offsite Alternatives: The majority of this site has been previously mined, the existing streams have predominately marginal RBP scores, and the impacts to wetlands are mostly those that are infested by *Phragmites australis*, invasive, or non-target species. Biological assessments showed poor MBI scores and moderate to high TDS and conductivity levels. Due to the fact that other potential coal reserves would result in impacts to potentially higher quality resources, and these sites are not available for mineral extraction, the location alternative was disqualified.

On-Site Alternatives: Different mining methods were considered as alternatives for the proposed RFA1 mine. These alternatives include auger, underground mining, and highwall mining to avoid "waters of the U.S.".

The proposed project would surface mine Kentucky coal seams #10, #11, and #12. The #12 coal is approximately 0.98-ft thick, the #11 averages 1.61-ft, and the #10 is 3.04-ft thick. The #10 will be the lowest coal seam to be mined. Any coal that may exist between these seams that exhibit suitable thickness and quality will also be recovered. For an economically practicable return at RFA1, Oxford will recover all seams.

Auger Mining: This method of recovery is generally used in conjunction with open-pit surface mining operations because auger mining requires the coal seam to be exposed. Auger mining is used in conjunction with surface mining to augment coal recovery in deeper ratio areas and areas where mandatory set-back distances are required.

The auger mining system consists of a motorized drive unit attached to a cutting head by a series of continuous flight augers. As the cutting head penetrates the seam, the augers convey the coal out of the hole. The auger system mines the coal in a series of circular holes. The auger diameter used is generally about 6 inches less than the thickness of the seam being mined to prevent the auger from encountering the roof or floor.

Auger diameters commonly used range from about 18-inches up to 96-inches. General auger mining is not considered feasible in coal seams less than 2-feet thick. A pillar of coal is left between each hole to support the overlying strata. The thickness of the web pillar depends on the strength of the coal in the pillars, the strength of the strata above the coal, and the strength of the floor on which the pillars rest. The depth of the auger hole varies based on the size of the auger, geologic and operational conditions, but is generally limited to a maximum of about 400 to 500 feet

from the coal face in the pit.

Oxford evaluated the use of auger mining at the RFA1 reserve and determined that it will be implemented, but not to the extent that it will appreciably decrease impacts.

Underground Mining: Underground mining is generally utilized to recover coal seams that are too deep to be efficiently mined using surface mining methods. The major limiting factor determining whether a seam can be mined using underground methods is the seam height. Due to the size of equipment used in underground mining and the adverse working conditions resulting from confined spaces, seams with a coal thickness less than 4 feet are generally not considered mineable. All of the seams at RFA1 are less than 4 feet eliminating this is a practicable alternative.

Highwall Miner Method: Highwall mining is a method of coal mining in which a continuous mining machine is driven under remote control into the seam exposed by open cut operations. A continuous haulage system carries the coal from the miner to an open-air installation for stockpiling and transport. This process forms a series of parallel, unsupported drives. It is vital that the coal pillars remaining between adjacent drives are capable of supporting the overburden structure to preclude unplanned subsidence. This mining method is totally reliant on effective remote control. Straight, parallel openings at the tightest separation consistent with geotechnical design can only be achieved if the mining machine's position and heading can be determined and controlled remotely. While highwall mining is generally associated with reserves where the overburden depth to a coal seam is too great to economically surface mine the area, there are other factors that must be considered prior to utilizing this method. These factors include the geology of the overburden, particularly the competency of the strata directly above the coal seam, the thickness of the coal seam, the load bearing (unconfined compressive strength) of the coal seam, the competency and moisture content of the strata at the base of the coal seam, and the strike and dip of the seam to be recovered. Additionally, since highwall mining requires an open pit that is excavated from the surface, there must be areas in the reserve that can be surface mined to allow access for the highwall miner system to recover the remaining reserves. The use of highwall mining was eliminated in order to maximize coal recovery.

No Action Alternative: Oxford leased this reserve area for the sole purpose of developing a surface coal mining operation. Exploration drilling was conducted to gather information regarding the quality and distribution of the coal seams in the reserve for mine planning. More recently, Oxford conducted a testing program to further evaluate the quantity and quality of the coal reserves. Oxford's acquisition of the coal reserve, pursuit of various environmental permits, and its exploration activities represent a significant economic investment in the project.

The underlying presumption of the no action alternative is that the proposed activity either is not necessary or can be moved to another site to avoid the proposed impacts. Unlike most commercial, industrial or residential development that can be moved to another suitable site, mineral extraction is resource dependent, i.e. the activity must occur where the resource exists in sufficient quantity and quality to be economically recoverable. Coal does not occur everywhere and is only found in thirty-eight of the one hundred and twenty Kentucky Counties. Coal in Kentucky is only found in a small section of western Kentucky and eastern Kentucky. Even where present, many factors affect the economic feasibility of recovering the coal. These factors include the seam thickness, coal quality, thermal heating value, depth or thickness of overburden, and proximity to transportation systems, or end-user customers. Therefore, even though coal may be present beneath an area it may not be economically feasible to recover the resource.

Surface mining has occurred in Kentucky for many years and extensive areas have already had the coal removed. The majority of the large, contiguous reserve areas have already been mined. Most of

the remaining mineable coal reserves are smaller blocks of coal between or around the perimeter of the larger surface mined areas. RFA1 is one such reserve area.

Kentucky obtains approximately 97% of its electric power from coal-fired power plants. Electric power consumption in the state has increased significantly in the last five years and is expected to increase further during the next twenty years. In order to meet the projected increase in energy demand, the development of new coal mining operations to supply the state's power generating facilities is necessary.

When the U.S. Congress enacted Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977 (SMCRA), they recognized that coal mining operations contribute significantly to the Nation's energy requirements but also resulted in environmental damage. Recognizing these facts, one of the purposes of SMCRA stated by Congress was to "assure that the coal supply essential to the Nation's energy requirements, and to its economic and social well-being, is provided and strike a balance between protection of the environment and agricultural productivity and the Nation's need for coal as an essential source of energy." As recognized by Congress, the development of new coal mining operations is necessary to preserve and protect the economic and social needs of the country. Therefore, foregoing the proposed project would not be in the national interest, especially in these times of scarce energy supplies and historically high energy prices.

The primary purpose of this proposed operation is to supply coal for electric power generation. The proposed operation will have significant socioeconomic impacts. RFA1 is a continuation of the larger adjacent mine which will continue to employ approximately 61 miners which represents approximately 0.1% of the workforce in Muhlenberg County where the unemployment rate is approximately 9%; the average salary will be approximately $60,000 per year with a total annual payroll of approximately $2.8 million. At today's market prices, the market value of this reserve is approximately $50 million. Over $2.6 million in payroll taxes will be generated over the life of the mine, while approximately $1.3 million of state and federal black lung and reclamation taxes will also be paid.

The "no action" alternative would have a considerable financial impact on Oxford as well as the surrounding area. Oxford has made a significant investment in the reserve and is in the process of negotiating coal supply agreements with potential electric utility customers. The "no action" alterative would make it impossible for Oxford to meet the conditions of potential coal supply contracts and could result in legal action against the company for breach of any potential contract. If shipments could not be made, potential customers would have the ability to claim harm and pursue damages against Oxford. Not pursuing the project would also have an impact, both direct and indirect, on the local economy through the loss of jobs and on the local government through the loss of tax revenue from property taxes on the equipment, facilities, and other improvements associated with the mine development.

Proposed Action: Oxford has proposed to avoid, where possible, disturbance to "waters of the U.S.". This will result in avoidance and minimization of approximately 962-ft of intermittent stream, 773-ft of ephemeral stream, 0.9-acres of PFO and 0.3-acres of PEM in the Plum Creek – Pond Creek Watershed. Several design alternatives were considered, but due to the site size, configuration, and location of jurisdictional waters, a functional design for the surface mining operation that does not discharge dredge or fill material could not be achieved.

The design requirement for the chosen alternative includes the use of best management practices, proper post-mine reclamation, and mitigation to compensate for direct impacts and to minimize impacts to the environmental resources of the surrounding aquatic ecosystem.

Neutralization Potential

Introduction: The geologic sampling program identified the potential acidic strata. The neutralization potential of the non-acidic strata to be disturbed is sufficient to balance the potential acidic strata.

Approximate original contour and drainage patterns are to be re-established prior to top soiling. Some smaller drainage ways may be eliminated to allow dissipated runoff and to retard rill and gully erosion. The topsoil and any necessary soil horizons will be replaced uniformly over regarded overburden with scrapers. Scrapers will be unloaded as rapidly as possible and chisel plow and/or dozer rippers will be used to avoid excessive compaction caused by repeated passes over a particular area. The entire area will be final dressed using scrapers and motor graders with care being taken to avoid any depression that might contribute to erosion or excessive water pockets that would be detrimental to the proposed post-mining land use. The entire area will be disked to a depth of 6 to 8-inches to correct any inadvertent over-compaction occurring during the redistribution activities. Natural settlement and heavy equipment traffic should result in an insignificant difference between original and final grades. Expanded spoil will be used to eliminate the high wall. After soil tests have been taken to determine agricultural lime and fertilizer amendments needed and incorporated, the area will be seeded and/or mulched.

Toxic Material Handling Plan: All acidic units will be buried in the surface mining pit within 30-days of exposure and covered with at least four (4.0) ft of non toxic/non acidic spoil material in order to reduce and/or prevent oxidation of pyrite.

Water will not be allowed to accumulate on the mine floor for long periods of time. This will prevent or greatly reduce pyrite oxidation within the sandy shale floor material. The floor material of the KY# 12, 11, and 10 Coal includes confining shale units that should preclude groundwater transmission to underlying stratigraphic units.

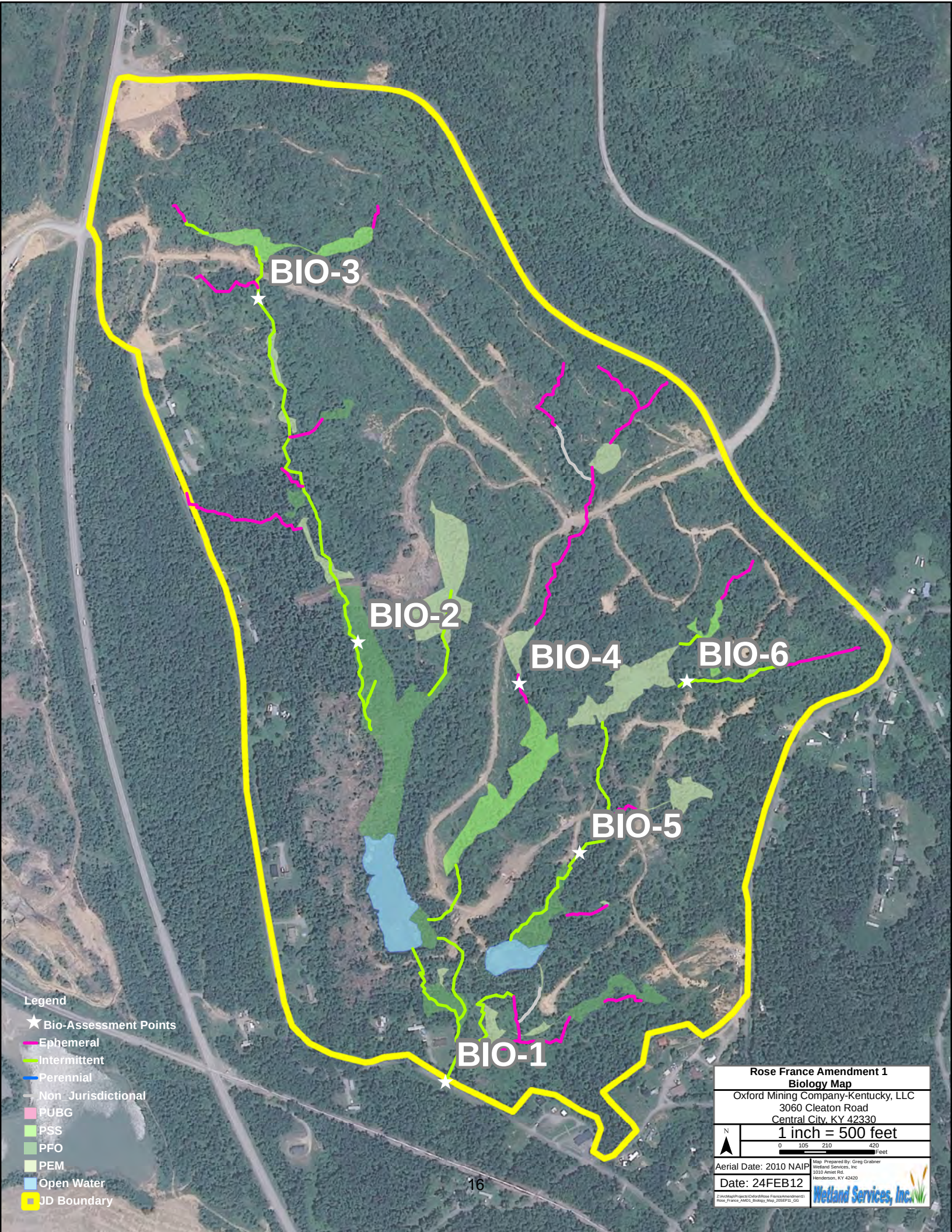
Mining pits are opened by removing topsoil from the next pit area and then pushing the unconsolidated material into the previous mining pit to create a bench for blasting. The upper sandy shale immediately below the unconsolidated will be removed at this time with the unconsolidated to insure that the potentially acidic material is buried in the bottom of the previous pit with at a minimum of four feet of non-toxic, non-combustible material.

After blasting operations the spoil will be pushed into the previous pit or hauled out to be deposited in the area receiving reclamation operations. Any toxic material adjacent to the coal seam will remain in the pit or be removed, segregated, and contained in the bottom of the active pit as the coal seam is being loaded out.

Spoil handling in the manner described will insure that all acidic overburden is buried as deep as possible, to a minimum 4-feet, during the backfilling and grading operations.

RFA1 Geology				
Strata	Depth – feet	Potential Neutralization Tcce/kT	Potential Acid Tcce/kT	Total Sulfur mg/kg
Topsoil/Brown Sandstone	0-5	3.7	<0.050	131
Brown Sandstone	5-10	2.5	<0.050	130
Brown Sandstone	10-15	2.7	<0.050	106
Brown Sandstone	15-20	2.2	<0.050	169
Brown Sandstone	20-25	27.4	1.81	208
Brown Sandstone	25-30	1.8	<0.050	182
Brown Sandstone	30-35	2.3	<0.050	142
Brown Sandstone	35-40	2.0	<0.050	170
Gray Sandstone	40-45	1.8	<0.050	786
Gray Sandstone	45-50	6.0	<0.050	2590
Brown Sandstone	50-55	9.7	<0.050	513
Brown Sandstone	55-60	2.6	<0.050	277
Brown Sandstone	60-65	2.1	<0.050	294
Brown Sandstone	65-70	4.8	0.510	186
Brown Sandstone	70-75	<0.4	<0.050	148
Brown Sandstone	75-80	2.8	<0.050	166
Brown Sandstone	80-85	2.7	<0.050	117
Brown Sandstone	85-90	<0.4	<0.050	1020
Gray Sandy Clay	90-93	<0.4	4.26	2070
#12 Coal Seam	93-97.5	<0.4	50.4	6970
Limestone	97.5-99.5	195	12.8	9690
#11 Coal Seam	99.5-103	95.6	22.9	4930
Gray Sandy Shale	103-110	46.1	30.4	6440
Gray Sandy Shale	110-115	63.5	10.7	4140
Gray Sandy Shale	115-120	35.1	3.48	3190
Gray Sandy Shale	120-125	64.6	8.95	2610
Gray Sandy Shale	125-130	20.2	5.66	1170
Gray Sandy Shale	130-135	24.1	5.39	1160
Dark Gray Sandy Shale	135-140	40.2	<0.050	2100
Dark Gray Sandy Shale	140-144	24.8	0.510	1530
#10 Coal Seam	144-147.3	17.3	131	2620
Gray Sandy Shale	147.3-155	9.6	2.6	1320
Gray Sandy Shale	155-160	10.1	<0.050	864

CONCLUSION: The information contained in this section is an assimilation of pertinent material developed in the SMCRA permit application. The table above illustrates that site geology has a positive neutralization potential more than sufficient to bury or dilute acid bearing overburden. In contingency, should toxic material exist that was not detected during core sampling, the applicant has also established a toxic materials handling plan.


BIO-3
BIO-2
BIO-4
BIO-6
BIO-5
BIO-1
Legend
Bio-Assessment Points
Ephemeral
Intermittent
Perennial
Non_Jurisdictional
PUBG
PSS
PFO
PEM
Open Water
JD Boundary
Rose France Amendment 1
Biology Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0 105 210 420
Feet
Aerial Date: 2010 NAIP
Date: 24FEB12
Z:\ArcMapProjects\Oxford\Rose FranceAmendment1\Rose_France_AMD1_Biology_Map_20SEP11_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.

Biological Assessment and Water Quality Report

Introduction: This report summarizes the stream biological assessments conducted by Wetland Services, Inc for Oxford Mining. Sampling was completed on September 21, 2011 for the Rose France 1 permitting area. A total of six sites were selected for bio-assessment. The report and contributing assessments have been designed to portray the condition and structure of aquatic communities in wadeable and headwater streams. The streams selected for sampling reflect the expected biological attributes of the surrounding streams in the geographic region. Representative sites were chosen to represent each land use type and watershed in the proposed permit area. Since it may not be possible to adequately monitor each water-body, bio-assessment programs collect data from a representative sample of water-bodies in a target population (EPA CALM, 2002).

Bio-assessments are an evaluation of the biological condition of a water body using surveys of biological communities (EPA CALM, 2002). This report is based on one or more biological assemblages including benthic macroinvertebrates, fish, water chemistry, and physical habitat. Macroinvertebrate communities are utilized for bio-monitoring due to their ease of collection and their sensitivity to water quality. Oxford Mining requested a biological assessment to evaluate the current quality of streams in the defined area. The bio-assessments followed the Environmental Protection Agency's (EPA) Rapid Bio-assessment Protocol (RBP II) for wadeable and headwater streams, and utilized a macroinvertebrate Index of Biotic Integrity (mIBI) and fish Index of Biotic Integrity (KIBI) developed by the Kentucky Division of Water's (KYDOW) Standard Operating Procedures.

Study Area: The assessment points are located on a tributary of Pond Creek in Muhlenberg County, KY just to the south of Central City, KY. Watershed area above the sample points range from 10 - 227 acres. The site is composed mostly of upland forest, with portions significantly logged within the last 5 years. Stream riparian corridors are dominated by soft mast forest and are frequently wetlands with a dense understory/forbs layer. The site has been historically mined evident by the presence of coal material in the top soil and streams. Names, coordinates, and watershed size of the sample points are listed in the data table section at the end of this narrative. Sample points can be referenced on the adjoining map.

Methods and Materials

Biological Evaluation Methods: Macroinvertebrate samples were collected on the site at single habitat riffles, or by using the multi-habitat approach following methods described in, *Methods for Assessing Biological Integrity of Surface Waters* by the KYDOW.

Single Habitat Riffle: Where riffles were present, two representative riffle areas were chosen and the "kick" method was employed to disturb one m^2 of substrate to collect organisms/debris dislodged from the disturbance. The method involved collection of organisms using a 600 micron kick-net for single-habitat riffle samples.

Multi-Habitat Sweep: The multi-habitat approach, employed when few or no riffles were present, used a 600-µm D-frame dip net in a series of dips in three replicates for each of the following habitat types: undercut banks/root mats, leaf packs, silt, sand, fine gravel, rock picks, and wood sampling. Contents were removed from the dip net after each habitat sampling and placed into a sieve bucket where they were elutriated to remove excess material. Samples were then placed into jars properly preserved and labeled.

Fisheries Sampling: Fish sampling was performed via a Halltech backpack electrofisher, and occurred on a reach of stream ranging from 50-500 meters by multiplying the wetted width times five. A minimum distance of 50 meters was required for streams with narrow wetted width and a maximum distance of 500 meters for larger streams. The sample area consisted of at least 1 riffle, run, pool complex. If electrofishing was not feasible, the technique of seining was utilized. Upon collection, fish were identified, counted, and then released back into the stream. One of each fish species collected was photographed for recording purposes and to confirm identification. Results were entered into the Kentucky Index of Biotic Integrity (KIBI) for scoring.

Physical Evaluation Methods: Physical evaluation followed the EPA RBP II physical habitat evaluation method outlined by the EPA.

Chemical Evaluation Methods: Parameters recorded included temperature, total dissolved solids, (TDS), conductivity, pH, and turbidity. A HACH 156 water quality analysis meter was utilized to perform these tests. The instrument was first calibrated with a known solution, and then placed in the center of the thalweg of each sample point to acquire the specified test readings.

Field and Laboratory Processing: Samples were first processed in the field where they were elutriated with a sieve bucket to remove excess gravel. Once in the lab, semi-aquatic species were removed and the sample was identified down to the family and/or the genus level. Due to the small size of Chironomidae, Culicidae, and Dixidae families, these organisms were slide mounted using CMCP-9AF mounting medium, glass slides, and cover glass. The slides were cured for 24 hours and then placed under a Leica DME compound microscope for identification down to the genus level.

Data Analysis: Analysis of macroinvertebrate assemblages were analyzed using the KYDOW MBI Family 200 sample pick (riffle) method, and/or the Genus 300 multi-habitat sample pick method.

The Kentucky MBI (macroinvertebrate) family level is based on six metrics:

1. Family-Taxa Richness (F-TR)
2. Number EPT Family
3. FBI – the Family Biotic Index
4. % Ephemeroptera, Plecoptera, Trichoptera individuals (%EPT)
5. Percent Ephemeroptera (% Ephem)
6. % Chironomidae + % Oligocheata (%C+%O)

The Kentucky MBI (macroinvertebrate) genus level is based on seven metrics:

1. Genus-Taxa Richness (G-TR)
2. EPT Genera
3. Modified Hilsenhoff Biotic Index (mHBI)
4. Modified % EPT, (m%EPT), exclude the genus Cheumatopsyche from Trichoptera.
5. Percent Ephemeroptera (% Ephem)
6. % Chironomidae + % Oligocheata (%C+%O)
7. Percent primary clingers (% Cling)

The Kentucky KIBI (fish) is based on seven metrics:

1. Native species richness, (NAT)
2. Darter, Madtom, Sculpin species richness, (DMS)

3. Intolerant species richness, (INT)
4. Simple Lithophilic spawning species richness, (SL)
5. Percent insectivorous individuals, excluding tolerant individuals, (%INSCT)
6. Percent tolerant individuals, (%TOL)
7. Percent facultative Headwater Individuals, (%FHW)

Results

Biological Evaluation Results: Kentucky Department of Waters 303(d) methodology sets the standard for scoring macroinvertebrate and fish biotic communities. MBI scores vary by bioregion in the state and stream classification as wadeable or headwater. Most western KY coal deposits lie in the Mississippi Valley-Interior River Bioregion (MVIR). Scores rank stream conditions as very poor, poor, fair, good, and excellent. The results of the KIBI follow the same scoring methods based on bioregion and classification of headwater or wadeable stream. The collection tables detail the order, family, and genus present for macroinvertebrates, as well as genus and species for fish species encountered during sampling at each bio-assessment site. MBI and KIBI scores are displayed in separate tables. All can be viewed in the data table section following this narrative.

Physical Evaluation Results: These results are based on the EPA RBP physical Habitat Assessment for low-gradient streams. The RBP score is based on 10 habitat parameters. The overall score is out of 200 with a higher score indicating a more "optimal habitat". The actual habitat assessment process involves rating the 10 parameters as optimal, suboptimal, marginal, or poor based on the criteria included on the Habitat Assessment Field Data Sheets, (EPA 841-B-99-002). See the data table section at the end of this narrative for a breakdown of each site's score.

Chemical Evaluation Results: Results of water chemistry analysis are displayed in a table following this narrative.

Quality Assurance/Quality Control (QA/QC): QA/QC in biological assessments involves labeling samples clearly and accurately so that collected data corresponds with the correct project, cleaning all nets, sieves, and gear used in sampling to ensure that organisms identified are representative of the sites sampled, along with performing duplicate sampling events on ten percent of the sampling sites to ensure that accurate species compositions are attained, and that sampling effort and technique are consistent.

Discussion:

Site visit to complete stream bio-assessments took place on September 21, 2011. Upon investigation it was found that the majority of streams on site were dry. Collection of macroinvertebrates took place at two out of the six selected sites. All streams that were dry upon assessment are seasonal flowing ephemeral or intermittent streams, and would be expected to display macroinvertebrate communities similar to the other bio-assessment points on site. Bio 1 is the main drainage for the area and was dry due to an open water having lowered pool levels below drainage outlets. Weather conditions prior to sampling included intermittent shower activity along with a heavy rain event within the past seven days.

Macroinvertebrate Index of Biotic Integrity (MBI) results ranged from 20.36 to 20.87 placing them in the poor (19-34) category for the MVIR bio region headwater streams. Bio 2 and Bio 3 displayed similar macroinvertebrate communities, which is to be expected for two sites located on the same stream. Their location on the largest watershed on site provides more consistant stream flows

allowing for more diverse benthic communities. Wetland complexes along this stream most likely provide refugia during dry periods as well. All MBI scores were limited by a lack in diversity, especially the EPT taxa, and a lack of taxa displaying clinger behavior, indicating poor stream substrate compositions and a lack of stability (Pond 2003).

No bio-assessment points supported fish communities. Small stream dimensions and small drainage area are key reasons for the absence of fish in bio-assessment streams. Open waters on site most likely support warm water fish communities.

RBP II physical habitat assessments were completed at all bio-assessment points. Scores ranged from 91 - 118. RBP categories consistently scored in the marginal to sub-optimal range. RBP scores were limited by a lack of channel flow status at some sites, poor to marginal scores for epifaunal substrate/available cover and pool variability, as well as low scores for riparian vegetative zone width due to logging. Increased levels of sediment in the form of sand were observed. Waters (1995) found that alteration of substrate conditions by sedimentation as a result of urbanization, increased agriculture runoff, elimination of riparian vegetation, or channelization of streams is a significant threat to aquatic life in streams due to homogenization and reduced diversity in stream habitat

Upon completion of water chemistry analysis it was found that the pH for sites Bio 2 and Bio 3 was 7.2. The bio-assessment sites fell within Kentucky pH standards (pH range 6 - 9) for surface waters (Kywater.org). TDS and conductivity values were moderate to high. High amounts of iron precipitate were observed coating the stream substrate at Bio 3.

References

Compton, M.C., G.J. Pond, and J.F. Brumley. 2003. Development and application of the Kentucky Index of Biotic Integrity (KIBI). Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

EPA Consolidated Assessment & Listing Methodology, 2002

Kentucky Division of Water (KDOW). 2011. Methods for Sampling Benthic Macroinvertebrate Communities in Wadeable Waters. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

Kentucky Division of Water (KDOW). 2009. Collection Methods for fish in wadeable streams. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

Pond, G.J., S.M. Call, J.F. Brumley and M.C. Compton. 2003. The Kentucky macroinvertebrate bioassessment index: derivation of regional narrative ratings for wadeable and headwater streams. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Ky.

WATERS, T. F 1995. Sediment in Streams. Sources, Biological Effects and Control. AFS Monograph 7. American Fisheries Society, Bethesda, Maryland.

http://kywater.org/ww/ramp/rmtests.htm Water Quality Parameters.

Data Tables:

Sample Point Locations			
Sample Point	**Latitude**	**Longitude**	**Watershed size (acres)**
Bio 1	37.25676	-87.09813	227
Bio 2	37.26251	-87.09967	84
Bio 3	37.26672	-87.10125	38
Bio 4	37.26204	-87.09718	28
Bio 5	37.25999	-87.09620	34
Bio 6	37.26208	-87.09458	10

Macroinvertebrates Collected by Sample Point								
Order	**Family**	**Genus**	**Bio 1**	**Bio 2**	**Bio 3**	**Bio 4**	**Bio 5**	**Bio 6**
Isopoda	Asellidae	Asellus		49	16			
Amphipoda	Gammaridae	Gammarus		1				
Oligocheata				1				
Hirundinae				1				
Lepidoptera	Crambidae				1			
Diptera	Ptychopteridae	Bittacomorphora			5			
	Tipulidae	Tipula			2			
	Culicidae	Anophles		1				
		Culex		3	1			
	Chironomidae	Larsia			1			
		Zavrelimyia			1			
		Psectrocladius			1			
	Ceratopogonidae	Bezzia						
Coleoptera	Dytiscidae	Coptotomus						
		Neoporus		1				
	Scirtidae	Scirtes			1			
	Psephenidae	Dicranopselaphus		1				
Odonata	Corduliidae	Somatochlora			8			
	Gomphidae	Progomphus			1			
		Arigomphus		1				
	Cordulegastridae	Cordulegaster		3				
Total			NA	**62**	**38**	NA	NA	NA

MBI Results (multi-habitat genus level)								
	Bio 1		**Bio 2**		**Bio 3**		**Bio 4**	
Metric	Value	Score	Value	Score	Value	Score		
G-TR			10	15.87	11	17.46		
G-EPT			0	0.00	0	0.0		
mHBI			7.73	29.03	7.47	32.35		
M%EPT			0%	0.0	0%	0.0		
% Ephem			0%	0.0	0%	0.0		
% C+O			1.61%	99.06	7.89%	92.74		
% Cling			1.61%	2.13	0%	0.0		
MBI Score	NO WATER		**20.87**		**20.36**		NO WATER	

MBI Results (multi-habitat genus level)				
	Bio 5		**Bio 6**	
Metric	Value	Score	Value	Score
G-TR				
G-EPT				
mHBI				
M%EPT				
% Ephem				
% C+O				
% Cling				
MBI Score	NO WATER		NO WATER	

EPA RBP Physical Habitat Assessment Results						
Parameters	**Bio 1**	**Bio 2**	**Bio 3**	**Bio 4**	**Bio 5**	**Bio 6**
Epifaunal/Substrate available Cover	7	8	9	9	7	6
Pool Substrate Character	7	6	6	11	7	6
Pool Variability	6	5	8	6	8	5
Sediment deposit	17	17	16	18	11	18
Channel Flow Status	1	10	10	1	1	1
Channel Alteration	16	17	16	16	16	16
Channel Sinuosity	4	7	6	6	6	6
Bank Stability	16	18	16	16	14	16
Vegetative protection	15	16	16	14	14	16
Riparian Vegetative Zone Width	14	14	6	6	7	6
Total	**103**	**118**	**109**	**103**	**91**	**96**

Water Chemistry Evaluation Results						
Variables	**Bio 1**	**Bio 2**	**Bio 3**	**Bio 4**	**Bio 5**	**Bio 6**
Temperature	NA	74.4 F	71.4 F	NA	NA	NA
TDS	NA	410 mg/l	253 mg/l	NA	NA	NA
Conductivity	NA	838 µs/cm	523 µs/cm	NA	NA	NA
pH	NA	7.2	7.2	NA	NA	NA

Report Clarification

The following Aquatic Rapid Bioassessment Survey was done for two different locations. Only the data that refers to Rose France South (RFS) is pertinent to this application. For this report, Rose France South is the same as RFA1.

Aquatic Rapid Bioassessment Survey for Oxford Mining Company Kentucky, LLC's. Rose France permit Muhlenberg County, Kentucky

Prepared for Oxford Mining Company Kentucky, LLC.

Prepared by:

COPPERHEAD
ENVIRONMENTAL CONSULTING

June 2011

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Figure 2 Survey reach locations on Oxford Mining Company Kentucky, LLC's Rose France permit north addition Muhlenberg County, Kentucky May 2011. 8

Figure 3 Survey reach locations on Oxford Mining Company Kentucky, LLC's Rose France permit north addition Muhlenberg County, Kentucky May 2011. 9

Introduction

Copperhead Environmental Consulting, Inc. was contracted by Oxford Resources, LLP. to conduct a fish survey on the additions to the Rose France coal permit area in Muhlenberg County, KY. The proposed permit area is located within the "Green River-Southern Wabash Lowlands" Ecoregion (Woods et al 2002). Pond Creek, a heavily channelized stream of the Green River basin, is the ultimate receiving stream for all waters within the permit boundary. The Rose France permit area lies entirely within Plum Creek-Pond Creek, Hydrologic Unit (HUC12: 051100030404). Project location maps are included as Figures 1, 2, and 3.

Methods

Habitat Assessment

Habitat assessments were conducted at each fish sample site using high gradient stream datasheets (KDOW 2010). Habitat parameters evaluated included:

- Epifaunal Substrate/Available Cover
- Embeddedness
- Velocity/Depth Regimes
- Sediment Deposition
- Channel Flow Status
- Channel Alteration
- Frequency of Riffles
- Bank Stability
- Vegetative Protection
- Riparian Vegetative Zone Width

Biologists collaborated when completing habitat assessments to reduce potential for individual bias. Scanned field data sheets are available in appendix 1.

Fish Survey

The fish survey was conducted on 11-12 May, 2011. Fish sampling was conducted using KY Division of Water (KDOW, 2010) standard guidance and employed single pass electrofishing. Fish communities were sampled using an Appalachian Aquatics AA-24 backpack electrofisher with supplemental seining and dip netting in habitats (e.g. deep pools, shallow streams) not effectively sampled using electrofishing techniques. Survey Reaches were partitioned into segments of between approximately 100 and 300 meters (when possible) for fish population sampling. Representative pictures are available in Appendix 2. Electrofishing time was recorded in seconds so Catch per Unit Effort (CPUE) could be calculated. Sampling time for each reach is presented in Table 1. Downstream and upstream endpoints of all sample reaches were recorded using handheld GPS units (Table 2) and reach length was calculated (Table 3). At each sampling station, all fish encountered were identified, enumerated and the presence of any abnormalities (e.g. lesions, parasites, deformations, etc) were noted. All data collected was recorded on field data sheets which are appended to this report. Vouchers of specimens were preserved in alcohol and will be held at the Copperhead Consulting office for verification purposes for a minimum of five years. This survey encompasses two additions to the existing Rose France Permit; Rose France North (RFN) and Rose France South (RFS), for reporting purposes both additions have been included.

Table 1. Survey reach sample times on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Station	Shock Time (sec)
RFN Bio 1	828
RFN Bio 2	547
RFN Bio 3	321
RFN Bio 4	175
RFN Bio 5	24 dipnets
RFN Bio 6	307
RFN Bio 7	286
RFS Bio 1	376
RFS Bio 2	250
RFS Bio 3	not shockable
RFS Bio 4	159
RFS Bio 5	223
RFS Bio 6B	231

Table 2. Survey reach locations on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Station	Downstream Lat/Long	Upstream Lat/Long	Notes
RFN Bio 1	37.28187/-87.07164	37.28322/-87.07225	
RFN Bio 2	37.28377/-87.08772	37.28399/-87.08759	
RFN Bio 2B	37.28370/-87.08758	37.28378/-87.08752	
RFN Bio 3	37.28159/-87.09155	37.28170/-87.09184	
RFN Bio 4	37.28427/-87.08735	37.28455/-87.08744	
RFN Bio 5	37.28789/-87.07675	37.28796/-87.07950	
RFN Bio 6	37.29317/-87.07911	37.29358/-87.07980	
RFN Bio 7	37.28117/-87.09904	37.28104/-87.09933	
RFS Bio 1	37.25752/-87.09795	37.25831/-87.09846	
RFS Bio 2	37.25829/-87.09803	37.25885/-87.09797	
RFS Bio 3	37.26042/-87.09751		Not surveyed, no water

RFS Bio 4	37.25753/-87.09795	37.28322/-87.07225	
RFS Bio 5	37.25975/-87.09632	37.26051/-87.09567	
RFS Bio 6B	37.26699/-87.10122	37.26714/-87.10117	

Table 3 Survey reach lengths on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Site	Length (m)
RFN Bio 1	165.0090
RFN Bio 2	38.7781
RFN Bio 3	30.3607
RFN Bio 4	33.0842
RFN Bio 5	23.5330
RFN Bio 6	80.3709
RFN Bio 7	121.4000
RFS Bio 1	104.4380
RFS Bio 2	69.3952
RFS Bio 4	70.9409
RFS Bio 5	107.2580
RFS Bio 6	17.5819

In situ water quality measurements were taken using an Eureka Environmental Manta portable water meter (Table 4).

Using metrics outlined in *2008 Methods for Assessing Biological Integrity of Surface Waters in Kentucky* (KDOW 2008), a KY Index of Biotic Integrity (KIBI) score was calculated for each fish sampling reach and for the entire survey as a whole following KDOW's Standard Operating Procedures (SOP). KDOW's Excel KIBI template was utilized for the calculation process.

Fish survey reaches are shown in Figure 1.

Results

Water Quality

Table 4. Water quality parameters of survey reaches on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Station	Turb (NTU)	Temp (°C)	Sp Cond (µm/L)	pH	DO (mg/L)	TDS (mg/L)
RFN Bio 1	8.26	27.55	1800	7.72	9.95	1151.19
RFN Bio 2	15.36	27.22	2533	7.54	6.96	1621.45
RFN Bio 2B	8.34	25.65	2457	7.74	7.25	1573.08
RFN Bio 3	3.76	28.78	825	7.51	8.52	528.01

RFN Bio 4	13.31	30.01	2343	6.95	1.32	1514.5
RFN Bio 5	3.46	23.03	3291	7.12	5.34	2106.52
RFN Bio 6	5.82	23.24	1051	7.64	7.36	672.06
RFN Bio 7	6.72	22.5	254	7.49	7.55	162.79
RFS Bio 1	4.15	22.35	588	7.47	7.45	377.13
RFS Bio 2	4.32	24.75	582	7.26	7.12	372.83
RFS Bio 3	Not Sampled Due to Lack of Water					
RFS Bio 4	3.54	21.22	497	7.39	7.77	318.6
RFS Bio 5	5.26	21.02	726	7.46	8.14	464.62
RFS Bio 6B	3.58	22.19	468	6.95	5.7	299.77

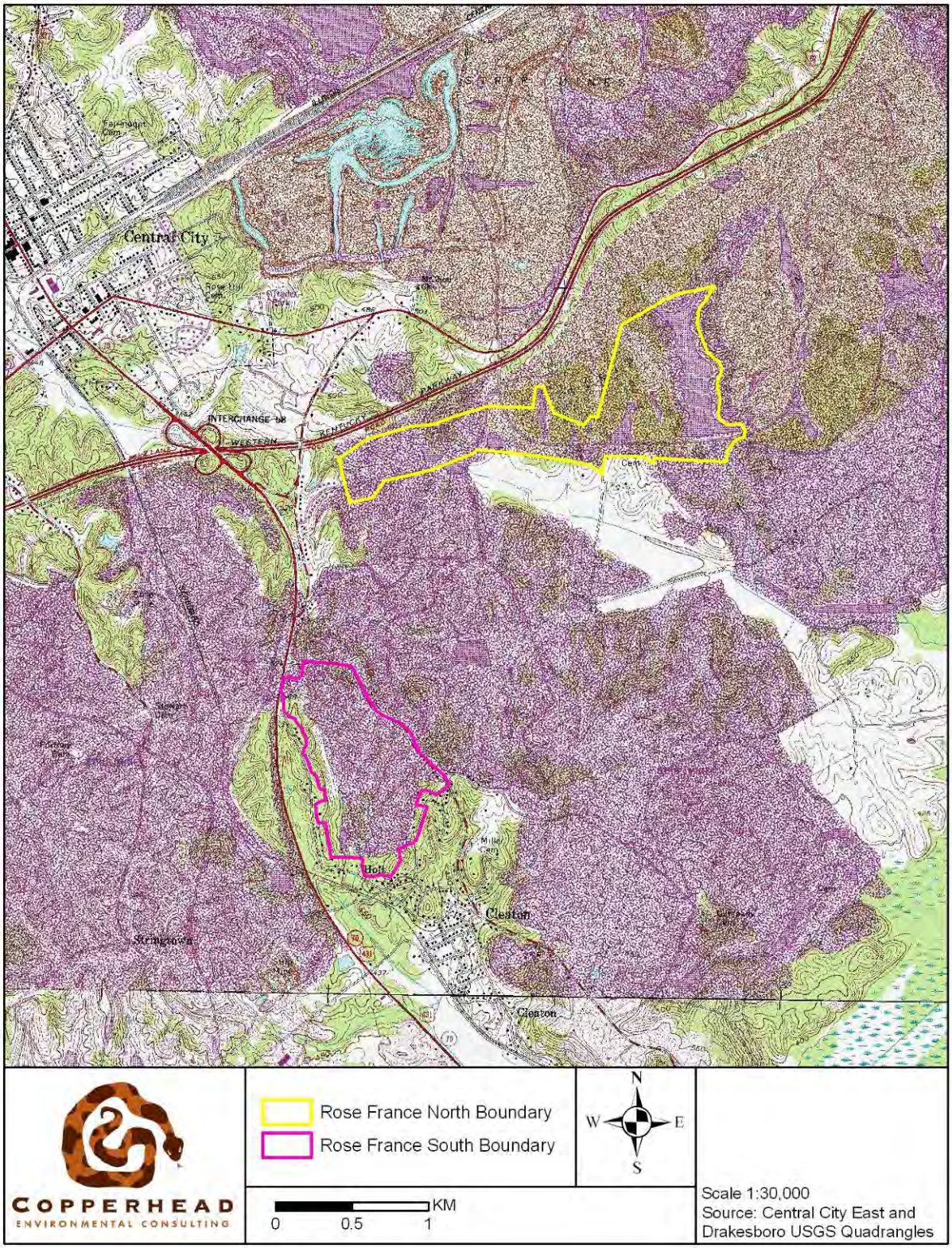

Figure 1 Permit addition locations on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Figure 2 Survey reach locations on Oxford Mining Company Kentucky, LLC's Rose France permit north addition Muhlenberg County, Kentucky May 2011.

Figure 3 Survey reach locations on Oxford Mining Company Kentucky, LLC's Rose France permit north addition Muhlenberg County, Kentucky May 2011.

Fish Survey

A total of 36 individuals representing 9 different species were encountered during the survey (Table 3), scanned data sheets are available in appendix 3.

Table 5 Species captured by survey reach on Oxford Mining Company Kentucky, LLC's Rose France permit Muhlenberg County, Kentucky May 2011.

Station	Species	Common Name	Total
RFN Bio 1	*Lepomis macrochirus*	Bluegill	3
	Gambusia affinis	Mosquitofish	2
RFN Bio 2	*Lepomis macrochirus*	Bluegill	2
RFN Bio 3	*Lepomis cyanellus*	Green Sunfish	13
	Lepomis macrochirus	Bluegill	10
RFN Bio 4	*Lepomis macrochirus*	Bluegill	1
	Micropterus salmoides	Largemouth Bass	1
RFN Bio 5	No Captures		
RFN Bio 6	*Lepomis cyanellus*	Green Sunfish	2
RFN Bio 7	*Lepomis cyanellus*	Green Sunfish	21
RFS Bio 1	*Lepomis macrochirus*	Bluegill	1
RFS Bio 2	*Lepomis macrochirus*	Bluegill	2
RFS Bio 3	Not Sampled Due to lack of Water		
RFS Bio 4	*Lepomis gulosus*	Warmouth	2
	Micropterus punctulatus	Spotted Bass	1
RFS Bio 5	No Captures		
RFS Bio 6B	No Captures		

* Nomenclature follows Etnier and Starnes (1993)

Reach Descriptions

The survey included an un-named tributary of Pond Creek and its tributaries.

RFN Bio 1- This reach drains a large sediment basin and is surrounded by second growth forest. Using the high gradient stream habitat assessment form (KDOW 2008), this reach scored a 72 which is considered to be non-supporting of designated use (KDOW 2008). The reach was highly embedded, fresh sediment deposition was noticed, and the channel was altered greatly, a combination of these factors helped to contribute to the low score. 5 individuals representing 2 species were captured which scored a 33 on the KIBI scoring system, which rates it as fair for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams.

RFN Bio 2- Two drains which ran from a sediment pond encompassed this reach, due to their proximity and because they drained the same water source, the reaches were combined. These streams were bordered on one side by a haul road and drained into a large wetland. This reach scored 97 on the High Gradient Stream Habitat Assessment Form, considered be non-supporting of designated uses (KDOW 2008). A lack of epifaunal substrate/available cover and poor velocity/depth regimes contributed to this score. Drastic orange staining typical of coal

mining impacted streams in the area was present throughout both of these reaches. Two bluegill were captured in this reach resulting in a KIBI score of 50, which rates the reach as good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. The presence of bluegill in these reaches is likely influenced by the downstream ponded wetland area and ponding upstream as well as the high tolerance of this species to pollution. Bluegill could likely not persist in streams of this size and poor water quality without these artificial ponded areas above and below the reaches.

RFN Bio 3- This reach drains a beaver impoundment and is surrounded by second growth forest. Habitat Assessment for this reach scored 112, which is considered to be non-supporting of designated use (KDOW 2008). Poor bank stability and lack of vegetative protection helped lower the score of this reach. A total of 26 individuals representing 2 species were captured in this reach, giving it a KIBI score of 50 which rates it as good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams.

RFN Bio 4- RFN Bio 4 feeds the sediment pond that drains into RFN Bio 2 and is bordered on one side by a haul road and reclaimed mine area. This reach was essentially a roadside ditch draining an old strip mine. Siltation of the stream was evidenced by high silt deposition in the channel, which was over two feet deep in places. It was largely stagnant water and all sediment was covered with bright orange iron staining. The in situ dissolved oxygen reading of this reach was 1.32mg/L. This reach scored 29 on the habitat scoring system considered to be non-supporting of designated use (KDOW 2008). The reach's KIBI score of 50 which is rated as good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. The KIBI score was influenced by the capture of 2 individuals representing 2 species. All of the habitat parameters of this reach rated towards the bottom of the scale. While the capture of two fish in this reach was surprising, it is probable that they migrated upstream from the ponded area into which the reach drains.

RFN Bio 5- Reach RFN Bio 5 drains into the large sediment basin on the east side of the permit. Due to its small size, this reach was sampled using a dip net. It is surrounded by thick second growth forest and most likely is dry during the summer months. RFN Bio 5 scored 135 on the habitat scoring system which is on the low end of full support of designated use (KDOW 2008). The reach's KIBI score of 0 which is considered very poor for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. The KIBI score was negatively influenced by the lack of fish captures during the survey. The stream was considered too small to support fish populations.

RFN Bio 6- Like RFN Bio 5, this small tributary drains into the large sediment basin on the east side of the permit area. It is surrounded by reclaimed mine land. RFN Bio 6 scored 95 on the habitat scoring system which is on the low end of full support of designated use (KDOW 2008). A lack of riffles and bends as well as poor epifaunal substrate contributed to the low habitat score of this reach. The reach's KIBI score of 50 which is considered good for headwater streams of the Mississippi Valley-Interior River (MVIR). Two green sunfish were captured on this reach.

RFN Bio 7- A small tributary bordering the Western Kentucky Parkway near the northeastern permit boundary, RFN Bio 7 is surrounded by thick second growth forest and most likely is dry during the summer months. RFN Bio 7 scored 70 on the habitat scoring system which is non-supporting of designated use (KDOW 2008). The reach's KIBI score of 50 which is considered good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. Two green sunfish were captured during the survey of this reach.

RFS Bio 1- This stream, located at the southern boundary of the permit, is bordered by a recently logged forest and some residences. RFS Bio 1 scored 116 on the habitat scoring system which is on the low end of partially supporting of designated use (KDOW 2008). The reach's KIBI score of 50 which is considered good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. One bluegill was captured during the survey of this reach.

RFS Bio 2- Located at the southern boundary of the permit RFS Bio 2 is bordered by a recently logged area and drains a sediment basin. RFS Bio 2 scored 97 on the habitat scoring system which is non-supporting of designated use (KDOW 2008). The reach's KIBI score of 50 which is considered good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. Two bluegill were captured during the survey of this reach.

RFS Bio 3- Was not sampled due to a lack of water.

RFS Bio 4- RFS Bio 4 is located at the southern boundary of the permit and is a tributary of RFS Bio 1, it is bordered by a recently logged forest. RFS Bio 4 scored 138 on the habitat scoring system which is on the low end of fully supporting of designated use (KDOW 2008). The reach's KIBI score of 50 which is considered good for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. 3 individuals representing 2 species were captured during survey of this reach.

RFS Bio 5- This survey reach is located upstream of RFS Bio 4 and is surrounded by recently logged and second growth forest. RFS Bio 5 scored 90 on the habitat scoring system which is non-supporting of designated use (KDOW 2008). The reach's KIBI score was 0 which is considered very poor for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. There were no captures during the survey of this reach.

RFS Bio 6- This reach was sampled in the only location possible due to the majority of the reach being impounded by beaver, which resulted in it being too deep and too big to effectively survey using a backpack shocker and seine. RFS Bio 6 scored 47 on the habitat scoring system which is non-supporting of designated use (KDOW 2008). The reach's KIBI score was 0 which is considered very poor for headwater streams of the Mississippi Valley-Interior River (MVIR) headwater streams. There were no captures during the survey of this reach.

It is likely that small catchment area of many of the streams sampled inflated the IBI scores, causing them to be higher than anticipated. In many cases, despite only a few individuals of one or two species were captured, IBI scores were relatively high, especially when compared

to water quality parameters and habitat scores for the reach. It should be noted that the scores of some of the reaches be interpreted with caution as some of the individuals collected would likely not survive extended periods of time in the reaches due to high conductivities, low oxygen content, and low water levels. The authors are of the opinion that impoundments up and downstream of many of the reaches may have been source reservoirs for fish that otherwise would not have been present.

Literature Cited

Etnier, D. A. and W. C. Starnes. 1993. The Fishes of Tennessee. The University of Tennessee Press, Knoxville, TN.

KDOW (Kentucky Division of Water). 2008. Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky: Revision 3. Kentucky Division of Water, Frankfort, KY. 138 pp.

KDOW (Kentucky Division of Water). 2010. Methods for Conducting Resource Extraction Intensive Surveys in Non-OSRW Streams of the Western Kentucky Coalfields. Kentucky Department for Environmental Protection Division of Water, Frankfort, Kentucky.

Woods, A.J., Omernik, J.M., Martin, W.H., Pond, G.J., Andrews, W.M., Call, S.M, Comstock, J.A., and Taylor, D.D., 2002, Ecoregions of Kentucky (color poster with map, descriptive text, summary tables, and photographs): Reston, VA., U.S. Geological Survey (map scale 1:1,000,000).

Appendix 1 Scanned Habitat Assessment Data Sheets

Stream Name RFS Bio	Location
Station # 1 RiverMile	Stream Class
Lat 37.25752 Long 87.09795	River Basin Green River
Investigators TANW, PLS, JSA, EMW	Agency Copperhead
Form Completed By Theresa Wetzel	Date 12 May 2011 Time 0836 C.S.T / Reason For Survey CWA Permit - Fish

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	10	Channel Alteration	15
Embeddedness or Pool Substrate Characterization	7	Frequency of Riffles or Bends or Channel Sinuosity	17
Velocity/Depth Regime or Pool Variability	8	Bank Stability (score each bank)	Left Bank 5 Right Bank 5
Sediment Deposition	12	Vegetative Protection (score each bank)	Left Bank 6 Right Bank 6
Channel Flow Status	15	Riparian Vegetative Zone Width (score each bank)	Left Bank 4 Right Bank 6

116

Stream Name RFS Bio	Location
Station # 4 RiverMile	Stream Class
Lat 37.25753 Long 87.09795	River Basin Green River
Investigators TAMW, PLS, JTA, EMW	Agency Copperhead
Form Completed By TAMW	Date 12 May 2011 Time
	Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	11	Channel Alteration	17
Embeddedness or Pool Substrate Characterization	9	Frequency of Riffles or Bends or Channel Sinuosity	15
Velocity/Depth Regime or Pool Variability	8	Bank Stability (score each bank)	Left Bank 8 Right Bank 8
Sediment Deposition	14	Vegetative Protection (score each bank)	Left Bank 8 Right Bank 8
Channel Flow Status	17	Riparian Vegetative Zone Width (score each bank)	Left Bank 7 Right Bank 8

138

Stream Name_____	Location_____
Station # RFS Bio 2 RiverMile_____	Stream Class_____
Lat 37.25829 Long 87.09803	River Basin Green River
Investigators_____	Agency Copperhead
Form Completed By EMW	Date 11/MAY/11 Time 1608 CTS — Reason For Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	8	Channel Alteration	12
Embeddedness or Pool Substrate Characterization	1	Frequency of Riffles or Bends or Channel Sinuosity	17
Velocity/Depth Regime or Pool Variability	5	Bank Stability (score each bank)	Left Bank 2 Right Bank 4
Sediment Deposition	10	Vegetative Protection (score each bank)	Left Bank 4 Right Bank 7
Channel Flow Status	15	Riparian Vegetative Zone Width (score each bank)	Left Bank 6 Right Bank 6

97

Stream Name RFS Bio	Location
Station # 5 RiverMile	Stream Class
Lat 37.25975 Long 87.09632	River Basin Green River
Investigators TANW, RLS, EMW, JJA	Agency Copperhead
Form Completed By TANW	Date 11 May 2011 Time 1632 C.D.T. Reason For Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	10	Channel Alteration	12
Embeddedness or Pool Substrate Characterization	3	Frequency of Riffles or Bends or Channel Sinuosity	14
Velocity/Depth Regime or Pool Variability	6	Bank Stability (score each bank)	Left Bank 5 Right Bank 5
Sediment Deposition	2	Vegetative Protection (score each bank)	Left Bank 5 Right Bank 5
Channel Flow Status	9	Riparian Vegetative Zone Width (score each bank)	Left Bank 8 Right Bank 6

90

Stream Name RFS Bio	Location
Station # 86B RiverMile	Stream Class
Lat 37.26699 Long 87.10122	River Basin Green River
Investigators TANW, PLS, EMW, JDA	Agency Copperhead
Form Completed By TANW	Date 11 May 2011 Time 1815 C.S.T / Reason For Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	1	Channel Alteration	1
Embeddedness or Pool Substrate Characterization	2	Frequency of Riffles or Bends or Channel Sinuosity	12
Velocity/Depth Regime or Pool Variability	3	Bank Stability (score each bank)	Left Bank 1 Right Bank 1
Sediment Deposition	10	Vegetative Protection (score each bank)	Left Bank 1 Right Bank 1
Channel Flow Status	12	Riparian Vegetative Zone Width (score each bank)	Left Bank 1 Right Bank 1

Stream Name_____	Location_____
Station #____RiverMile_____	Stream Class_____
Lat_____Long_____	River Basin_____
Investigators_____	Agency_____
Form Completed By	Date_____ Time_____ Reason For Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover		Channel Alteration	
Embeddedness or Pool Substrate Characterization		Frequency of Riffles or Bends or Channel Sinuosity	
Velocity/Depth Regime or Pool Variability		Bank Stability (score each bank)	Left Bank Right Bank
Sediment Deposition		Vegetative Protection (score each bank)	Left Bank Right Bank
Channel Flow Status		Riparian Vegetative Zone Width (score each bank)	Left Bank Right Bank

Stream Name _____	Location _____
Station # RFN Bio 1 RiverMile _____	Stream Class _____
Lat 37.28187 Long 87.07164	River Basin Green
Investigators TANW, PLS, EMW, JJA	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1200 CST / Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	8	Channel Alteration	2
Embeddedness or Pool Substrate Characterization	3	Frequency of Riffles or Bends or Channel Sinuosity	16
Velocity/Depth Regime or Pool Variability	12	Bank Stability (score each bank)	Left Bank 5 Right Bank 5
Sediment Deposition	2	Vegetative Protection (score each bank)	Left Bank 2 Right Bank 2
Channel Flow Status	7	Riparian Vegetative Zone Width (score each bank)	Left Bank 4 Right Bank 4

72

Stream Name RFN Bio	Location
Station # 2B RiverMile	Stream Class
Lat 37.28370 Long 87.08758	River Basin Green
Investigators TANW, JJA, PLS, EMW	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1350 E.S.T. Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	5	Channel Alteration	3
Embeddedness or Pool Substrate Characterization	8	Frequency of Riffles or Bends or Channel Sinuosity	10
Velocity/Depth Regime or Pool Variability	2	Bank Stability (score each bank)	Left Bank 8 Right Bank 8
Sediment Deposition	9	Vegetative Protection (score each bank)	Left Bank 7 Right Bank 7
Channel Flow Status	15	Riparian Vegetative Zone Width (score each bank)	Left Bank 8 Right Bank 7

97

Stream Name RFN Bio	Location
Station # 2 RiverMile	Stream Class
Lat 37.28377 Long 87.08772	River Basin Green
Investigators TANW, PLS, EMW, JSH	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1400 C.S.T. Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	3	Channel Alteration	2
Embeddedness or Pool Substrate Characterization	2	Frequency of Riffles or Bends or Channel Sinuosity	12
Velocity/Depth Regime or Pool Variability	9	Bank Stability (score each bank)	Left Bank 7 Right Bank 7
Sediment Deposition	5	Vegetative Protection (score each bank)	Left Bank 7 Right Bank 7
Channel Flow Status	14	Riparian Vegetative Zone Width (score each bank)	Left Bank 5 Right Bank 8

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Stream Name RFN Bio	Location
Station # 4 RiverMile	Stream Class
Lat 37.28427 Long 87.08735	River Basin Green
Investigators TANW, PLS, JDA, EMW	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1420 C.S.T. / Reason For Survey CWA-Permit Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	2	Channel Alteration	1
Embeddedness or Pool Substrate Characterization	1	Frequency of Riffles or Bends or Channel Sinuosity	1
Velocity/Depth Regime or Pool Variability	2	Bank Stability (score each bank)	Left Bank 5 Right Bank 5
Sediment Deposition	1	Vegetative Protection (score each bank)	Left Bank 1 Right Bank 1
Channel Flow Status	4	Riparian Vegetative Zone Width (score each bank)	Left Bank 1 Right Bank 1

Stream Name RFN Bio	Location
Station # 03 RiverMile	Stream Class
Lat 37.28159 Long 87.09155	River Basin Green
Investigators PLS; JJA	Agency Cumberland Consulting
Form Completed By JJA	Date 12-May-2011 Time 1517 / Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	12	Channel Alteration	12
Embeddedness or Pool Substrate Characterization	10	Frequency of Riffles or Bends or Channel Sinuosity	12
Velocity/Depth Regime or Pool Variability	13	Bank Stability (score each bank)	Left Bank 2 Right Bank 5
Sediment Deposition	14	Vegetative Protection (score each bank)	Left Bank 2 Right Bank 5
Channel Flow Status	15	Riparian Vegetative Zone Width (score each bank)	Left Bank 4 Right Bank 6

112

Stream Name RFN Bio	Location
Station # 7 RiverMile	Stream Class
Lat 37.28117 Long 87.09904	River Basin Green
Investigators PLS, TANW, EMW, JA	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1703 C.S.T. / Reason For Survey CWA Permit - Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	11	Channel Alteration	8
Embeddedness or Pool Substrate Characterization	2	Frequency of Riffles or Bends or Channel Sinuosity	2
Velocity/Depth Regime or Pool Variability	2	Bank Stability (score each bank)	Left Bank 3 Right Bank 3
Sediment Deposition	3	Vegetative Protection (score each bank)	Left Bank 7 Right Bank 7
Channel Flow Status	14	Riparian Vegetative Zone Width (score each bank)	Left Bank 4 Right Bank 4

70

Stream Name_____	Location_____
RN Bios Station #____RiverMile_____	Stream Class_____
Lat 37.28789 Long 87.07675	River Basin Green River
Investigators_____	Agency_____
Form Completed By	Date 12 May 11 Time 1400 CTS Reason For Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	12	Channel Alteration	15
Embeddedness or Pool Substrate Characterization	15	Frequency of Riffles or Bends or Channel Sinuosity	12
Velocity/Depth Regime or Pool Variability	8	Bank Stability (score each bank)	Left Bank 7 Right Bank 7
Sediment Deposition	14	Vegetative Protection (score each bank)	Left Bank 5 Right Bank 5
Channel Flow Status	17	Riparian Vegetative Zone Width (score each bank)	Left Bank 9 Right Bank 9

135

RFN

Stream Name Bio	Location
Station # 6 RiverMile	Stream Class
Lat 37.29317 Long 87.07911	River Basin Green
Investigators TANW, PLS	Agency Copperhead
Form Completed By TANW	Date 12 May 2011 Time 1615 C.S.T. / Reason For Survey CWA - Permit Fish Survey

Habitat Parameter	Score	Habitat Parameter	Score
Epifaunal Substrate/Available Cover	6	Channel Alteration	15
Embeddedness or Pool Substrate Characterization	10	Frequency of Riffles or Bends or Channel Sinuosity	5
Velocity/Depth Regime or Pool Variability	4	Bank Stability (score each bank)	Left Bank 6 Right Bank 6
Sediment Deposition	7	Vegetative Protection (score each bank)	Left Bank 6 Right Bank 6
Channel Flow Status	15	Riparian Vegetative Zone Width (score each bank)	Left Bank 4 Right Bank 5

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Appendix 3 Scanned Fish Survey Data Sheets.

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station BFS Bio 2	Riv Mile	Stream Class	
DS Lat: 37.25829	DS Lon 87.09803	River Basin	
US Lat 37.25885	US Lon 87.09797	Investigators	
Gear Backpack Shocker		Shock Time 250	
Form Completed by EMW		Date 11 May 11	Time 1608 CTS

Sample Collection	Capture Method	
	Block Nets Used?	
	Sampling Duration	
	Stream Width 1 M	Reach Length 100 M

Habitat Types	**% Habitat Types**		
	Riffle 30%	Pools 0%	Runs 70%

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. macrochirus	2						D	E	F	L	M	S	T	Z
Tally														
II														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

COPPERHEAD
ENVIRONMENTAL CONSULTING

* Stream is very shallow; only captured fish in very downstream portion.

Turb: 4.32
Temp: 24.75
Sp Cond: 582
pH: 7.26
DO: 7.12
TDS: 372.83

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Pin 5	Riv Mile	Stream Class	
DS Lat: 37.25975	DS Lon 87.09632	River Basin Green River	
US Lat 37.26051	US Lon 87.09567	Investigators TANW, PLS, JJA, EMW	
Gear Backpack Shocker		Shock Time 223	
Form Completed by TANW		Date 11 May 2011	Time 1632 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 223	
	Stream Width .5 meters	Reach Length

Habitat Types	**% Habitat Types**				
	Riffle 40%	Pools 10%	Runs 50%		

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														
Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														
Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														
Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														
Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														
Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 5.26
Temp: 21.02
Sp Cond: 726
pH: 7.46
DO: 8.14
TDS: 464.62

COPPERHEAD
ENVIRONMENTAL CONSULTING

Orange staining present in water and on substrate.

Section of stream towards upstream section impassable, so ~60 ft of reach not surveyed.

JJA camera: 1075-1078

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Bio A3	Riv Mile	Stream Class	
~~DS~~ Lat: 37.26042	~~DS~~ Lon 87.09751	River Basin Green River	
~~US Lat~~	~~US Lon~~	Investigators TANW, RLS, JJA, EMW	
~~Gear~~		Shock Time Not shockable	
Form Completed by TANW		Date 11 May 2011	Time 1715 C.S.T

Sample Collection	Capture Method —	
	Block Nets Used? —	
	Sampling Duration —	
	Stream Width —	Reach Length —

Habitat Types	**% Habitat Types**		
	Riffle	Pools	Runs

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb:
Temp:
Sp Cond:
pH:
DO:
TDS:

COPPERHEAD
ENVIRONMENTAL CONSULTING

JJA Camera:

1079

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Bio 6A	Riv Mile	Stream Class	
~~DS~~ Lat: 37.26415	~~DS~~ Lon 87.09833	River Basin Green River	
~~US Lat~~	~~US Lon~~	Investigators TANW, PLS, EMW, JJA	
~~Gear~~		Shock Time Not Shockable	
Form Completed by TANW		Date 11 May 2011	Time 1744 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration —	
	Stream Width —	Reach Length —

Habitat Types	**% Habitat Types**		
	Riffle	Pools	Runs

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb:
Temp:
Sp Cond:
pH:
DO:
TDS:

COPPERHEAD
ENVIRONMENTAL CONSULTING

JJA Camera:
1080 - 1082

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Bio U6B	Riv Mile	Stream Class	
DS Lat: 37.26699	DS Lon 87.10122	River Basin Green River	
US Lat 37.26714	US Lon 87.10117	Investigators TAN/W, RLS, JJA, EMW	
Gear ~~Backpack Shocker~~		Shock Time 231	
Form Completed by TANW		Date 11 May 2011	Time 1806 C.S.T

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 231	
	Stream Width .75 meters	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 30%	Pools 0%	Runs 70%

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 3.58
Temp: 22.19
Sp Cond: 468
pH: 6.95
DO: 5.7
TDS: 299.77

COPPERHEAD
ENVIRONMENTAL CONSULTING

JJA Camera:

1083 - 1086

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Bin 1	Riv Mile	Stream Class	
DS Lat: 37.25752	DS Lon 87.09795	River Basin Green River	
US Lat 37.25831	US Lon 87.09846	Investigators TANW, JTA, FMW, PLS	
Gear Backpack Shocker		Shock Time 376s	
Form Completed by Theresa Wetzel		Date 12 May 2011	Time 0830 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 376	
	Stream Width 1 meter	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 30%	Pools 5%	Runs 65%

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. macrochirus	1						D	E	F	L	M	S	T	Z
Tally														
1														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 4.15
Temp: 22.35
Sp Cond: 588
pH: 7.47
DO: 7.45
TDS: 377.13

COPPERHEAD
ENVIRONMENTAL CONSULTING

TANW's camera:

0232-0237

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFS Bio 4	Riv Mile –	Stream Class	
DS Lat: 37.25753	DS Lon 87.09795	River Basin Green River	
US Lat 37.25806	US Lon 87.09756	Investigators TANW, PLS, EMW, JTA	
Gear Backpack Shocker		Shock Time 159s	
Form Completed by TANW		Date 12 May 2011	Time 0907

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 159	
	Stream Width 0.25 m	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 40%	Pools –	Runs 60%

Species	Total	Voucher	Length (Optional)				Anomalies*							
M. punctulatus	1	1					D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. gulosus	2						D	E	F	L	M	S	T	Z
Tally														
II														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 3.54
Temp: 21.22°C
Sp Cond: 497
pH: 7.39
DO: 7.77
TDS: 318.60

COPPERHEAD
ENVIRONMENTAL CONSULTING

pictures: 0238 - 0242 : TW

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station R-FN Bio 1	Riv Mile	Stream Class	
DS Lat: 37.28187	DS Lon 87.07164	River Basin GREEN	
US Lat 37.28322	US Lon 87.07225	Investigators PLS; JJA; TW; EW	
Gear Backpack Shocker		Shock Time 828	
Form Completed by PLS		Date 12-May-2011	Time 1200

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 828	
	Stream Width 1.5 meter	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 70%	Pools 5%	Runs 25%

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. macrochirus	3						D	E	F	L	M	S	T	Z
Tally										1				
III														

Species	Total	Voucher	Length (Optional)				Anomalies*							
G. affinis	2						D	E	F	L	M	S	T	Z
Tally														
II														
Picture taken 1099-1103														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 8.26
Temp: 27.55
Sp Cond: 1800
pH: 7.72
DO: 9.95
TDS: 1151.19

COPPERHEAD
ENVIRONMENTAL CONSULTING

Runs through a blown out earthen dam.

JJA Camera:
1088-1098

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 2	Riv Mile	Stream Class	
DS Lat: 37.28377	DS Lon 87.08772	River Basin Green	
US Lat 37.28399	US Lon 87.08759	Investigators TANW, JTA, EMW, PLS	
Gear Backpack Shocker		Shock Time 343	
Form Completed by TANW		Date 12 May 2011	Time 1400 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 343	
	Stream Width .5 meter	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 45%	Pools 10%	Runs 45%

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

COPPERHEAD
ENVIRONMENTAL CONSULTING

Stream very orange in coloration.

Turb: 15.36
Temp: 27.22
Sp Cond: 2533
pH: 7.54
DO: 6.96
TDS: 1621.45

JTA Camera: 1106-1108

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 2B	Riv Mile	Stream Class	
DS Lat: 37.28370	DS Lon 87.08758	River Basin Green	
US Lat 37.28378	US Lon 87.08752	Investigators TANW, EMW, JJA, PLS	
Gear Backpack shocker, dipnet		Shock Time 204	
Form Completed by TANW		Date 12 May 2011	Time 1350 C.S.T.

Sample Collection	Capture Method Backpack shocker, dipnet	
	Block Nets Used? No	
	Sampling Duration 204	
	Stream Width 1 meter	Reach Length

Habitat Types	**% Habitat Types**				
	Riffle 30	Pools 0%	Runs 70		

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. macrochirus	2						D	E	F	L	M	S	T	Z
Tally														
II														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

COPPERHEAD
ENVIRONMENTAL CONSULTING

25 dipnet sweeps in addition to shocking.

Turb: 8.34
Temp: 25.05
Sp Cond: 2457
pH: 7.74
DO: 7.25
TDS: 1573.08

JJA Camera: 1104-1105

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RN B10S	Riv Mile	Stream Class	
DS Lat: 37.28788	DS Lon 87.07675	River Basin Green	
US Lat 37.28796	US Lon 87.07695	Investigators EMW, JJA	
Gear net		Shock Time	
Form Completed by EMW		Date 12 May 11	Time 1400 CT5

Sample Collection	Capture Method	
	Block Nets Used?	
	Sampling Duration 24 dipnets	
	Stream Width 1/4 M	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 30%	Pools 10%	Runs 60%

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 3.46
Temp: 23.03
Sp Cond: 3291
pH: 7.12
DO: 5.34
TDS: 2106.52

COPPERHEAD ENVIRONMENTAL CONSULTING

very low flow, surveyed reach most water w/ dip net

JJA Camera: 1112 - 1113

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 4	Riv Mile	Stream Class	
DS Lat: 37.28427	DS Lon 87.08735	River Basin Green	
US Lat 37.28455	US Lon 87.08744	Investigators TANW, PLS, EMW, JTA	
Gear Backpack Shocker		Shock Time 175	
Form Completed by TANW		Date 12 May 2011	Time 1418 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 175	
	Stream Width 1 meter	Reach Length

Habitat Types	**% Habitat Types** Riffle 0%	Pools 0%	Runs 100%		

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
L. macrochirus	1										
Tally											
1											

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
M. salmoides	1										
Tally				1							
1				No tongue							

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
Tally											

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
Tally											

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
Tally											

Species	Total	Voucher	Length (Optional)	Anomalies*							
				D	E	F	L	M	S	T	Z
Tally											

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

orange ditch

Turb: 13.31
Temp: 30.01
Sp Cond: 2343
pH: 6.95
DO: 1.32
TDS: 1514.5

COPPERHEAD
ENVIRONMENTAL CONSULTING

JJA camera: 1109

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 03	Riv Mile	Stream Class	
DS Lat: 37.28159	DS Lon 87.09155	River Basin Green River	
US Lat 37.28170	US Lon 87.09184	Investigators PLS; JJA	
Gear Backpack electrofisher		Shock Time 721	
Form Completed by PLS		Date 12-May-2011	Time 1517

Sample Collection	Capture Method Backpack electrofisher	
	Block Nets Used? No	
	Sampling Duration 1.5 m	
	Stream Width 1.5m	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 5	Pools 30	Runs 65

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. cyanellus	13						D	E	F	L	M	S	T	Z
Tally														
~~IIII~~ ~~IIII~~ III														

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. macrochirus							D	E	F	L	M	S	T	Z
Tally														
~~IIII~~ ~~IIII~~														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 3.76
Temp: 28.78°C
Sp Cond: 825
pH: 7.51
DO: 8.52
TDS: 528.01

COPPERHEAD ENVIRONMENTAL CONSULTING

Short stretch draining from large pond

Downstream point is where stream ceases to be wadable

Photos 1110-1111 - JJA

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 10	Riv Mile	Stream Class	
DS Lat: 37.29317	DS Lon 87.07911	River Basin Green	
US Lat 37.29358	US Lon 87.07980	Investigators TANW, PLS	
Gear Backpack Shocker		Shock Time 307	
Form Completed by TANW		Date 12 May 2011	Time 1610 C.S.T.

Sample Collection	Capture Method Backpack shocker	
	Block Nets Used? No	
	Sampling Duration 307	
	Stream Width 1 m	Reach Length

Habitat Types	**% Habitat Types**				
	Riffle 10%	Pools 0%	Runs 90%		

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. cyanellus	2						D	E	F	L	M	S	T	Z
Tally														
II														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 5.82
Temp: 23.24
Sp Cond: 1051
pH: 7.64
DO: 7.36
TDS: 672.06

COPPERHEAD
ENVIRONMENTAL CONSULTING

JJA Camera: 1114-1115

Copperhead Consulting Fish Sampling Datasheet 2011

Stream Name		Location	
Station RFN Bio 7	Riv Mile	Stream Class	
DS Lat: 37.28117	DS Lon 87.09904	River Basin Green	
US Lat 37.28104	US Lon 87.09933	Investigators TANW, JJA, EMW, PLS	
Gear Backpack Shocker		Shock Time 286	
Form Completed by TANW		Date 12 May 2011	Time 1705 C.S.T.

Sample Collection	Capture Method Backpack Shocker	
	Block Nets Used? No	
	Sampling Duration 286	
	Stream Width 1.5 meters	Reach Length

Habitat Types	**% Habitat Types**		
	Riffle 5%	Pools 10%	Runs 85%

Species	Total	Voucher	Length (Optional)				Anomalies*							
L. Cyanellus	21						D	E	F	L	M	S	T	Z
Tally														
~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ I														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

Species	Total	Voucher	Length (Optional)				Anomalies*							
							D	E	F	L	M	S	T	Z
Tally														

*Anomalies: D=deformities; E=eroded fins; F=fungus; L=lesions; M=multiple DELT anom; S=emaciated; Z=other

Turb: 6.72
Temp: 22.5
Sp Cond: 254
pH: 7.49
DO: 7.55
TDS: 162.79

COPPERHEAD
ENVIRONMENTAL CONSULTING

Most fish came out of one pool. A lot of silt. Stream drains into a wetland area.

JJA Camera: 1119-1120

MITIGATION

Introduction: The purpose of this document is to develop compensatory mitigation for impacts to streams and wetlands involved with operation of the RFA1 Mine.

Impact Site Description: This site is situated in the 12-Digit watershed 051100030404, the Plum Creek – Pond Creek Watershed.

Hydrology: This site is located near the top of the watershed with hydrology inputs limited to precipitation and surface runoff. Water exits the site through an unnamed tributary of Pond Creek to Pond Creek, a tributary of the Green River. All of the surface runoff from the areas disturbed by mining operations would pass through sediment ponds before entering unnamed tributaries of Pond Creek.

Climate: Climate in the Illinois Basin South as of 2003 at 400'ASL: 45" rain, 14" snow, mean annual temperature is 55.6^{o}F, Average daily extreme temperature is 87.3 ^{o}F and 22 ^{o}F.

Offsite Mitigation Description: N/A.

Overview: Wetland and stream mitigation will be conducted on-site, in and out-of-kind.

Watershed Approach: Considerations are addressed as mitigation will occur on-site in the same 12-digit watershed as the impact.

Aquatic Resource Functions: Functions considered in this mitigation include water quality, sediment transport, and nutrient cycling.

Hydrology: Hydrology into the site is a combination of precipitation and surface runoff. Groundwater hydrology will drive intermittent stream and wetland conditions.

Timing and Surety: Mitigation will begin with reclamation. Wetland and stream construction and planting will occur at this time. Temporal loss, or the offset thereof, and the likelihood of success have been considered according to the mitigation ratios in Tables 3 and 3A.

Jurisdictional Area: This section documents the specific quantity of "Waters of the U.S." existing on site based on the final jurisdictional determination.

Wetland Classification: See JD Report for full wetland descriptions.

Table 1: Existing Wetlands

Wetland Class	Acreage
PUBG	0
PFO	6.5
PEM	5.7
PSS	3.2
Isolated	0
Total	15.4

Stream Classification: See JD Report for full stream descriptions.

Table 1A: Existing Streams	
Rosgen Channel Type	Linear Feet
A	298
B	8,610
C	767
Da	132
E	105
F	0
G	2,457
Total	12,369

Intermittent Streams: Develop as inflow from both surface and subsurface discharge. Low gradient reaches likely cycle nutrients via anaerobic reduction in the hyporheaic zone. Some high gradient reaches likely lend to energy dissipation as these reaches are on steep side slopes. The riparian zones consist of overstory, herbaceous, and shrub species.

Ephemeral Streams: Develop as sheet flow drains on reclaimed sideslopes. Defined headwater drains begin downslope on rounded and dissected uplands with moderate slopes. These drains continue as ephemeral streams until reaching intersecting intermittent streams or becoming influenced by groundwater infiltration.

Open Water Descriptions: See JD Report for full stream descriptions.

Table 1B: Existing Open Waters	
Open Water Type	Acreage
Pond	0.7
Lake	1.8
Impound	0
Basin	0
Isolated	0
Total	2.5

Mitigation Objectives and Approach: The purpose of this section is to depict avoidance, minimization, and mitigation for the loss of wetlands and streams. Extensive core sampling, engineering, and reconnaissance have been conducted to develop a concise mining operations plan, and pinpoint an exact area of disturbance. It is during the actual recovery process that final operations and impacts are carried out. Old underground works, instability, deviations in seam and overburden ratios, and markets are examples of uncontrollable factors that guide the final mining operation. Table 2 illustrates projected avoidance, minimization, and impact acreages.

Table 2: Disturbance Projections				
Wetlands	**Acres**	**Avoidance**	**Minimization**	**Impact**
TOTAL	**15.4**	**0**	**1.1**	**14.3***
			PFO	**5.64**
			PSS	**3.18**
			PEM	**1.36**
			Phragmites PEM	**4.08**
Streams	**Stream Length**	**Avoidance**	**Minimization**	**Impact**
TOTAL	**12,369**	**491**	**1,244**	**10,634**
			Intermittent	**6,243**
			Ephemeral	**4,391**
Open Waters	**Acres**	**Avoidance**	**Minimization**	**Impact**
TOTAL	**2.5**	**0**	**0**	**2.5**

***Rounded to the nearest tenth acre**

Mitigation Compensation and Ratios: The following tables show the ratios of the mitigation design.

Table 3: Wetland Mitigation Ratio

The overall wetland mitigation ratio is 1.8:1. PFO is being mitigated at a ratio of 3:1 and all others at 1:1 as all mitigation will be established as PFO which is considered an ecological lift.

14.3-acres of wetland impact are proposed for this permit. Table 2 itemizes the impacts by acre/type.

25.4-acres of PFO will be developed on-site in the valley below mitigation streams S1 and S2.

Table 3A: Stream Mitigation Ratios

10,634-linear feet of stream impact are proposed.

Flow Regime	Linear Feet Impacted	ACOE Mitigation Ratios	Mitigation in Linear Feet
Intermittent	6,243	1:1	6,243
Ephemeral	4,391	0.5:1	2,196
		Total	8,439

8,439-linear feet of Priority 1 stream mitigation are proposed. Channels will have appropriate geomorphology and flow through PFO wetland; Bank erosion will be Very Low or Low; The channel will have no more than one impact less than 30' long per 0.5-mile; and the channel will be stable.

All mitigation will occur during the reclamation process.

Following resource recovery, the applicant will make a final assessment of any additional avoidance/minimization/mitigation conducted during mining. The applicant will then recompute the actual impacts, and propose to ACOE to mitigate these impacts according to the ratios in Table 3.

Contingency Plan: If other success criteria are not met for all or any portion of the compensatory mitigation project in any year, and/or if the success criteria are not satisfied, the permittee will prepare an analysis of the cause(s) of failure and propose remedial action for pre-approval. Ecologically this site is completely suited for establishment of the proposed mitigation. Should problems arise, the applicant will report to ACOE and based on available information, revise the mitigation plan to facilitate successful conditions.

Release from Monitoring: When the applicant has met the approved success criteria, a request for release will be submitted with the final monitoring report. This request will include formal wetland delineation. The release request will also include a survey description of the mitigation footprint and a boundary survey with meets and bounds. When ACOE approves release of the site, monitoring is no longer required.

Deed Protections and Recording Timeline: A Restrictive Covenant will be implemented on the on-site stream and wetland mitigation. The instrument will be executed immediately upon receiving written confirmation from ACOE that the site has met mitigation standards of success and no further actions are required.

Long-Term Ownership and Management: Landowners will continue to own their respective land after mitigation.

Stream and Wetland Mitigation Specifics, Monitoring, and Success Criteria: These items are located in the specifically titled sections.

MATERIAL HANDLING AND RECLAMATION

Introduction: Successful mitigation of aquatic ecosystems is critical in preserving the coal industry's image of good land stewardship and the ultimate continuation of regulatory mine permitting. The transfer of mitigation information and requirements from engineering to operations, specifically coal production, has historically proven to be a significant impasse. This section details the step-wise process of handling material during mining to ensure exact reconstruction of mitigation stream valleys and wetland basins. Discussed are the stock-piling and redistribution of soils, rock, logs, and other materials essential in mitigation, as well as the identification and disposal of objectionable materials. Low pH and high conductivity are the main reasons for the failure of legitimate attempts at mitigation.

Timing: Beginning with the first scoop, consideration must be given to the end product. It may be necessary for a dedicated surveyor to oversee the backhaul process to ensure proper shale grades are met and to inventory mitigation materials. Control points such as roads and culverts bear considerable weight on stream valley elevations and slopes. Mitigation, versus reclamation, requires that more materials be stockpiled in separate locations, and space can become limited. Since most larger surface mines include a series of panels or a progressional pit, becoming spoil bound should only occur during the initial cut. Afterwards, materials can go directly to the final destination.

Soils: The most important first step in successful mitigation/reclamation is to rebuild the surface with a material conducive to high fertility and low conductivity. Topsoil is ideal, and none should be intentionally buried. Previously mined sites are often limited to best available material. In this case, it is appropriate to mix remaining surface materials with a pre-identified layer of suitable geology in order to produce enough usable material to rebuild the mitigation surface. All unconsolidated soil horizons should be excavated and stockpiled separately, and not mixed with other rock, spoil, or objectionable material. Materials should be moved in the following order:

Wetland Soils: In meeting regulatory requirements, all wetlands >1-acre have been identified on the Materials map. At a minimum, the upper 12" of these soils must be specifically used in rebuilding mitigation wetlands.

A-Horizon: This horizon is excavated first and stockpiled in low windrows along the perimeter of the mining operation. Maintaining smaller stacks preserves biologic integrity.

B and C-Horizons: These materials are moved second and can be stacked deep.

Best Available Material: When reclaiming areas with limited soils, it is necessary to identify a best available material. B and C-horizons and certain neutralization shales, though considered relatively infertile, are far better than spoil. The weight of consideration should be given to limiting the amount of conductivity the material will produce as runoff.

Toxic Spoil and Objectionable Material: All toxic spoil and any material contaminated with Phragmites or other non-target vegetation is excavated separately and buried in the pit. Generally, the material immediately above and below coal seams are the most toxic. Locations with Phragmites have been depicted on the Materials map. This step is critical to give mitigation streams and wetlands the greatest opportunity to reestablish native vegetation in clean substrates, and is a key catalyst in achieving mitigation success.

Valley Construction: Mitigation should only occur after reclamation; again because high conductivity water leaching off haul roads and coal piles will cause chemical and biological failure.

Valley locations, sizes, and slopes are detailed in the Stream Plan; slopes cannot exceed 3%, or be less than 0.5%, except in limited E-channel designs. It is necessary to construct a valley wide enough to accommodate the Wfpa. This emulates an alluvial valley that naturally developed over geologic time. The lower gradients in alluvial valleys facilitate groundwater infiltration that drives intermittent flows. The valley also provides a corridor for the stream to meander and a flat location for overbank flooding and wetlands.

After a mitigation valley is reconstructed and vegetated it should sit for a year, or at least through a winter, to allow for differential settling. Vegetation and soil structure will reduce the amount of sediment passing through the system. During early establishment the stream valley will have no defined channel and be similar to a large waterway. For this reason, the valley should be flat laterally to limit concentrated flow and gullies, and temporary diversions should be maintained to limit the amount of water coming down valley. Stream construction should only occur in a stable watershed.

Once streams are constructed and surface flows fully diverted to the mitigation streams, diversion ditches must be filled and graded to match the adjoining landscape.

Redistribution: All ACOE mitigation surfaces must be reconstructed with the best A-horizon materials. B-horizon placement under the A-horizon shall be 4-6' deep. These materials are placed to grade and ripped. The purpose is to maintain these streams perched on the surface without water being lost to ground through spoil. Prior to soil placement, the surface of the shale grade should be tracked and made impermeable to prevent water from being lost to deep ground. It is intended that water naturally infiltrate the A and B-horizons, encounter an impermeable layer, move laterally, and reemerge as clean cool ground water similar to a natural water table.

Rock and Coarse Woody Debris: These materials are necessary for use as in-stream structures when building mitigation streams. If disposed of during mining these materials are quite costly and logistically difficult to reacquire. Therefore, they are stockpiled during mining in convenient locations for later use. Coarse woody debris consists of full size hardwood trees with limbs and tops removed, and large preferably flat root wads with 8'-12' stumps. Rock consists of flat slabs or square boulders of a size that can be handled with a 20-30 ton excavator. A given seam of limestone may yield enough consistently shaped and sized material to supply the entire mitigation. An initial tally of the required materials is located in the Stream Plan. A running inventory should be maintained to ensure an ample supply is available without becoming excessive.

Indiana Bat (Myotis sodalis): Wintering sites for this species are primarily limited to cavernous limestone regions of the eastern U.S., although some use of abandoned mine shafts have been observed. Regardless, all this permit area is within the range of summer roost trees. The species tends to roost beneath exfoliating bark and other structures of hardwood trees. The permit area is currently thought to contain hardwood trees that could be used as potential roosting sites. These bat species tend to forage near riparian habitat, therefore the likelihood of roosts tends to be proportional to the proximity to such habitat. While the forested drainage ways and its tributaries are not currently considered as ideal habitat, the potential for roosts may exist. However, this site is not currently considered particularly unique, so the presence of roosts on this permit is not considered to be more likely than for any similar habitat.

To reduce the impact on potential Indiana Bat population and habitat, certain protection and enhancement measures will be taken. Avoidance of known or potential habitat will be the primary measure to reduce adverse impacts to the Indiana bat and its habitat. Although there is no evidence of caves or history of underground mining within the permit boundary, increased awareness and observation will reduce the possibility of encountering a potential cavernous area

accidentally. Wetlands, streams, and specific tree species conducive to the Indiana bat do exist. In areas that are unable to be avoided, minimization of the disturbed area will be of utmost importance. Due to the existence of tree species that provide Indiana bat habitat, clearing will be completed between October 1st and March 31st. In addition, if possible, tree removal will occur in stages so large areas of removal at any one time are avoided.

Areas that are disturbed by mining operations will be replaced during the reclamation and mitigation process to reestablish the bat habitat. Streams will be constructed with riparian zones which included tree plantings with species that are known to provide habitat for the Indiana bat. Wetland areas will also be reestablished to provide habitat and an important water source.

Reclamation: Heavy equipment operation must be completed under suitable field conditions. Excavation during excessively wet or dry conditions reduces the quality of the end product and increases the risk of failure and accidents. In extreme circumstances, such as record wet or dry growing seasons, reclamation may have to be postponed until the following year. Operating in ecologically sensitive areas, such as tying into avoidance areas, requires strict attention to detail in manipulating undisturbed soils or vegetation. Well trained personnel will be onsite during all phases of construction to ensure restoration objectives are met with minimum disturbance.

Surface Roughening: This approach is effective at incorporating soil amendments and reducing compaction, surface runoff, and erosion. Bog discs or chisels should be operated across the slope to create ridges that serve as water bars. This approach is also effective at promoting surface wetland hydrology as required by ACOE. Surface roughening promotes ponding and creates many small depressions intermixed with large clods. Clods block wind and sun to reduce evaporation. Clods also provide 360^0 aspect to promote plant diversity as required by ACOE. Surface roughening is a good weed control technique between tree rows as it enhances hydrology while target herbaceous species recover rapidly.

Mitigation Planting: This is the most expensive and failure-prone step in restoration. Site-specific conditions of topography and hydroperiod guide the final planting and management process. When drilling seed it will likely be necessary to develop a good firm seedbed in-lieu of surface roughening. Surface roughening may be used when broadcasting only certain seed. Roughening can be applied as necessary after the target vegetation is established. All plant materials will be maintained in proper conditions such as refrigeration, stratification, dormant, wet or dry as appropriate until planted. Planting will occur during optimum field conditions and in a manner suitable for establishment of the specific propagule type. Planting specifics are outlined in greater detail in both the Stream and Wetland Plans.

STREAM PLAN

Goal: To construct a natural stream channel that can develop free-form, self-sustaining conditions. This approach to stream restoration is based on the best and most current Rosgen-based scientific methods. This program was developed specific to stream restoration in the Illinois Basin. Regionally specific criteria include regional curve data, reference design parameters, and trial and error.

Reference: This process is derived from a scientific approach to natural channel design. All design parameters are based on optimum reference conditions throughout the region. Channel sizing is based on the watershed area of the stream. Channel area is derived from regional curve data and sized for a 1-year return interval. Channel area is applied to a specific width/depth ratio. All other design parameters are set by dimensionless ratio to either width bankfull (Wbkf) or depth bankfull (Dbkf).

Entrenchment (the downward cutting of the streambed) is the #1 detriment to healthy streams, and the #1 cause of mitigation failure. With a channel sized for a 1-year flood event, excess flood waters spill onto the floodplain to relieve channel stress. It is not the sustained trickle, but rather the 1-year flows that ultimately form the channel.

Engineers Note: Channel sizing for SMCRA purposes is generally based on a return interval of 25-years. The channel volume illustrated in the attached drawings is sized for a storm with a 1-year return interval. The flood prone area (Wfpa) is now the area that contains the SMCRA required 25-year event.

Instructions: Stream construction should only occur in a watershed that has undergone one-year of differential settling, is well vegetated, and otherwise stable.

Survey and Design: With a well established valley, a survey must be conducted. This survey should include full cross-sections and a longitudinal profile of the valley. Points must be taken at intervals sufficient to ensure an accuracy range of ±0.1-foot. This information will be used to generate a site specific design.

Layout and Construction: GPS will be used for the channel layout and construction. The basic channel will have a set size (width and depth) that increases as the stream moves down valley. Sinuosity will increase as slope decreases. The base channel should be excavated to specifications. Excavation should be a precise cut with minimal peripheral disturbance; do not over dig. Careful consideration should be given when tying into offsite and avoidance areas. Only dig a section of channel long enough that it can be completed in a reasonable time frame. In the absence of flowing water, begin at the top. Wet channels are usually best built from the bottom up, and will require upstream plugs and pumping.

Riffle Sections: Riffles are the straight, sloping sections of a trapezoidal channel where flowing water has a broken surface. Riffles serve as the main function of grade control. Therefore, these features must be resistant to scouring during high velocity flows which is key to preventing head cuts. The design and installation of riffle structures varies with slope:

E-channel (0-1.3% slope): Riffle structures consist of the appropriate sized rock (gravel, cobble, etc.) as determined by shear-stress and velocity calculations. Refer to the Output Summary and drawings for profile and cross-section illustrations, and appropriate material sizing. Riffle rock will be placed in the stream during a later step.

B-channel (1.3-3% slope): Riffle structures consist of a log(s) keyed across the channel. Refer to the Output Summary and drawings for profile and cross-section illustrations, and appropriate material sizing. Riffle rock will be placed in the stream during a later step.

Pool Construction: Pools occur in the curved sections of a stream, and are ~2X deeper than the riffles. The main purpose of pools is energy dissipation. The bank slope of an outside bend is ~2:1. The face of the outside bend serves to turn high-velocity flowing waters, and is subject to erosion. The slope of the inside bend is ~6:1 and is an area of sediment deposition. These two slopes come to a single low point in the bottom of the pool.

Glides and Runs: These sections make the transition between riffles and pools. They gradually change the shape of the channel from a shallow trapezoidal riffle to a deeper triangular pool, and then back up to a trapezoidal riffle.

Vane Arms and Rootwad Revetments: Log vanes are installed in the Run sections. These vanes dissipate energy and redirect water into the center of the channel. Rootwad revetments are installed in the glide sections where they deflect water off the outside bend and toward the head of the next riffle. Refer to In-Stream Structures.

Excess Material: A berm should be shaped to prevent overland sheet flow from entering the stream in the vicinity of any outside bend. After sufficient backfilling around structures, excess material shall be graded out evenly across the floodplain without affecting the streams access to the floodplain.

Seed and Fertilize: Apply lime, fertilizer, and seed to exposed stream banks. Refer to the Herbaceous Species table below for species and rates.

Erosion Control and Rock Placement: Skipping this step will guarantee failure. Refer to Output Summary for appropriate erosion blanket and rock sizing. These materials are sized according to the streams shear stress and velocity. It is the corner of the riffles along the toe of the stream bank that are most susceptible to erosion. The following process double-protects these areas:

Blankets: The lower edge of the blanket should extend out onto the bottom of the raw channel 0.5' beyond the toe of the bank. The upper edge of the blanket will extend up the side slope towards the top of bank. Standard blanket size is 7.5', while the side slopes on very large channels are more than 7.5'. As such, blanket won't always extend to the top of bank. Again, the toe of the slope is most vulnerable and must be covered. Un-blanketed strips along the top of bank are of little consequence. Blankets should be overlapped downstream similar to shingles, and pinned on intervals $\geq$ 1-yd^2.

Riffle Rock: With blankets installed, rock can be placed. The Output Summary details the depth of rock placement. Rock should be placed to create a slightly concave channel bottom, with the rock a bit deeper along the toe of the banks.

Live Stakes: Install live stakes along riffles, runs, glides, and outside bends. Inside bends are depositional areas and require no live stakes or erosion control. Refer to the Live Stake table below for species and more specific patterning.

Riparian Buffers: When final stream construction is complete the riparian area should be seeded. Apply amendments, prepare a good seedbed, and seed according to the Herbaceous Species table below. Tree planting should only occur after the stream has established good

bank vegetation and is stabilized for at least one growing season. Stream maintenance activities will damage riparian trees if planted too early.

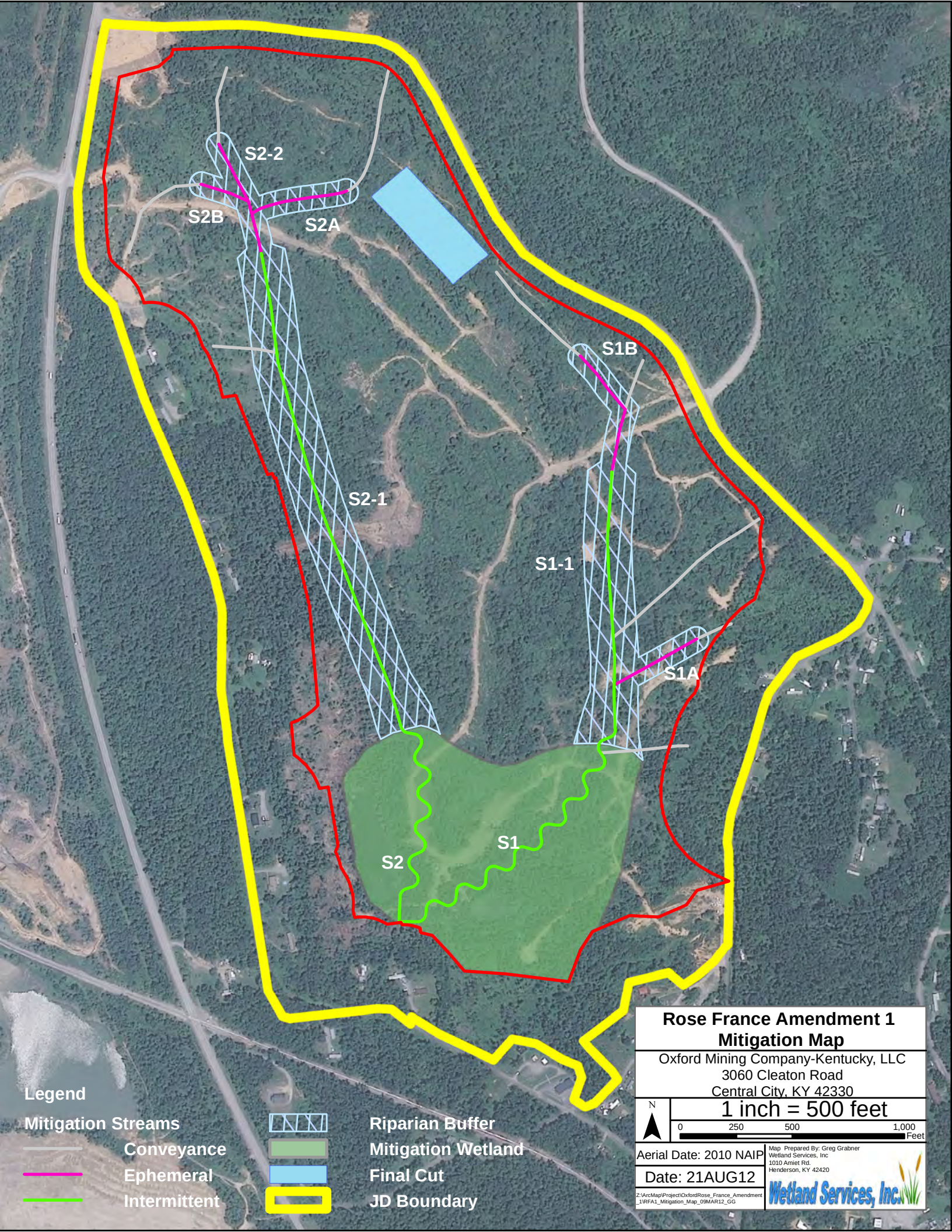
Vegetated Buffers: Either in the form of Riparian buffers or PFO wetland, linear forested features will be established adjacent to all mitigation streams. The widths vary according to flow regime: 50-ft for ephemeral and 100-ft for intermittent and perennial. These measurements are the minimum required widths off each bank. In other words, these are the minimum distances measured from the outside bend of a stream to the nearest adjacent landuse. Several factors will determine which tree type will be used: Tree availability, DNR requirements specific to PMLU planting densities, and site conditions. If bare root seedlings (BRS) are used they will be planted at 450/acre. If #3 RPMs are used they will be planted at 60/acre. See the table below for a list of tree species to be planted as riparian buffer.

Monitoring Stations: Continual headcut monitoring is essential. A single headcut can unravel a new stream in one storm event. Establish monitoring stations according to criteria set forth in the section titled As-built Conditions, Monitoring, Maintenance, and Success.

Tree Species: Riparian and PFO			
Species	**Common Name**	**Strata**	**Indicator**
Carya glabra	Pignut Hickory	T	FACU
C. laciniosa	Shellbark Hickory	T	FAC
C. Ovata	Shagbark hickory	T	FACU
C. Illinoensis	Pecan	T	FACU
Quercus alba	White Oak	T	FACU
Q. lyrata	Overcup Oak	T	OBL
Q. flacata	Southern Red Oak	T	FACU
Q. imbricaria	Shingle Oak	T	FAC
Q. muhlenbergii	Chinkapin Oak	T	NI
Q. rubra	Northern Red Oak	T	FACU
Q. shumardii	Shumardi Oak	T	FAC
Q. bicolor	Swamp White Oak	T	FACW
Q. michauxii	Swamp Chestnut Oak	T	FACW
Q. pagoda	Cherrybark Oak	T	FACW
Q. macrocarpa	Bur Oak	T	FAC
Q. palustris	Pin Oak	T	FACW
Taxodium distichum	Bald Cypress	T	OBL
- Bare root tree seedlings must be at least 30” tall at planting. - RPM tree saplings must be size #3. - 6 species minimum will be planted to ensure diversity. - Species are planted according to their tolerance to water depth. For example, OBL species are planted in wetter areas than FACU species.			

Herbaceous Species: PFO Understory, Alluvial Valley, and Stream Banks				
Genus and/or Species	**Common Name**	**Propagule/Rate**	**Strata**	**Indicator**
Acorus calamus	Sweet Flag	R 125/ac	H	OBL
Agrostic spp	Bent Grass	S 6oz/ac	H	FACW
Alisma subcordatum	Water Plantain	BRP 50/ac	H	OBL
Alopercurus spp.	Foxtail	S 6oz/ac	H	FACW
Arundinaria Gigantea	Giant Cane	R 50/ac	S	FAC
Asclepias spp.	Milkweed	R 50/ac	H	OBL
Carex spp.	Sedge	S 1-12oz/ac	H	FACW-OBL
Cinna latifolia	Wood Reed	S 1-12oz/ac	H	FACW
Commelina spp.	Dayflower	R 50/ac	H	FACW
Cyperus spp.	Flat Sedge	S 1-13oz/ac	H	FACW-OBL
Echinochloa spp.	Indian Millett	S 3lb/ac	H	FACW
Eleocharis spp.	Spike Rush	S 1/2-2oz/ac	H	OBL
Elymus spp.	Wild Rye	S 2lb/ac	H	FAC-FACW

Glyceria striata	Fowl Manna Grass	S 4oz/ac	H	OBL
Hottonia Inflata	Featherfoil	Any available	H	OBL
Iris spp.	Water Iris	R 125/ac	H	OBL
Juncus spp.	Rush	S 4oz/ac	H	FACW-OBL
Leersia spp.	Cutgrass	S 1lb/ac	H	OBL
Lemna spp.	Duck Weed	BRP 2bu/ac	H	OBL
Nelumbo lutea	American Lotus	T 125/ac	H	OBL
Nuphar spp.	Pond Lilly	R 125/ac	H	OBL
Nymphaea spp.	Water Lilly	T 125/ac	H	OBL
Panicum spp.	Deer Tongue Grass	S 6oz/ac	H	FAC
Peltandra spp.	Arrow Arum	T 125/ac	H	OBL
Polyganum spp.	Smart Weed	R,S 125,5lb/ac	H	FACW-OBL
Pontederia cordata	Pickerel Plant	BRP 125/ac	H	OBL
Potamogeton spp.	Pondweed	T 125/ac	H	OBL
Sagittaria spp.	Arrow Head	T 125/ac	H	OBL
Scirpus spp.	Bull Rush	S 4oz/ac	H	FACW-OBL
Sparganium spp.	Burreed	S 8oz/ac	H	OBL
Tripsacum dactyloides	East. Gamma Grass	S 4lb/ac	H	FACW
- No less than 8 of the above listed Genus and/or Species will be planted. - Species are planted according to their tolerance to water depth. For example, Milkweed and Dayflower were planted in shallower water from 3” to saturated soil, while Lotus and Lilly will be planted in deeper water up to 18”.				
Live Stakes: Stream Banks				
Genus and/or Species	**Common Name**	**Propagule/Rate**	**Strata**	**Indicator**
Acer spp.	Maple	LS 1/3ft^2	T/S	FAC-FACW
Alnus sp.	Alder	LS 1/3ft^2	T/S	FAC-FACW
Cornus sp.	Dogwood	LS 1/3ft^2	T/S	FAC-FACW
Platanus occidentalis	Sycamore	LS 1/3ft^2	T/S	FACW
Populus deltoides	Cottonwood	LS 1/3ft^2	T/S	FAC
Salix spp.	Willow	LS 1/3ft^2	S	OBL
- Live stake use is limited to bioengineering in developing stream bank stability. The planting zone generally extends from the toe of bank to 5-ft beyond the top of bank, not across the riparian area. Stakes along riffles, runs, glides, and outside bends are generally oriented in staggered rows with clusters around any structures.				


S2-2
S2B
S2A
S1B
S2-1
S1-1
S1A
S1
S2
Legend
Mitigation Streams
Conveyance
Ephemeral
Intermittent
Riparian Buffer
Mitigation Wetland
Final Cut
JD Boundary
Rose France Amendment 1
Mitigation Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0 250 500 1,000 Feet
Aerial Date: 2010 NAIP
Date: 21AUG12
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\RFA1_Mitigation_Map_09MAR12_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.

STREAM DATA

	S1	S1–1	S1A	S1B
Channel Type	E	B	B	B
Watershed	88.4 Acres	54.7 Acres	11.0 Acres	10.3 Acres
Slope	0.40%	4.00%	5.96%	6.96%
Channel Length	1712.1 ft	1440.8 ft	421.1 ft	311.3 ft
Ephemeral	0.0 ft	284.4 ft	421.1 ft	313.3 ft
Intermittent	1712.1 ft	1156.4 ft	0.0 ft	0.0 ft
Beltwidth	73.3 ft	14.4 ft	8.9 ft	8.7 ft

	S2	S2–1	S2–2	S2A	S2B
Channel Type	E	B	B	B	B
Watershed	97.0 Acres	93.3 Acres	37.3 Acres	16.8 Acres	9.7 Acres
Slope	0.40%	2.96%	2.96%	2.92%	3.63%
Channel Length	1174.4 ft	2454.7 ft	287.0 ft	438.8 ft	225.1 ft
Ephemeral	0.0 ft	240.1 ft	287.0 ft	438.8 ft	225.1 ft
Intermittent	1174.4 ft	2214.6 ft	0.0 ft	0.0 ft	0.0 ft
Beltwidth	75.0 ft	15.2 ft	8.6 ft	9.9 ft	8.6 ft

Proposed Mitigation Stream Lengths

Total	8465.3 lf
Ephemeral	2209.8 lf
Intermittent	6257.5 lf

Stream Mitigation Requirements

Total	8439.0 lf
Ephemeral	2196.0 lf
Intermittent	6243.0 lf

Site-specific Input		
Watershed area =	88.4	acres
Valley Slope =	0.004	ft/ft

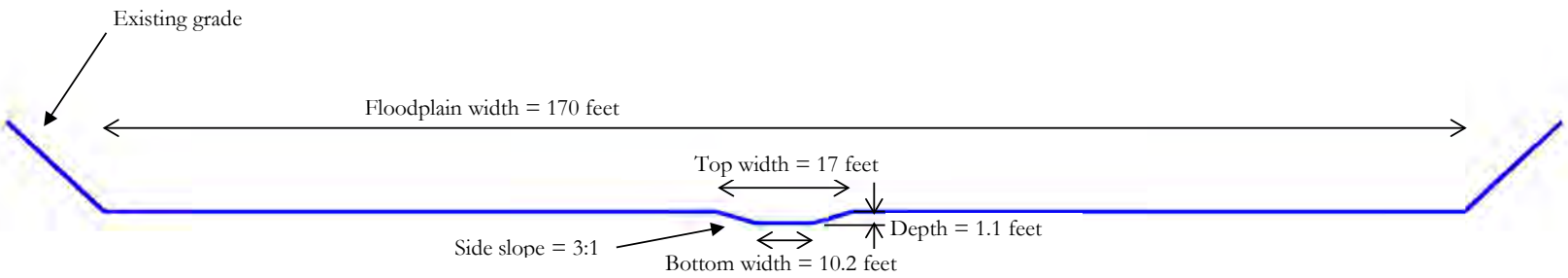
Universal Input		
Width/Depth ratio =	15	
Manning's n =	0.035	
Channel side slope =	3	:1
Floodplain width ratio =	10	
Pool depth ratio =	2	
Point bar slope =	5	:1
Sinuosity =	1.3	
Meander length ratio =	9	

Calculations		
Channel average depth (D) =	1.0	ft
Channel top width - riffle (W_{riffle}) =	17.0	ft
Channel cross-sectional area (A) =	15.5	ft^2
Channel depth - riffle (D_{riffle}) =	1.1	ft
Channel depth - Head of Riffle =	1.0	ft
Channel Depth - Toe of Riffle =	1.2	ft
Channel bottom width (W_{bot}) =	10.2	ft
Wetted perimeter (P) =	17.4	ft
Hydraulic radius (R_h) =	0.89	ft
Floodplain width (W_{fp}) =	170	ft
Channel slope (S_{ave}) =	0.0031	ft/ft
Riffle Slope =	0.0059	ft/ft
Riffle Slope Ratio =	1.93	
Drop per Riffle =	0.20	
Average velocity =	2.2	ft/sec
Average shear stress =	0.19	lbs/ft^2
Radius of curvature =	34.9	ft
Radius of Curvature Ratio =	2.05	
Meander length (L_m) =	153.2	ft
Beltwidth (W_{blt}) =	73.3	ft
Riffle length (L_{riffle}) =	34.0	ft
Run length (L_{run}) =	15.7	ft
Pool length (L_{pool}) =	34.0	ft
Glide length (L_{glide}) =	15.7	ft
Run depth (D_{run}) =	1.6	ft
Glide depth (D_{glide}) =	1.4	ft
Pool width (W_{pool}) =	15.9	ft
Pool depth (D_{pool}) =	2.3	ft

Flood Prone Area Inputs		
Lt. Flood Prone Area Width (Wpfa) =	76.61	ft
Rt. Flood Prone Area Width (Wpfa) =	76.61	ft
Upland Slope =	0.05	ft/ft
Left Flood Prone Area Slope =	0.0000	ft/ft
Right Flood Prone Area Slope =	0.0000	ft/ft

Output Summary		
Drawing M-1: Riffle Cross-section - Meandering Channel		
W_{fp} =	170	ft
W_{riffle} =	17.0	ft
W_{bot} =	10.2	ft
D_{riffle} =	1.1	ft
Side Slope =	3	:1
Drawing M-2: Pool Cross-section - Meandering Channel		
W_{fp} =	170	ft
W_{pool} =	15.9	ft
W_{bot} =	0.1	ft
D_{pool} =	2.3	ft
Outside Slope =	2	:1
Inside Slope =	5	:1
Drawing M-3: Longitudinal Profile - Meandering Channel		
L_{riffle} =	34	ft
L_{run} =	16	ft
L_{pool} =	34	ft
L_{glide} =	16	ft
D_{riffle} =	1.1	ft
D_{run} =	1.6	ft
D_{pool} =	2.3	ft
D_{glide} =	1.4	ft
Drawing M-4: Plan View - Meandering Channel		
L_m =	153	ft
W_{blt} =	73	ft
W_{fp} =	170	ft
Riffle Material		
Riffle particle size =	2	in
Substrate depth =	0.3	ft
Riffle length =	34	ft
Riffle width =	10.2	ft
Volume required (per riffle) =	3.8	cu yds
Erosion Blanket Specifications		
Average shear stress =	0.19	lbs/ft^2
Average velocity =	2.2	ft/sec

RFA1: S1

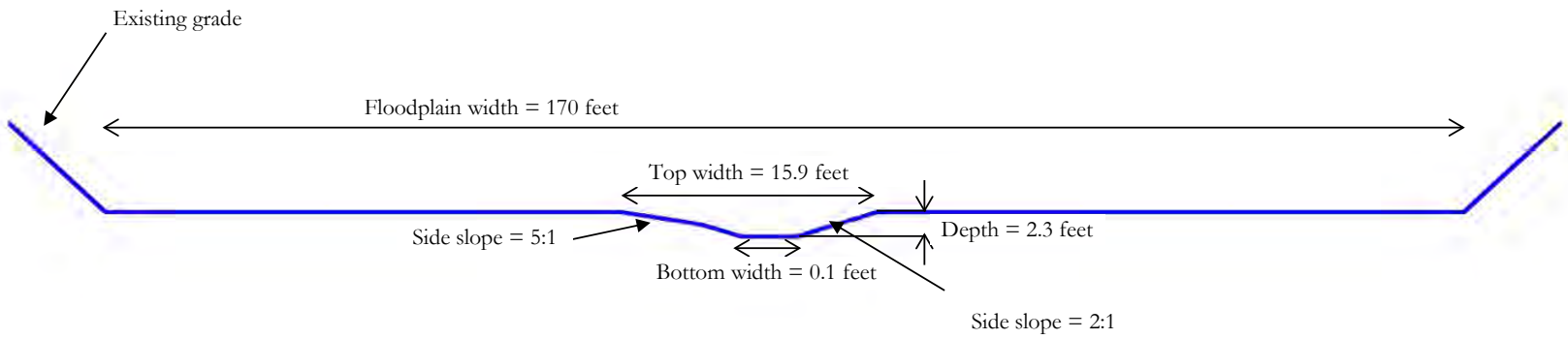


Notes:
1) All measurements are in feet.
2) Cross-section dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) Floodplain width can be greater than designated number.
4) Channel will not always be located in center of floodplain - refer to plan view for channel location.
5) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing M-1
Riffle Cross-Section - Meandering Channel
S1, Central City, Kentucky

DATE 25JUN12
PROJECT NO. RFA1
FILENAME S1
SHEET NO.
DRAWING NO.

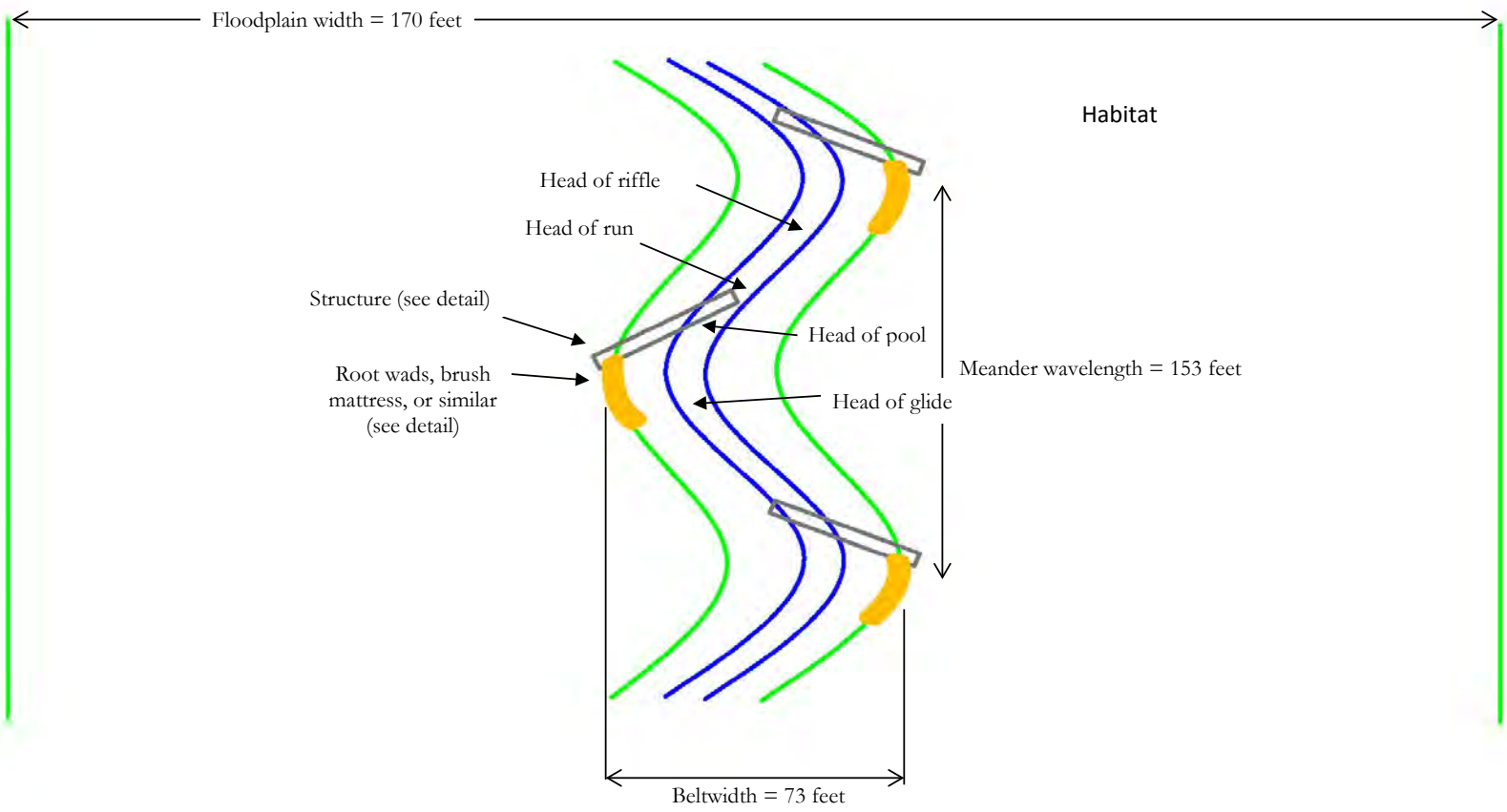


Notes:
1) All measurements are in feet.
2) Cross-section dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) Above dimensions apply to the cross-section through the pool at the outside of each meandering bend.
4) Floodplain width can be greater than designated number.
5) Channel will not always be located in center of floodplain - refer to plan view for channel location.
6) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing M-2
Pool Cross-Section - Meandering Channel
S1, Central City, Kentucky

DATE: 25JUN12
PROJECT NO.: RFA1
FILENAME: S1
SHEET NO.:
DRAWING NO.:

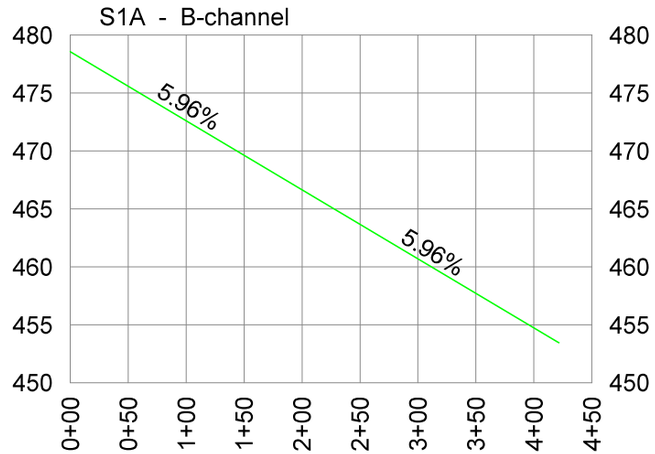


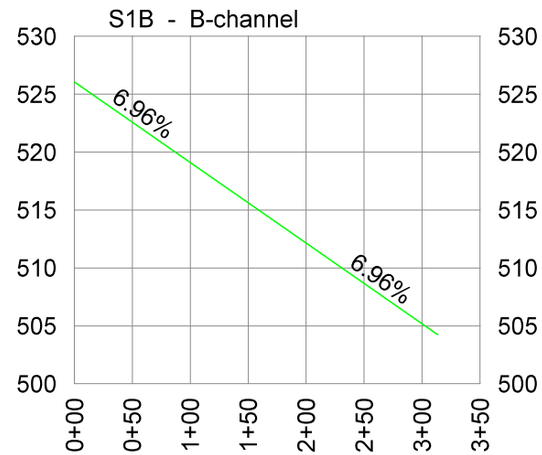
Notes:
1) All measurements are in feet.
2) Dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) For lengths and depths of riffle, run, pool, glide; refer to'Output Summary'.
4) Refer to Drawings M-1 and M-2, respectively, for dimensions of riffle and pool cross-sections.
5) Beltwidth and meander wavelength are measured with respect to the outside of meander bends.
6) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

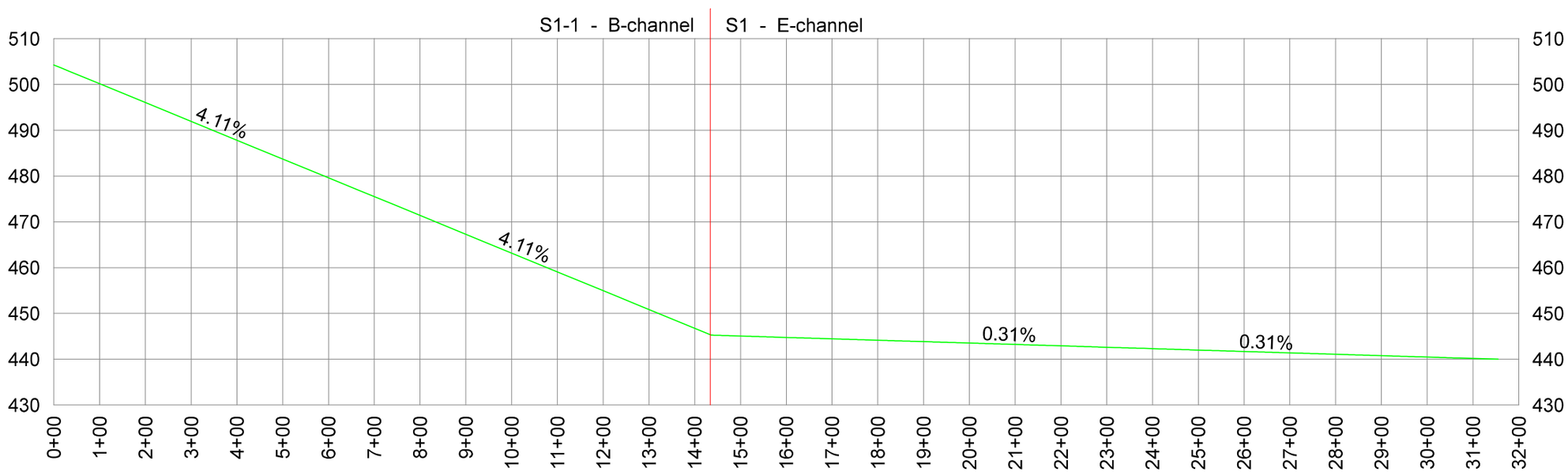
Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing M-4
Plan View - Meandering Channel
S1, Central City, Kentucky

DATE 25JUN12
PROJECT NO. RFA1
FILENAME S1
SHEET NO.
DRAWING NO.


S1A - B-channel
480
475
470
465
460
455
450
5.96%
5.96%
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50
4+00
4+50


S1B - B-channel
530
525
520
515
510
505
500
6.96%
6.96%
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50


S1-1 - B-channel
S1 - E-channel
510
500
490
480
470
460
450
440
430
4.11%
4.11%
0.31%
0.31%
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00

Site-specific Input		
Watershed area =	54.7	acres
Valley slope =	0.04	ft/ft

Universal Input		
Width/Depth ratio =	15	
Manning's n =	0.035	
Channel side slope (riffle) =	3	:1
Channel side slope (pool) =	2	:1
Floodplain width ratio =	10	
Pool depth ratio =	2	
Sinuosity =	1.1	
Step height (H_{step}) =	0.33	ft

Calculations		
Channel average depth (D) =	0.9	ft
Channel top width - riffle (W_{riffle}) =	13.4	ft
Channel top width - pool (W_{pool}) =	13.4	ft
Channel cross-sectional area (A) =	12.0	ft^2
Channel depth - riffle (D_{riffle}) =	1.2	ft
Channel bottom width - riffle (W_{bot}) =	6.0	ft
Channel bottom width - pool (W_{bot}) =	3.5	ft
Wetted perimeter (P) =	12.3	ft
Hydraulic radius (R_h) =	0.98	ft
Floodplain width (W_{fp}) =	134	ft
Average velocity =	8.0	ft/sec
Channel slope (S_{ave}) =	0.0364	ft/ft
Average shear stress =	2.21	lbs/ft^2
Meander length (L_m) =	40	ft
Beltwidth (W_{blt}) =	23	ft
Step length (L_{step}) =	18	ft
Riffle length (L_{riffle}) =	9	ft
Pool length (L_{pool}) =	9	ft
Pool depth (D_{pool}) =	2.5	ft

Output Summary

Drawing SP-1: Riffle Cross-section - Step-Pool Channel		
W_{fp} =	134	ft
W_{riffle} =	13.4	ft
W_{bot} =	6.0	ft
D_{riffle} =	1.2	ft
M =	3	:1

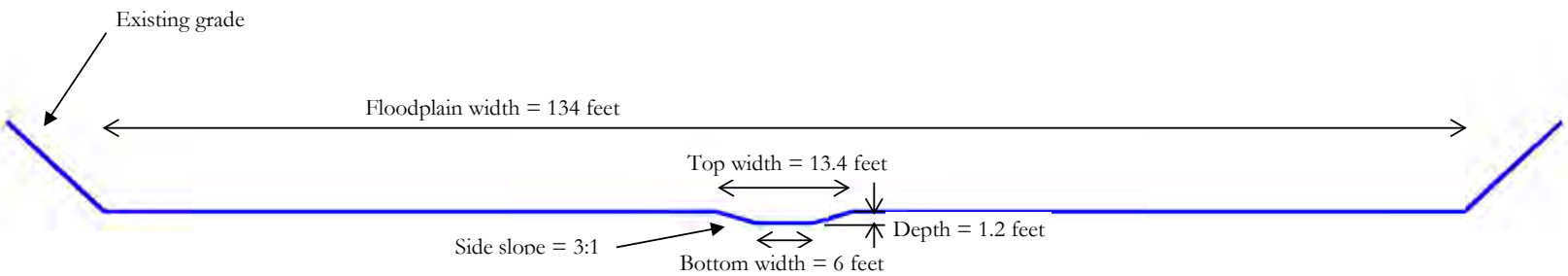
Drawing SP-2: Pool Cross-section - Step-Pool Channel		
W_{fp} =	134	ft
W_{pool} =	13.4	ft
W_{bot} =	6.0	ft
D_{pool} =	2.5	ft
M =	3	:1

Sediment Transport		
Immobile particle size =	11	in

Drawing SP-3: Longitudinal Profile - Step-Pool Channel		
H_{step} =	0.33	ft
D_{pool} =	2.5	ft
L_{pool} =	9	ft
D_{riffle} =	1.2	ft
L_{riffle} =	9	ft

Drawing SP-4: Plan View - Step-Pool Channel		
W_{fp} =	134	ft
W_{riffle} =	13.4	ft
W_{pool} =	13.4	ft
W_{bot} =	6.0	ft
L_{riffle} =	9	ft
L_{pool} =	9	ft

Erosion Blanket Specifications		
Average shear stress =	2.21	lbs/ft^2
Average velocity =	8.0	ft/sec

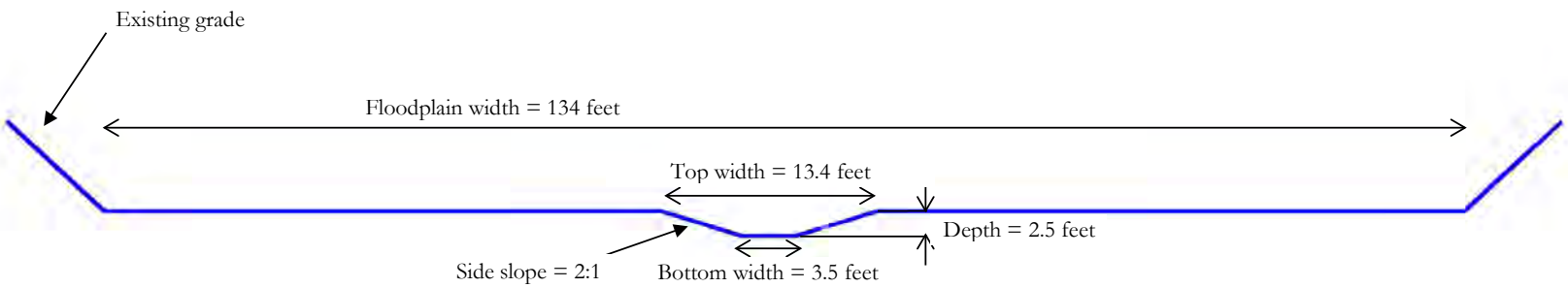


Notes:
1) All measurements are in feet.
2) Cross-section dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) Floodplain width can be greater than designated number.
4) Channel does not have to be located in center of floodplain.
5) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing SP-1
Riffle Cross-Section - Step-Pool Channel
S1-1, Central City, Kentucky

DATE 25JUN12
PROJECT NO. RFA1
FILENAME S1-1
SHEET NO.
DRAWING NO.

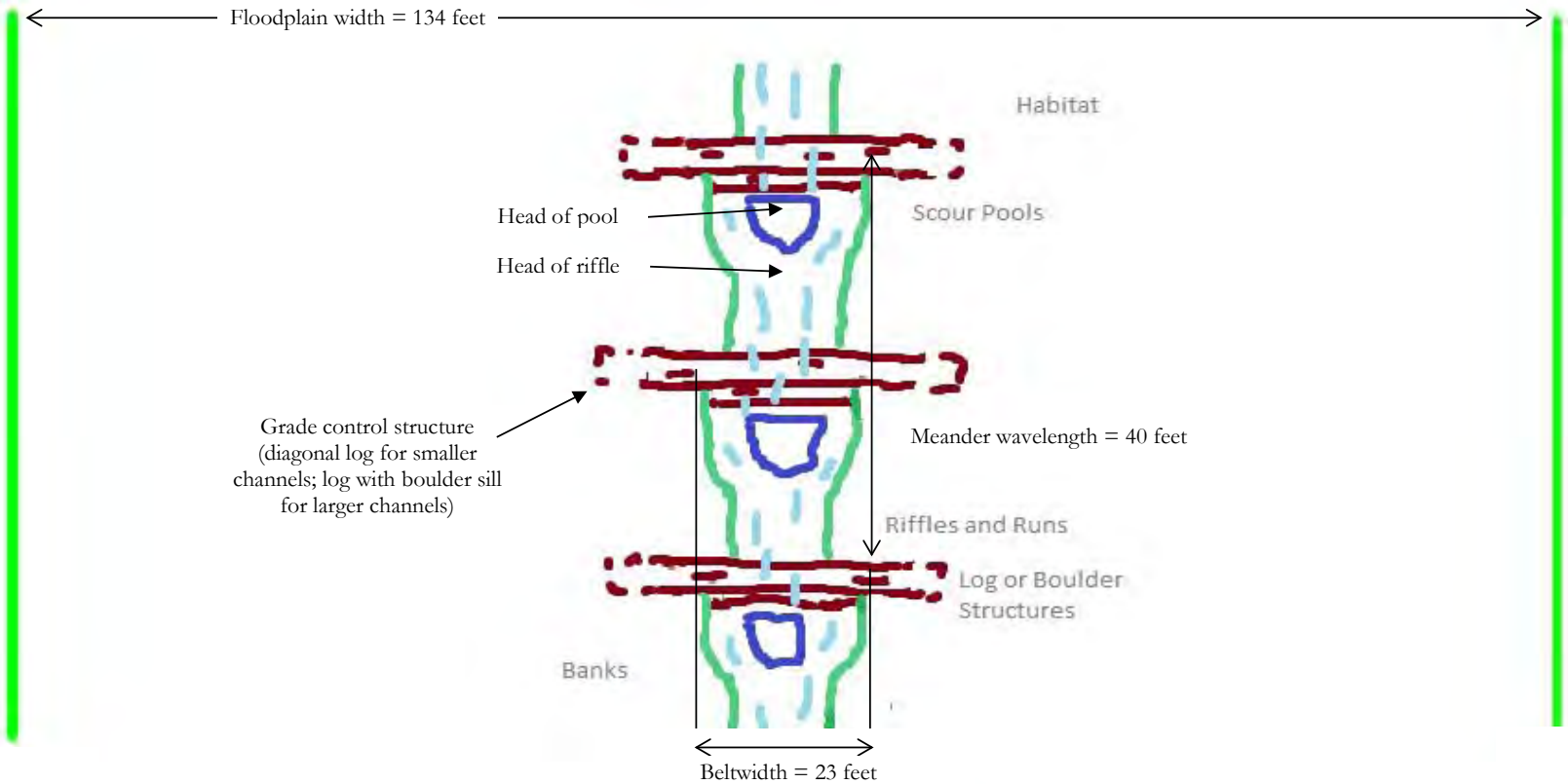


Notes:
1) All measurements are in feet.
2) Cross-section dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) Above dimensions apply to the cross-section through the deepest part of the pool.
4) Floodplain width can be greater than designated number.
5) Channel does not have to be located in center of floodplain.
6) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing SP-2
Pool Cross-Section - Step-Pool Channel
S1-1, Central City, Kentucky

DATE: 25JUN12
PROJECT NO. RFA1
FILENAME: S1-1
SHEET NO.
DRAWING NO.

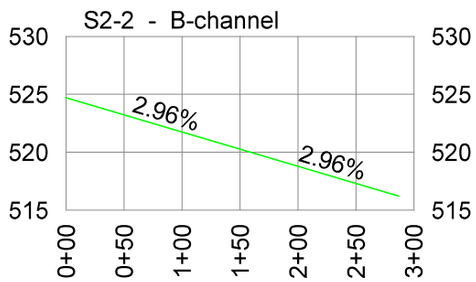


Notes:
1) All measurements are in feet.
2) Dimensions correspond to those listed in 'Output Summary' portion of channel sizing spreadsheet.
3) Refer to Drawings SP-1 and SP-2, respectively, for dimensions of riffle and pool cross-sections.
4) Beltwidth and meander wavelength are measured with respect to the outside of meander bends.
5) Grade control structures should be designed based on channel size and available material.
6) Grade control structures shall be immobile and anchored in a manner that prevents sidecutting.
7) This drawing is intended for informational pruposes only, and is not intended for construction until reveiwed by a qualified individual with specific knowledge of the project site.

Wetland Services, Inc.
3880 Trigg-Turner Road
Corydon, KY 42406

Drawing SP-4
Plan View - Step-Pool Channel
S1-1, Central City, Kentucky

DATE	25JUN12
PROJECT NO.	RFA1
FILENAME	S1-1
SHEET NO.	
DRAWING NO.	


S2-2 - B-channel
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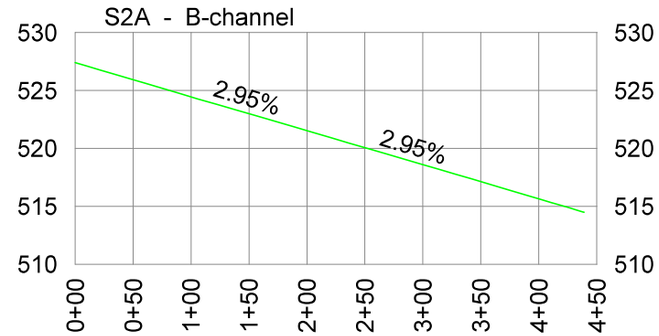
525
520
515
2.96%
2.96%
0+00
0+50
1+00
1+50
2+00
2+50
3+00


S2A - B-channel
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520
515
510
2.95%
2.95%
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0+50
1+00
1+50
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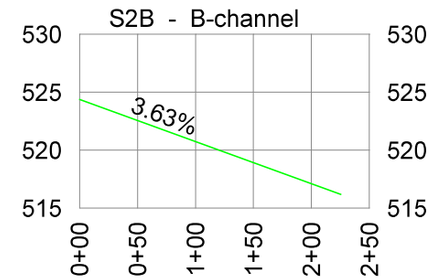
3+00
3+50
4+00
4+50


S2B - B-channel
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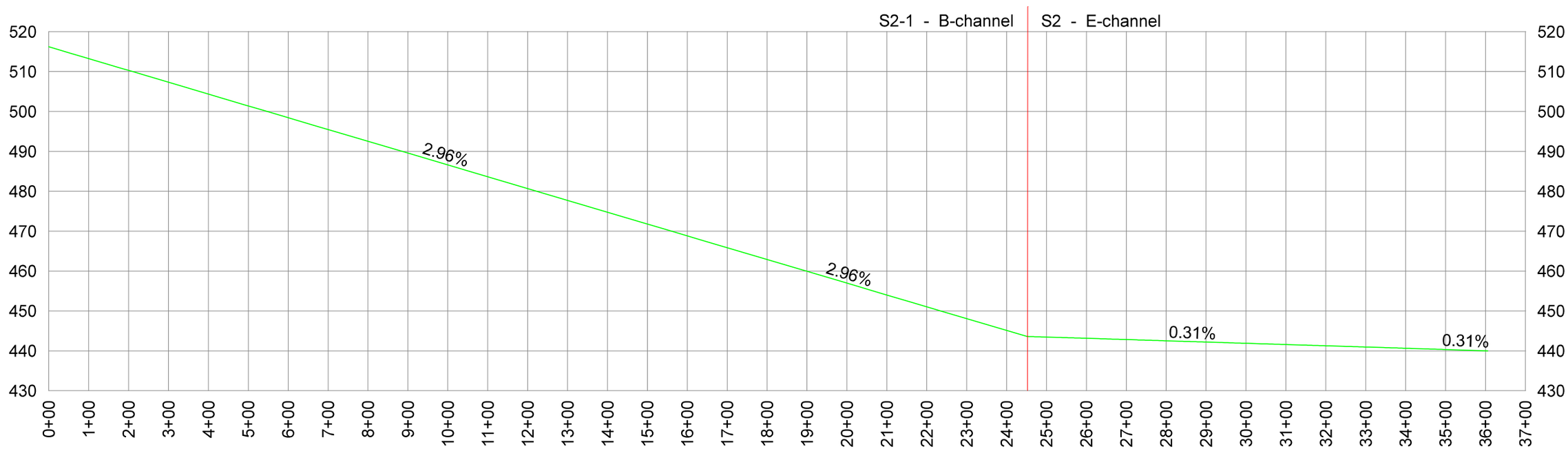
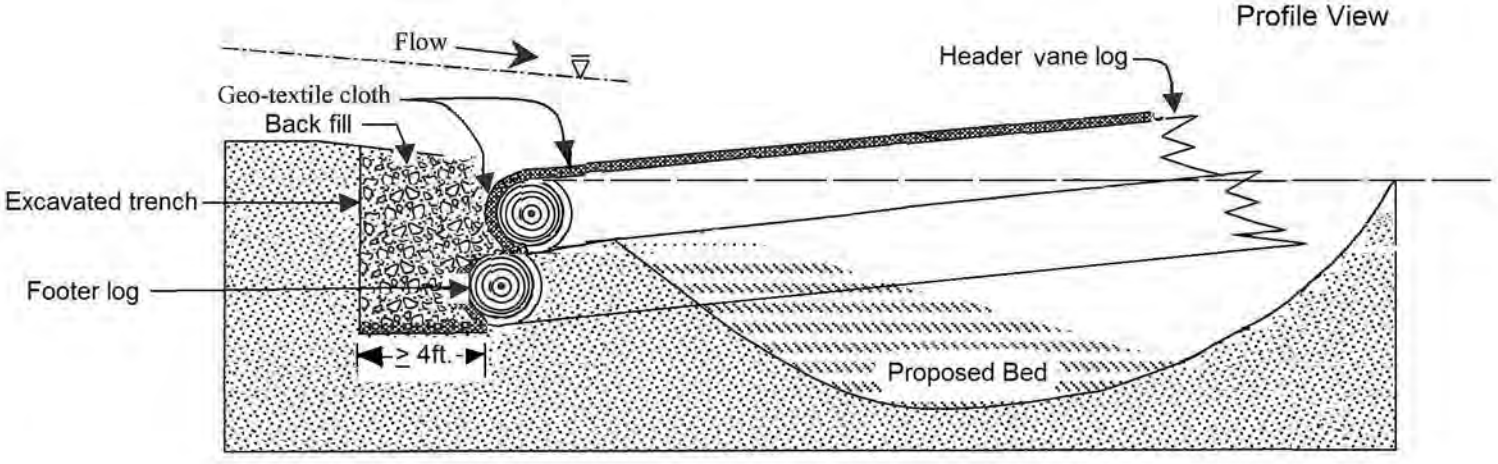
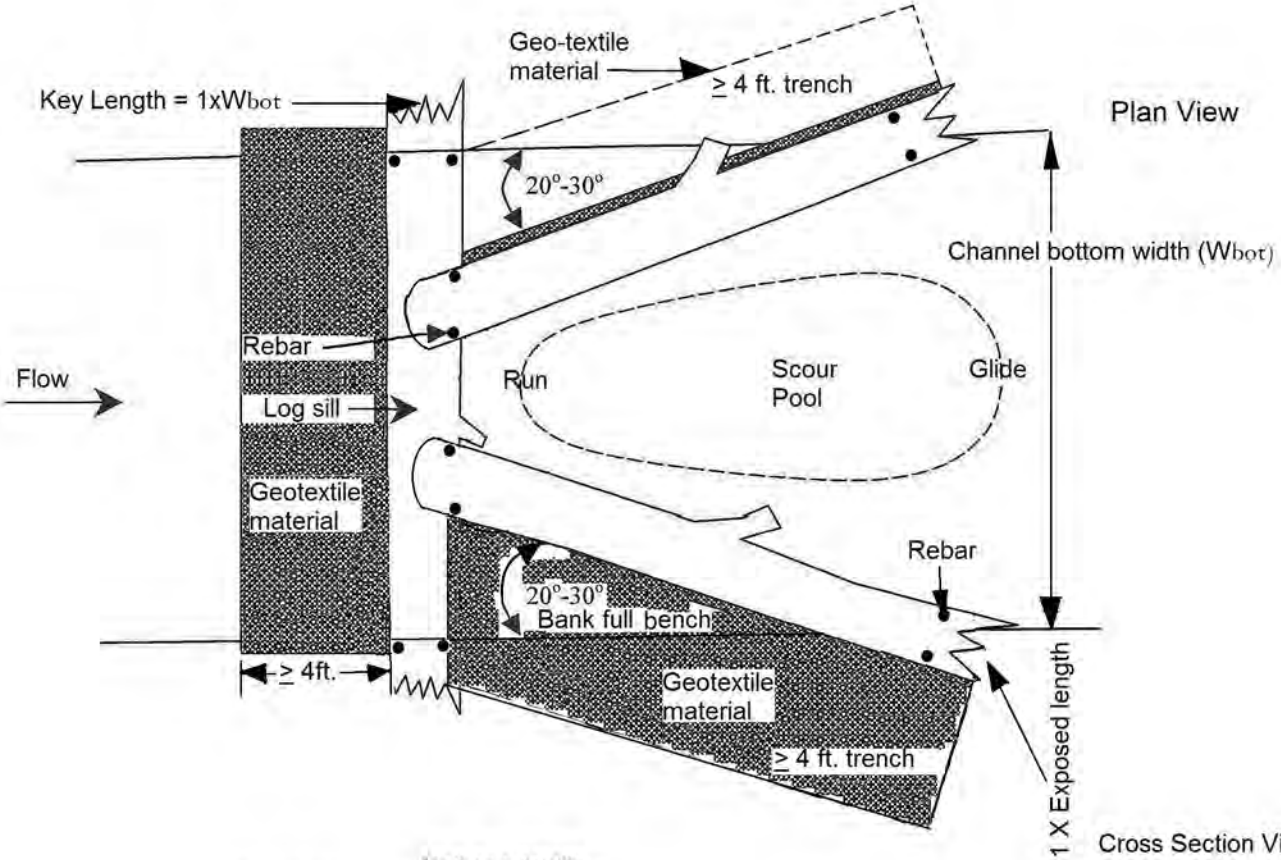
525
520
515
3.63%
0+00
0+50
1+00
1+50
2+00
2+50


S2-1 - B-channel
S2 - E-channel
520
510
500
490
480
470
460
450
440
430
2.96%
2.96%
0.31%
0.31%
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
35+00
36+00
37+00

Double Log Cross-Vane





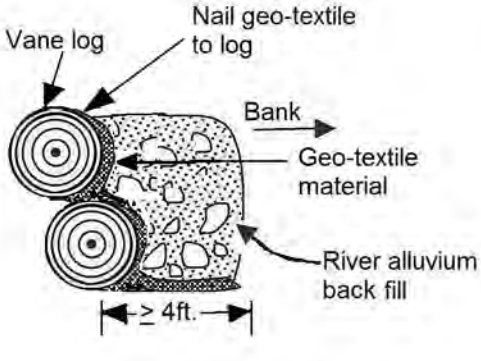
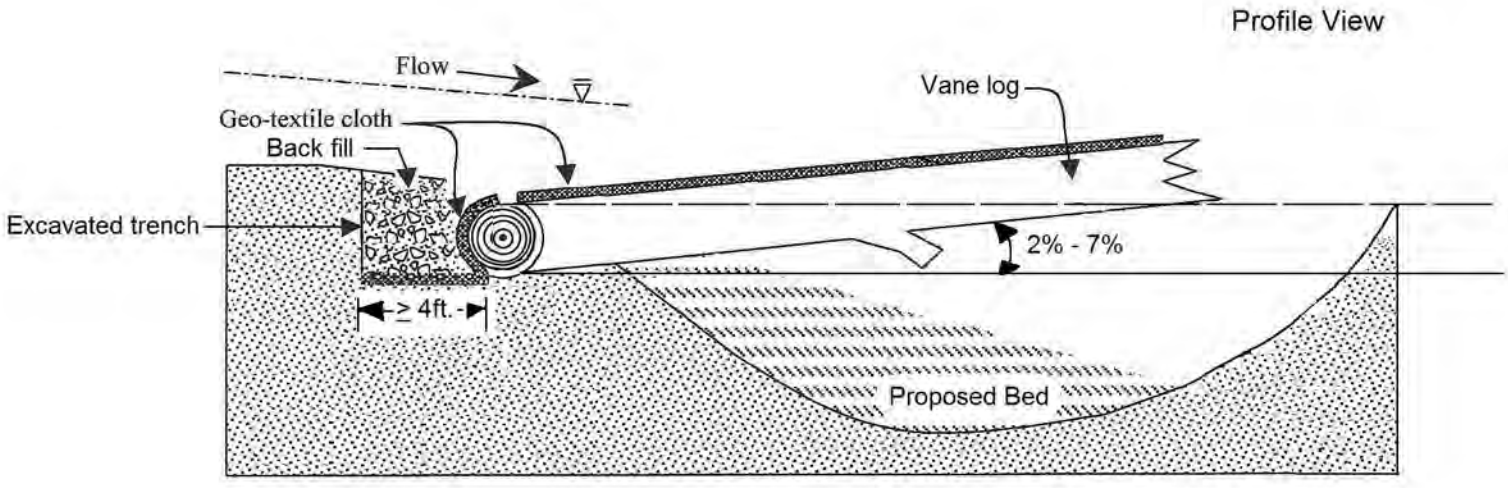
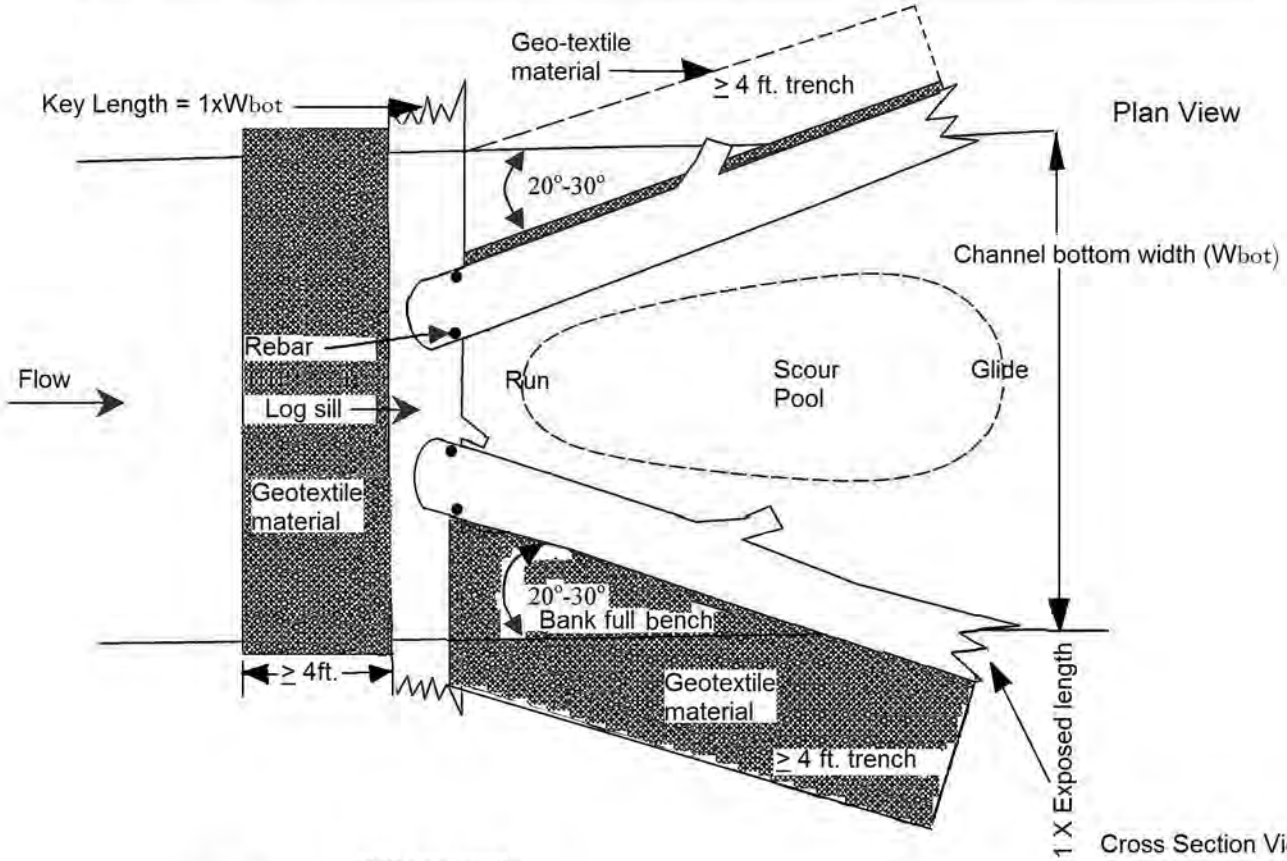


Diagram not to scale

Single Log Cross-Vane





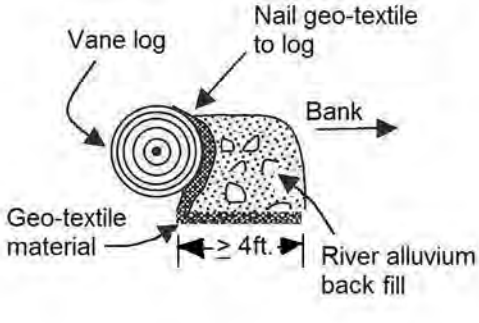
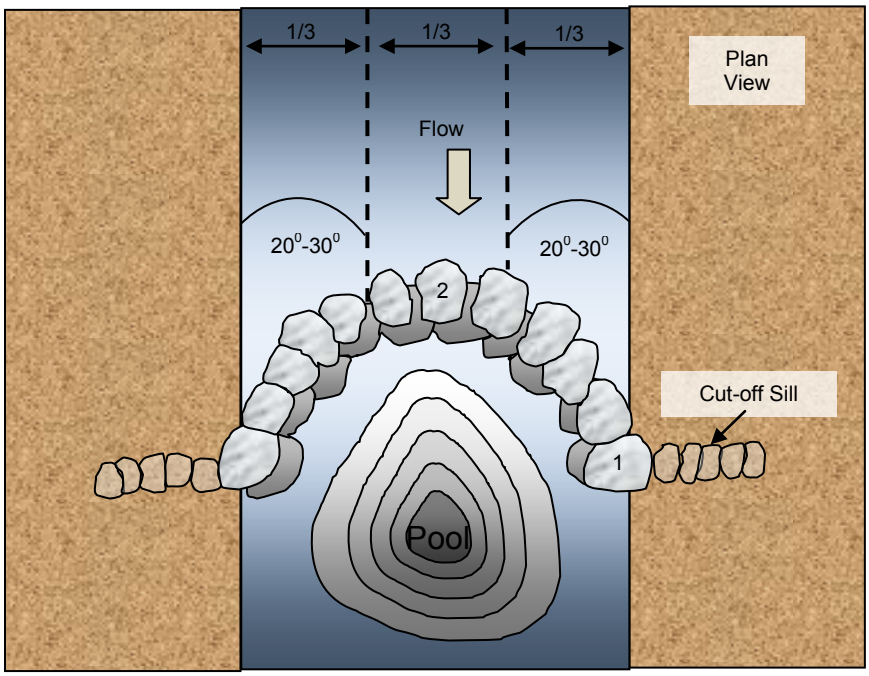
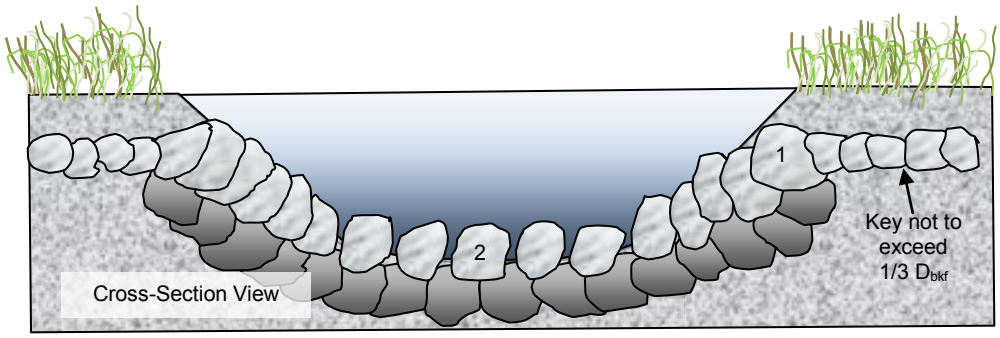
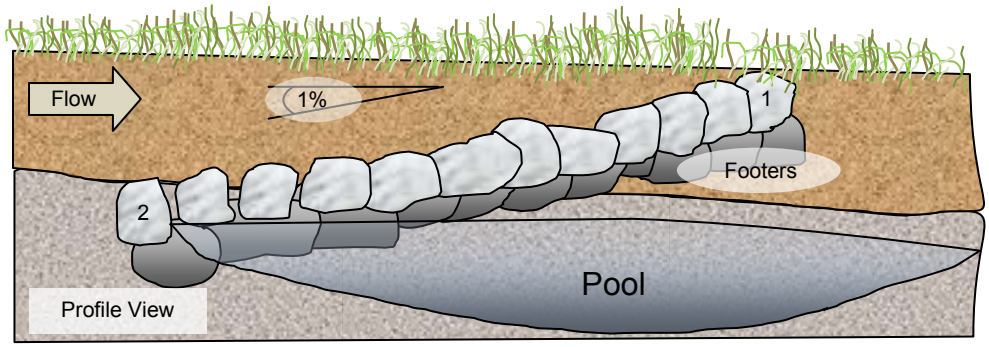


Diagram not to scale

Modified Boulder Cross Vane

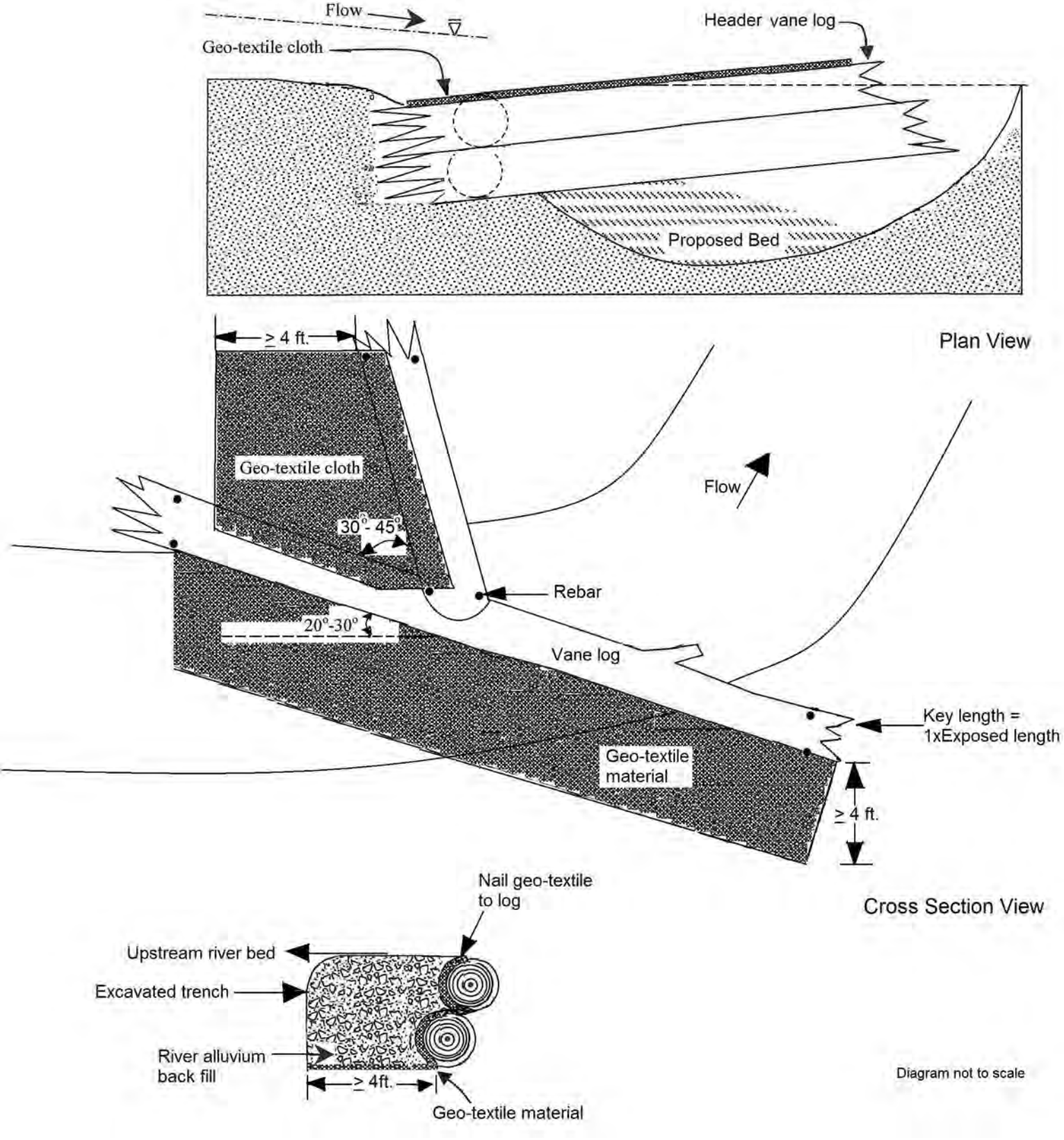




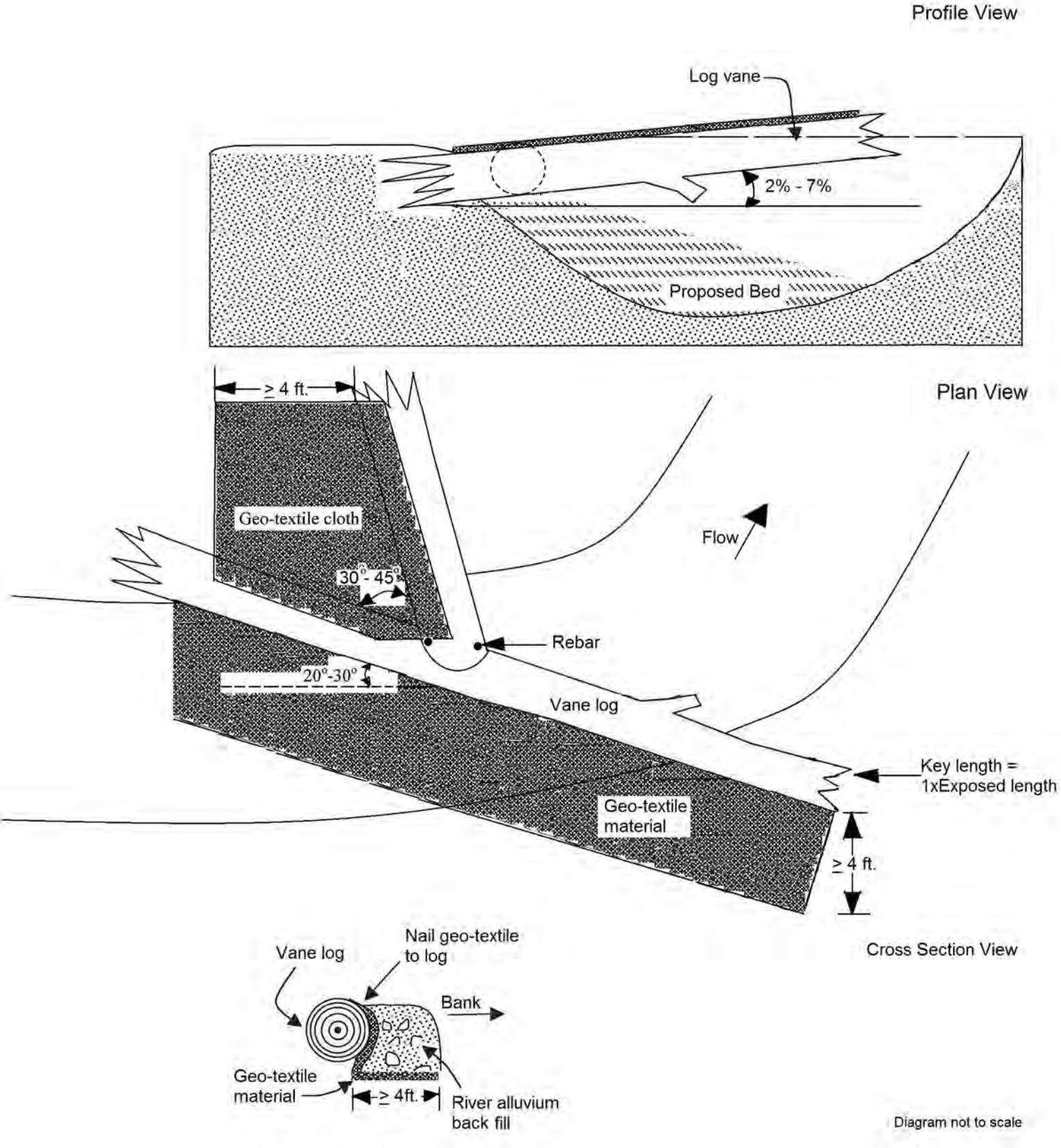


RISE
2/3rd Dbkf
2-7% slope
20-30º
ANGLE

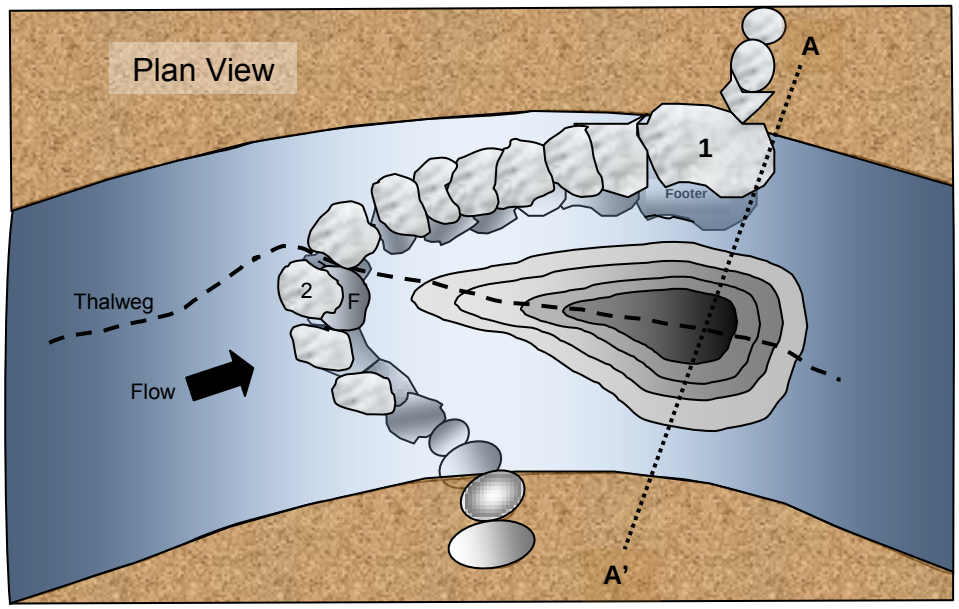
Double Log J-hook

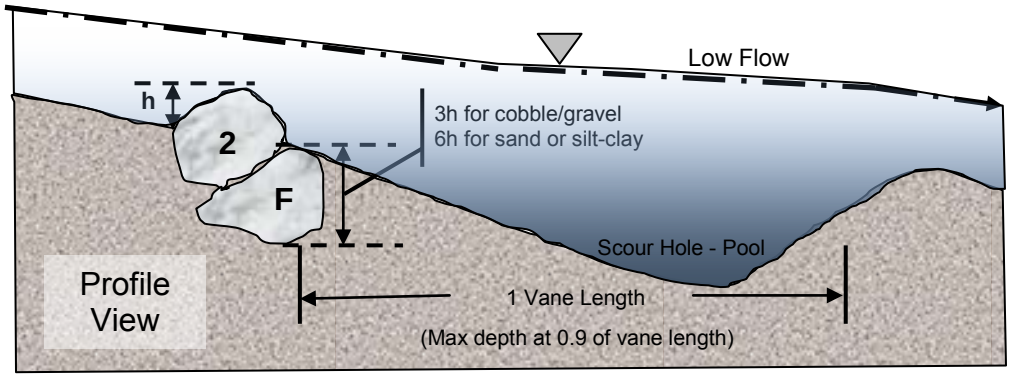


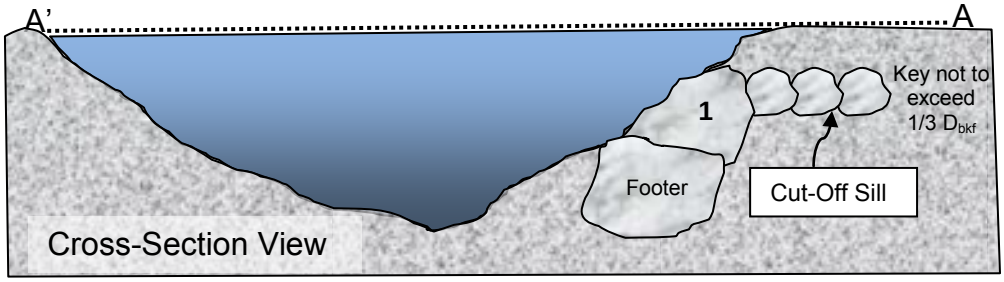
Single Log J-hook



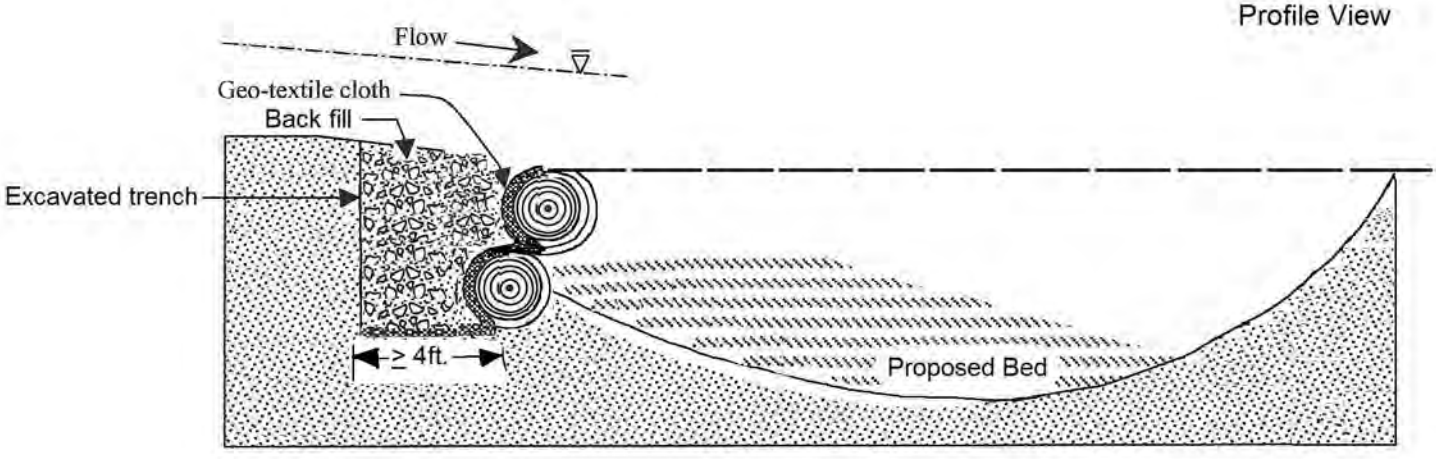
Boulder J-Hook

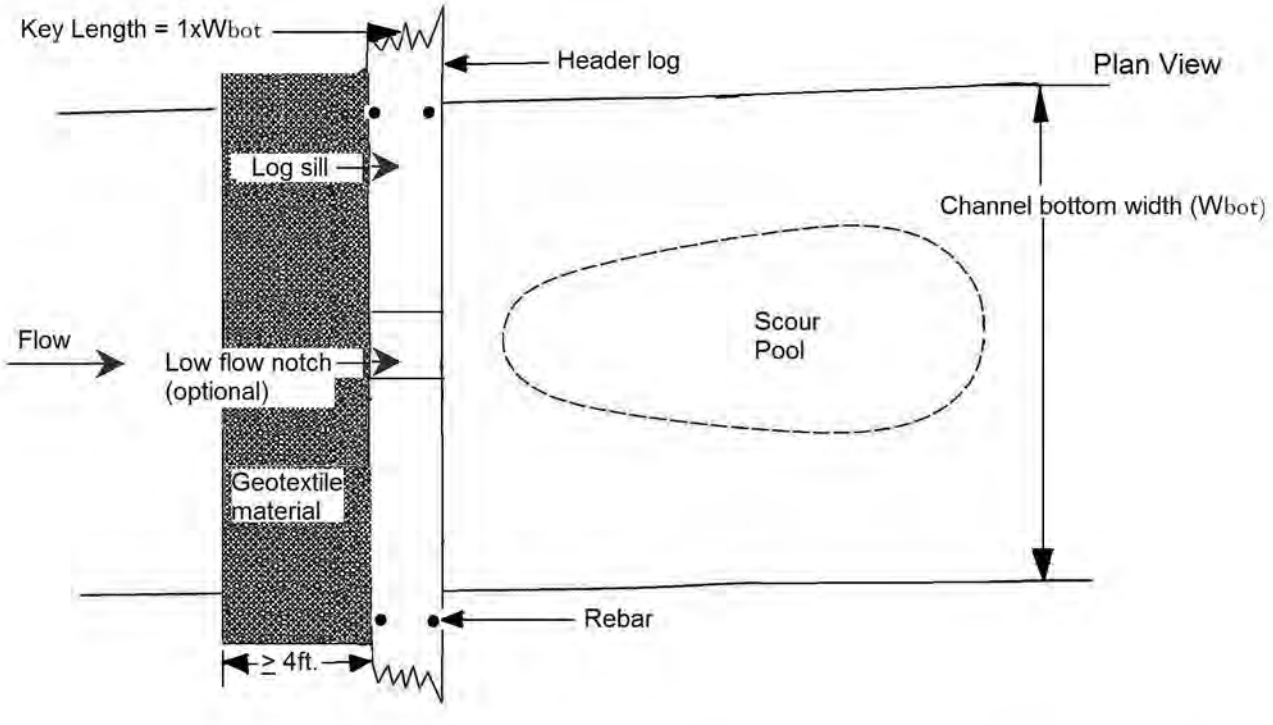






Double Log Sill





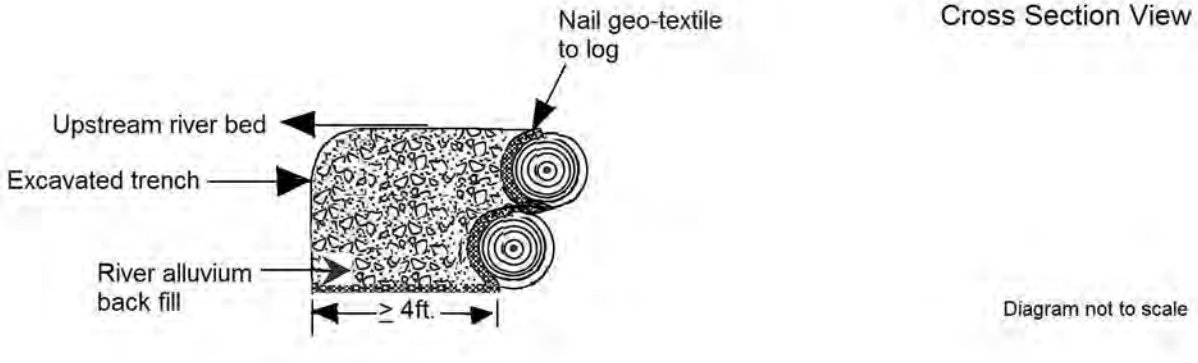
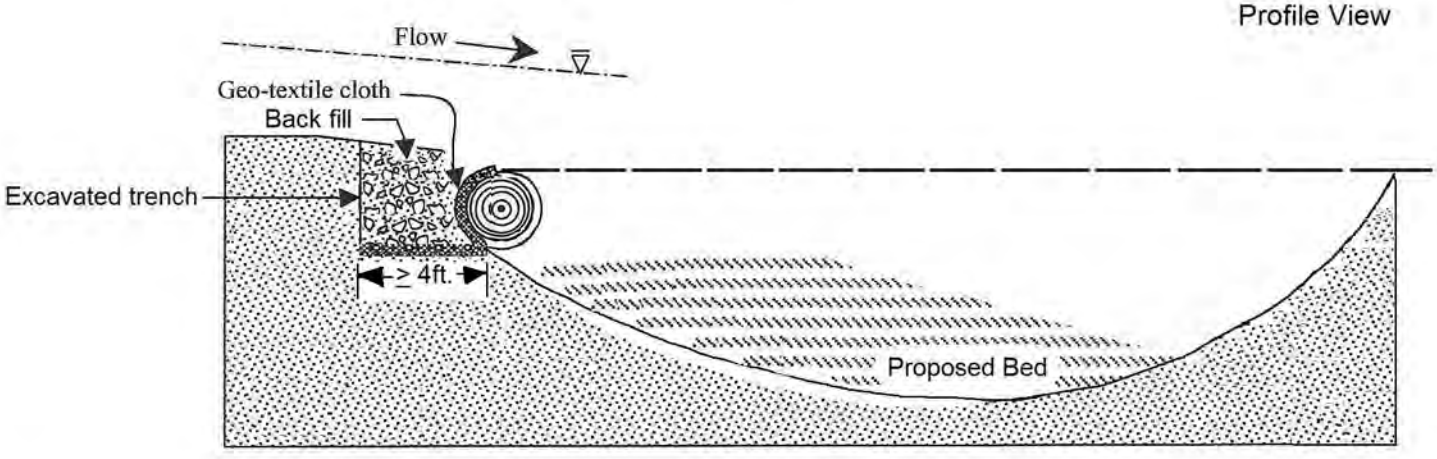
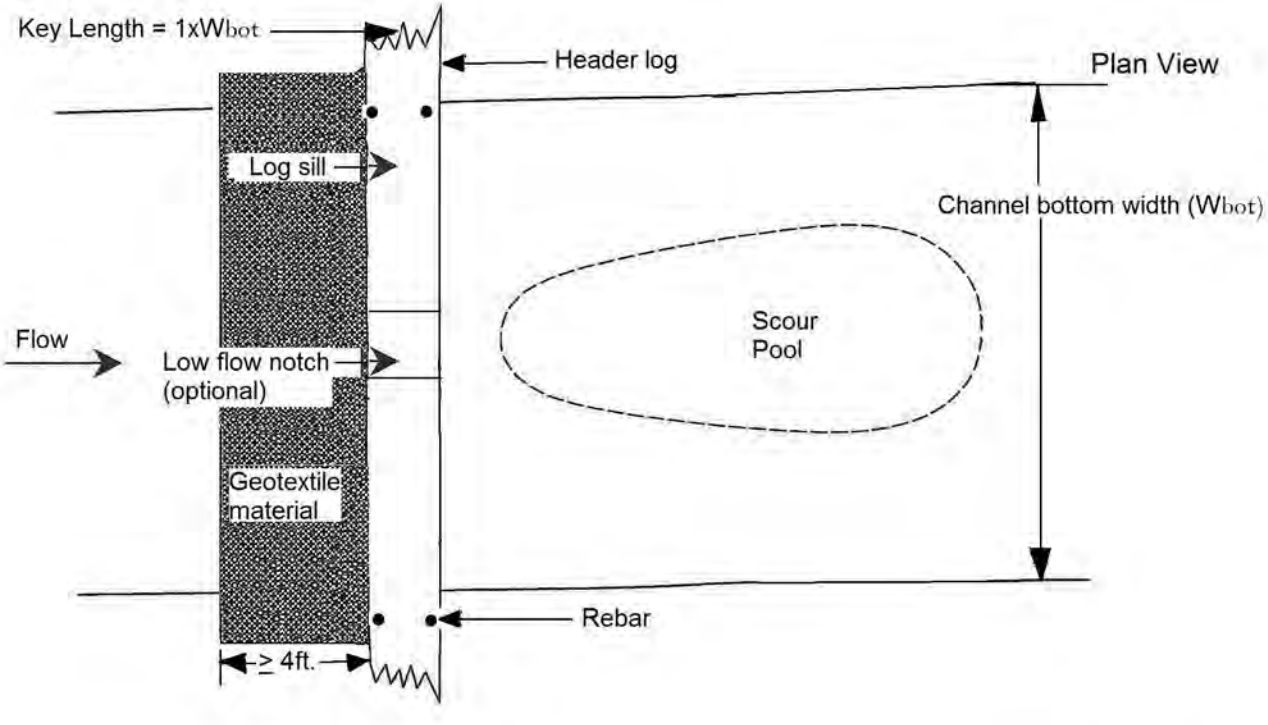


Diagram not to scale

Single Log Sill





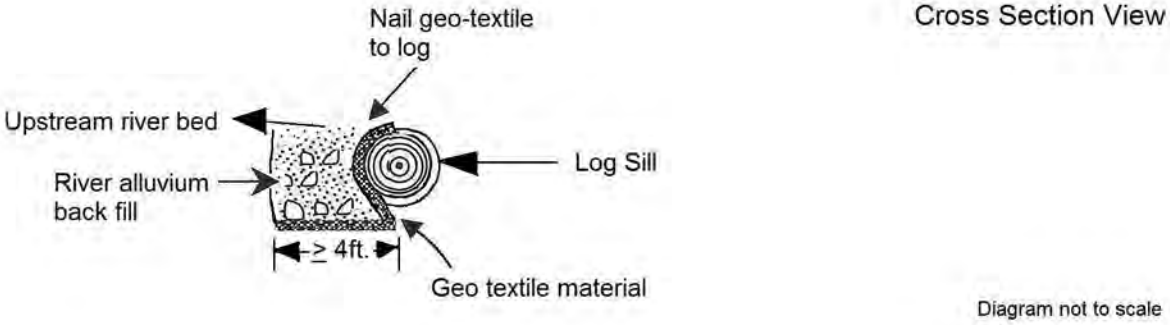
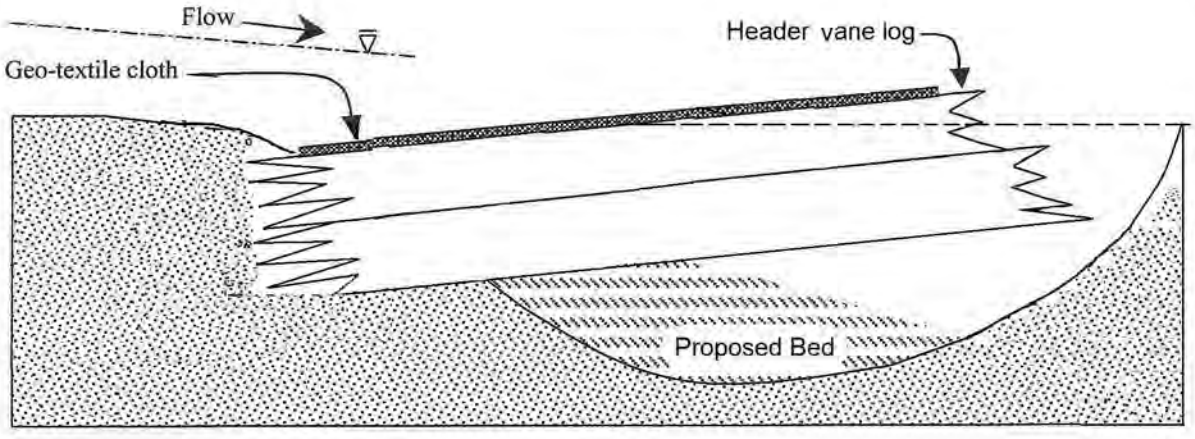


Diagram not to scale

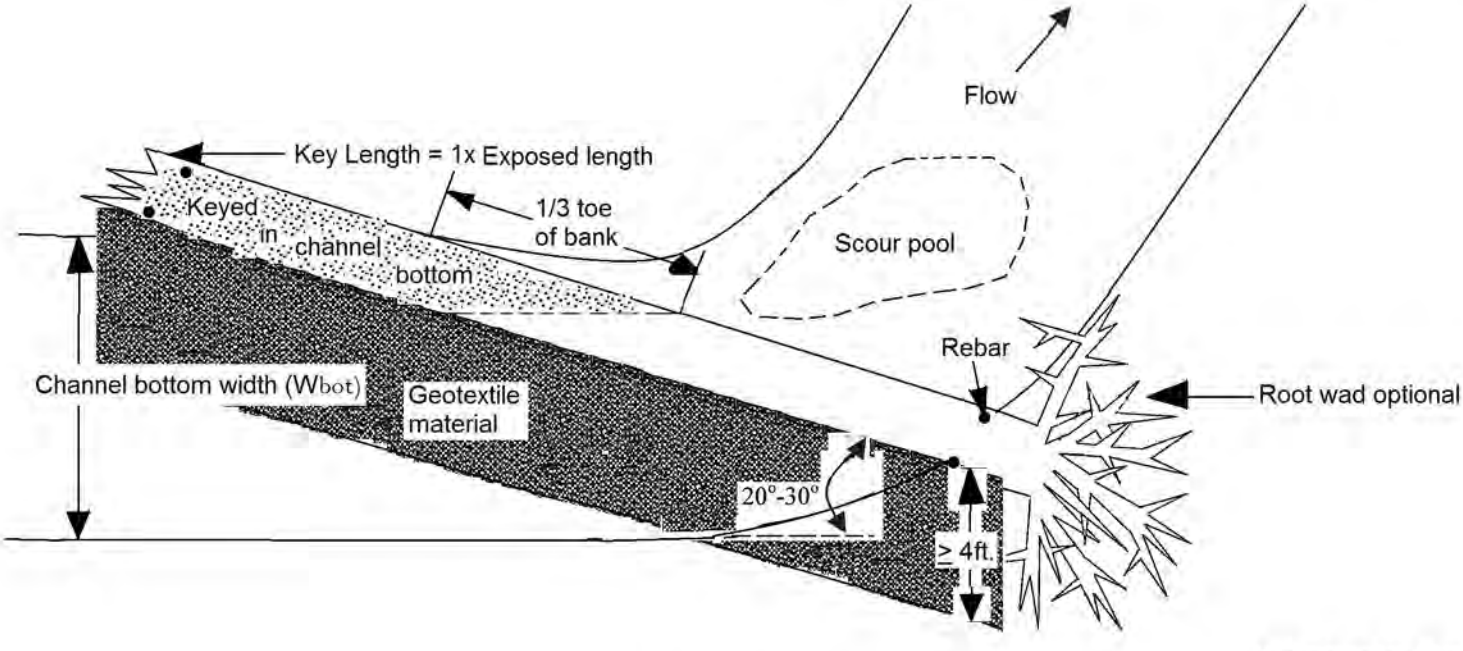
Header log off-set
to downstream side
FLOW

Double Log Vane

Profile View



Plan View



Cross Section View

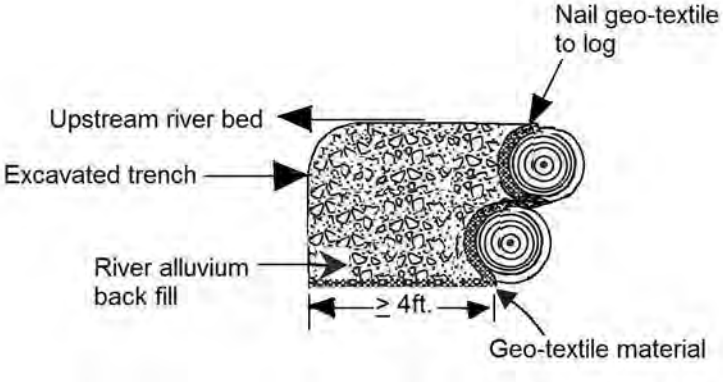
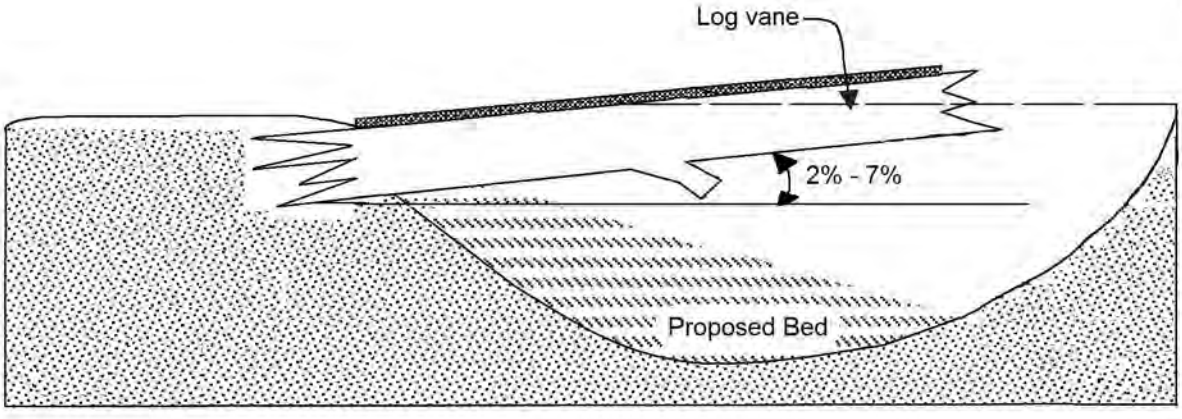


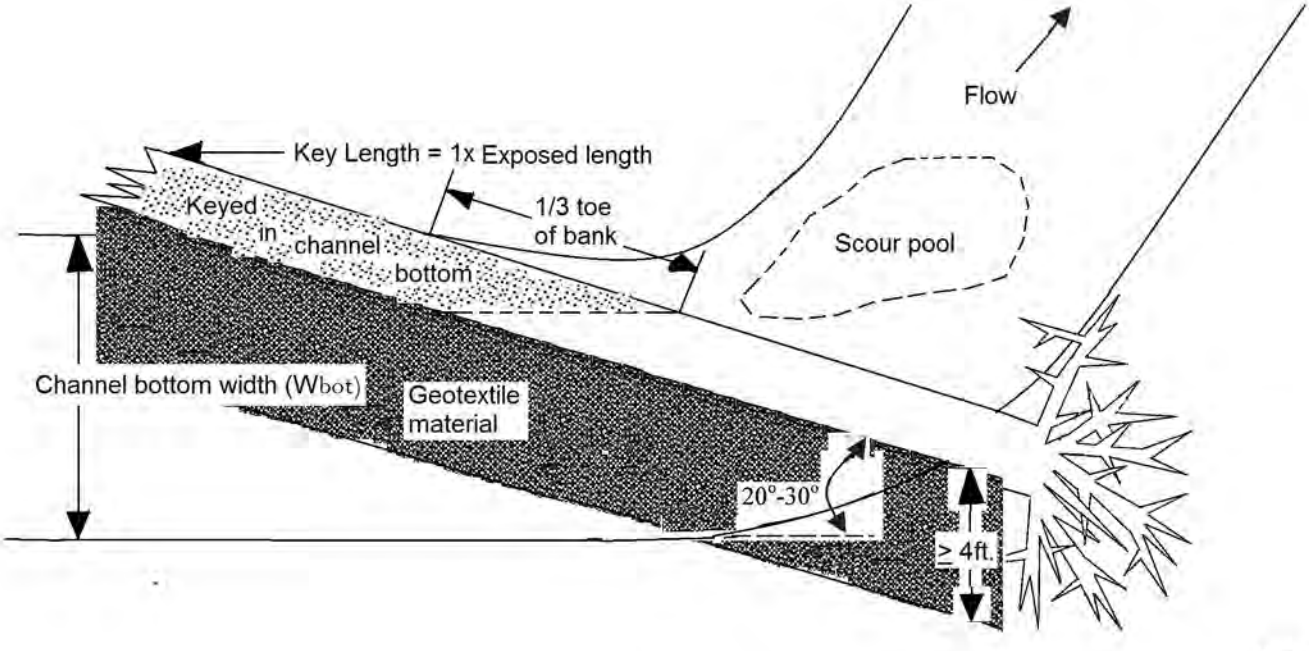
Diagram not to scale

Single Log Vane

Profile View



Plan View



Cross Section View

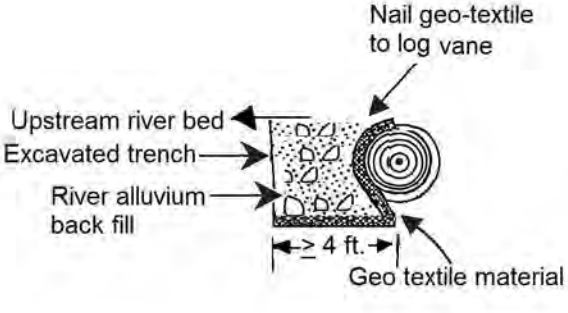
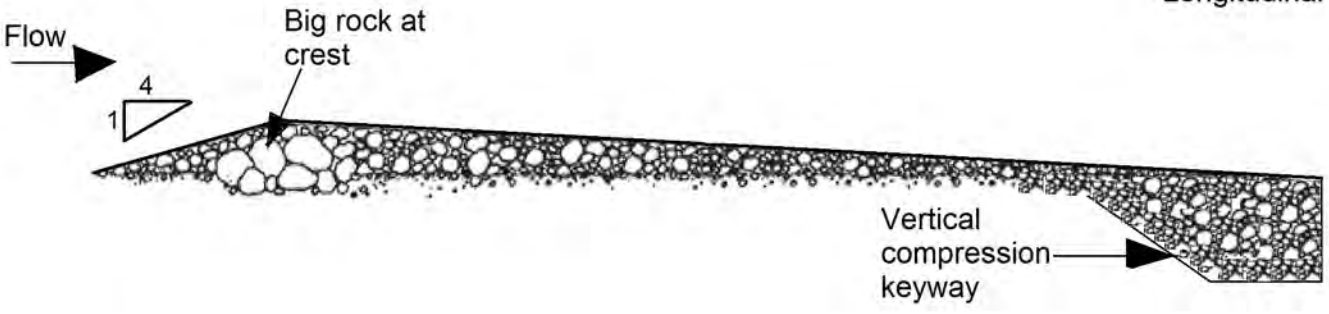


Diagram not to scale

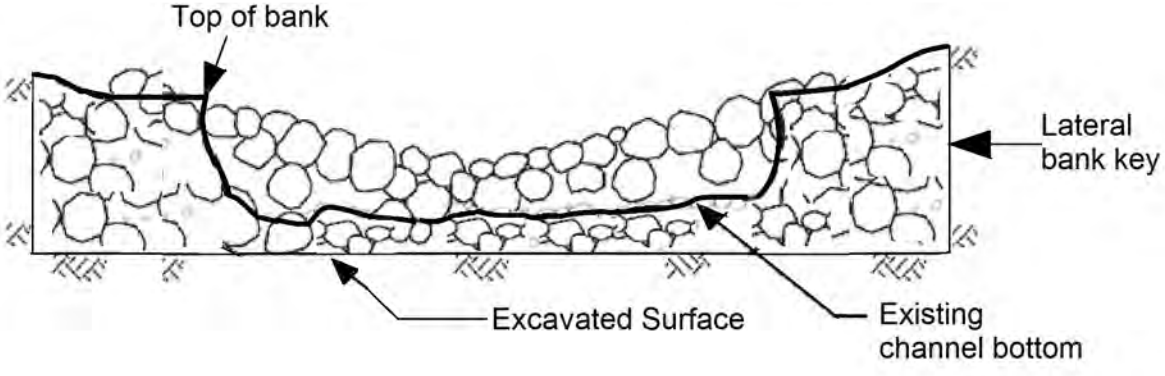
20-30º
2/3rd Dbkf
2-7% slope
R – S E

Newbury Rock Riffle

Longitudinal Profile

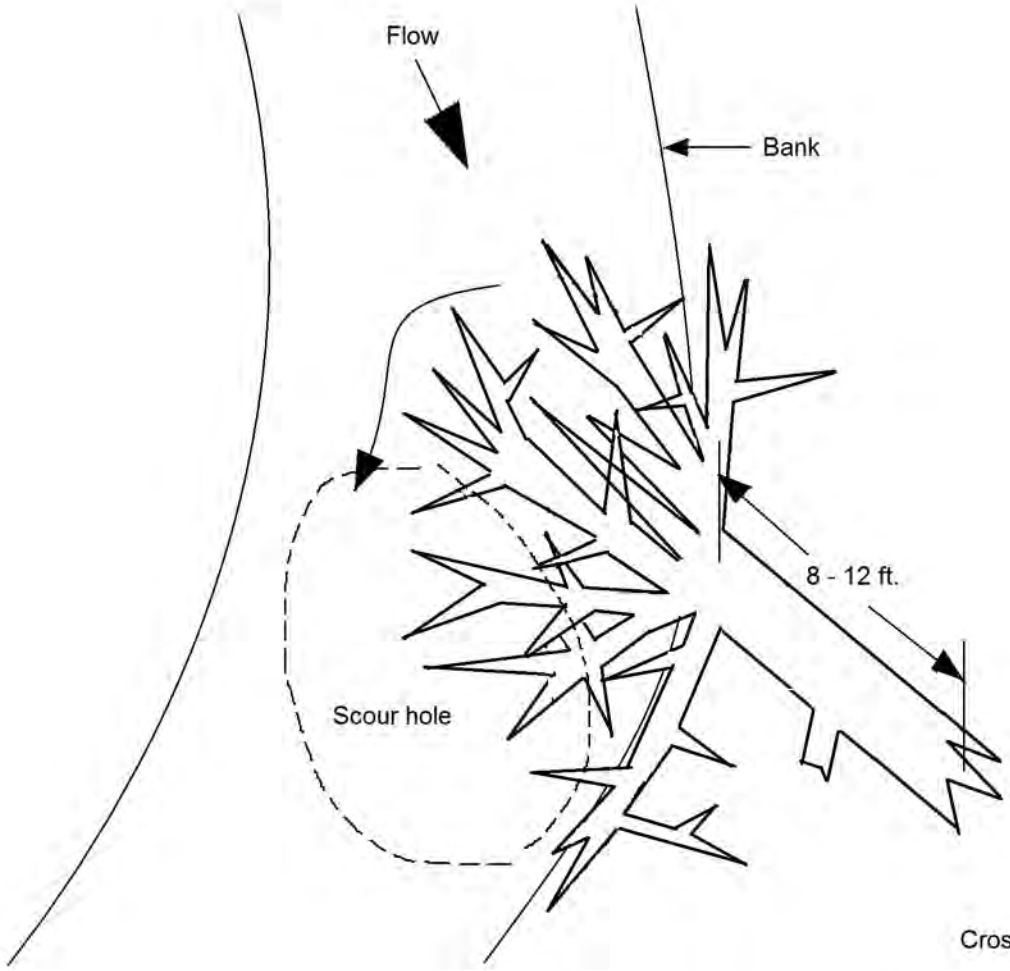


Cross Section

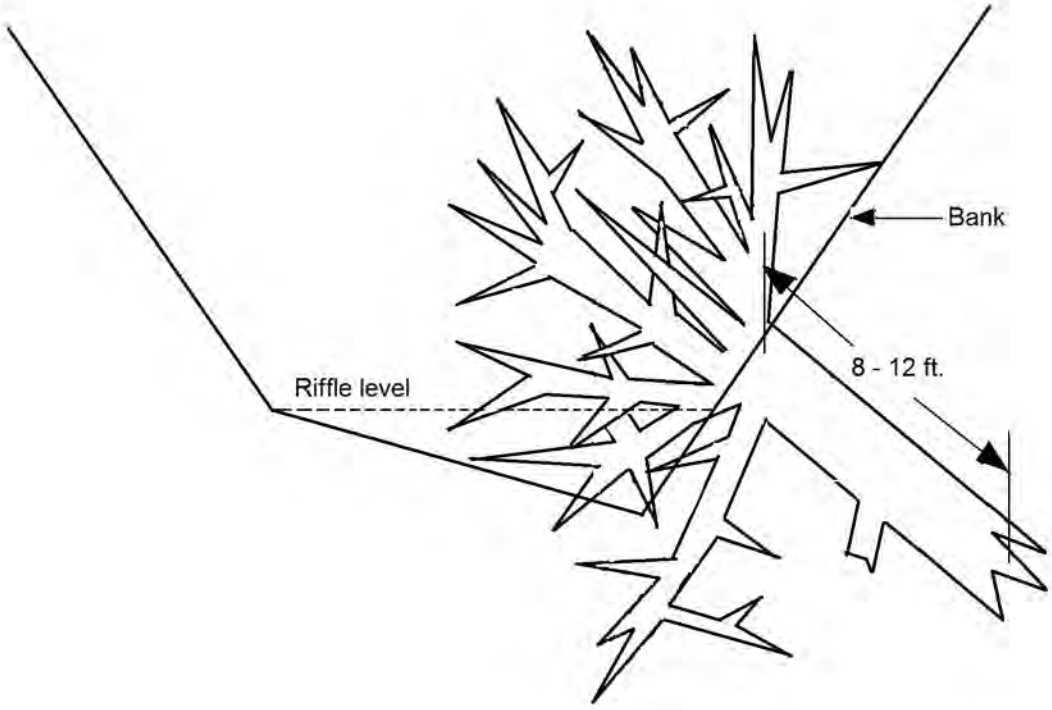


Root wad

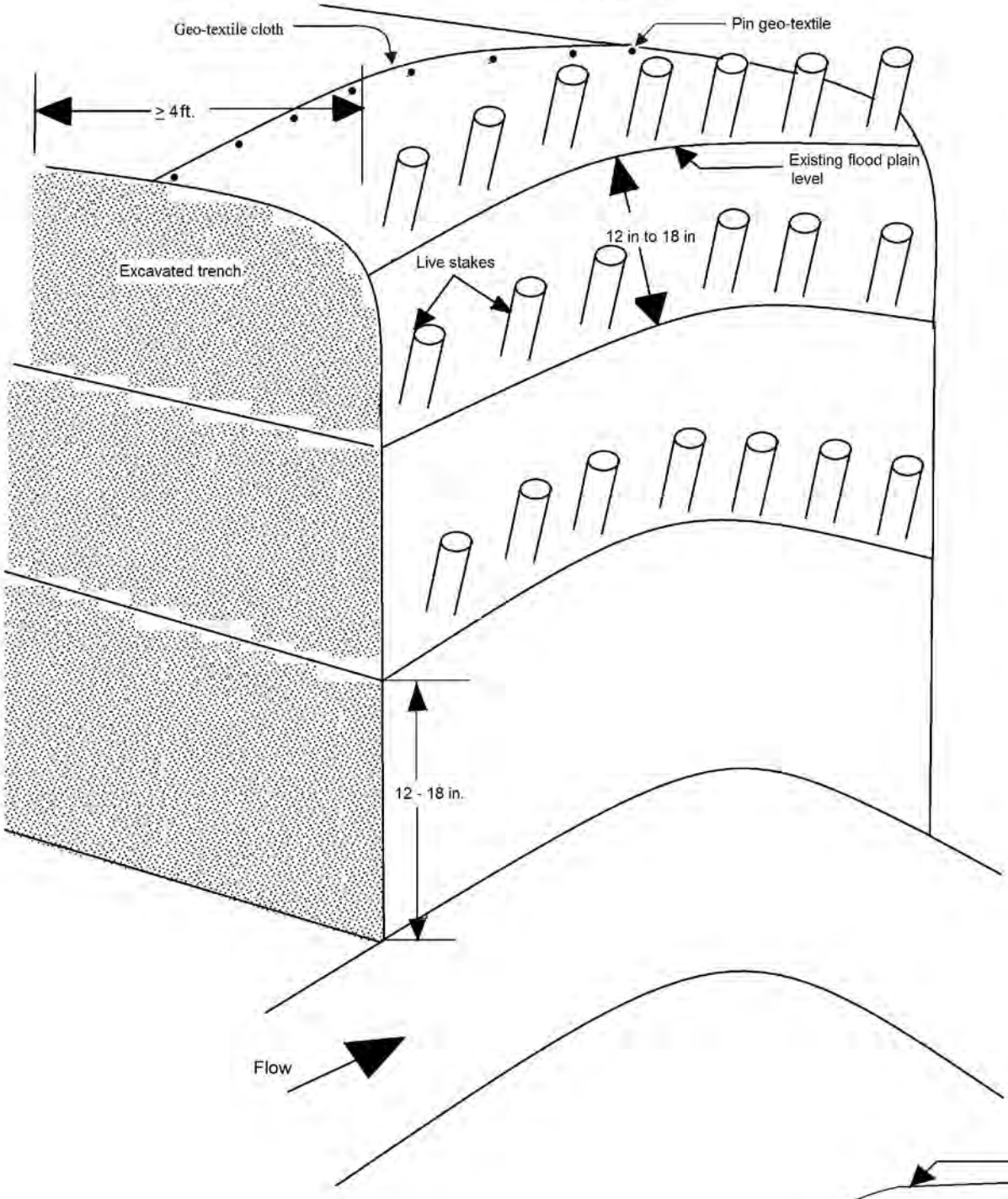
Plan View

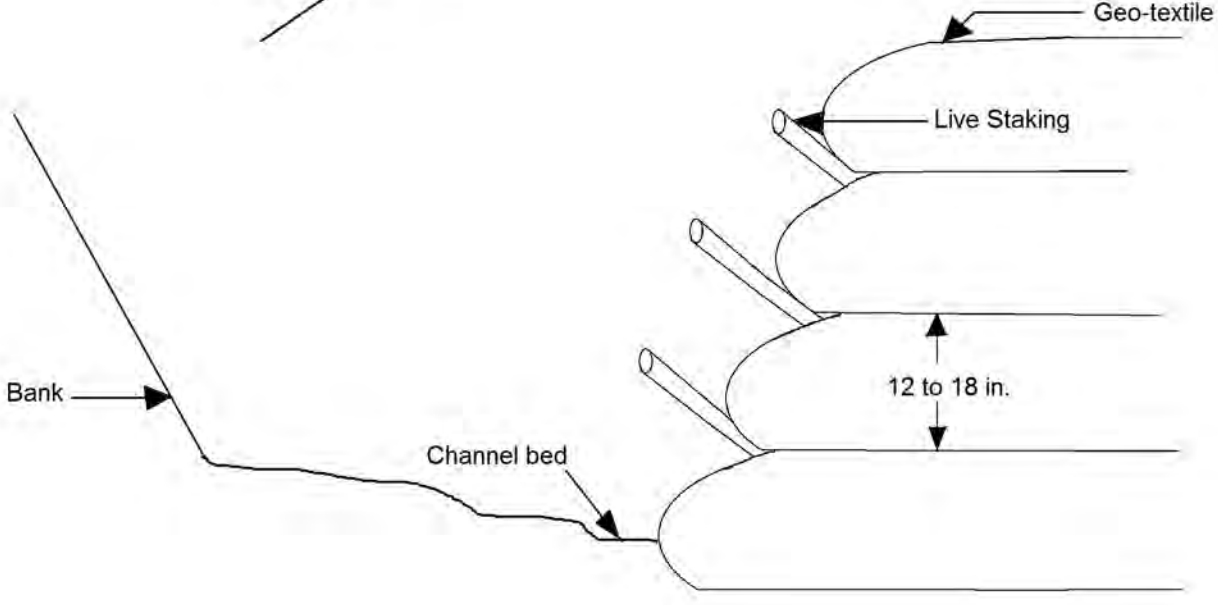


Cross Section View



Soil Lift


Geo-textile cloth
Pin geo-textile
≥ 4 ft.
Existing flood plain level
12 in to 18 in
Live stakes
Excavated trench
12 - 18 in.
Flow


Geo-textile
Live Staking
12 to 18 in.
Bank
Channel bed

WETLAND PLAN

Mitigation Goals and Objectives: This plan proposes to restore 25.4-acres of PFO. Construction will begin during the reclaim process immediately after mining is completed. The 25.4-acres of proposed PFO wetland will be an area of inundation contributed to by the mitigation streams.

S1 and S2 will supply water directly to the wetland. They will interact hydrologically during periods of overbank flooding. Overbank flooding will occupy the floodplain to service the adjacent wetland. Overflow will be stored on the floodplain where it will then be cleaned up and metered back into the stream to help drive intermittent stream flow conditions. The ultimate goal of the project is to restore a self-supporting wetland that is well developed in target native vegetation for the reestablishment and support of clean water and high quality habitat.

Site Selection and Justification: This site was chosen because of its location and because it provides the largest ecological lift in the watershed compared to other potential sites. This mitigation focuses on restoring an on-site PFO wetland. The mitigation ratio was determined by ACOE.

Hydrology: The combination of the following two sources will provide frequency and duration optimal to support at least PFO1A (temporarily flooded) conditions. Hydrology across most floodplains increases moving perpendicular away from the stream; with temporarily flooded or saturated conditions adjacent to the stream, and increasing to more seasonally flooded conditions further away from the stream in backslope locations. Plantings are designed specific to the range of hydrologic zones with FAC species in the more temporarily flooded areas and OBL in the more seasonally flooded areas, and FACW making up the transition.

Runoff:Retention Ratio: The 25.4-acre restoration area will receive laminar upland runoff from a cumulative total of approximately 219-acres. 25.4-acres of impoundment supplied by 219-acres of catchment gives a runoff:retention ratio of approximately 8.6:1, an ideal range for PFO wetland sustainability. According to research studies regarding nutrient cycling in constructed wetlands in Illinois, wetlands with low watershed to wetland area ratios have greater storage capacities and longer retention times, therefore being more effective in cycling nutrients (Kelly, 2006). For optimum wetland nutrient cycling and vegetation support, PFO designs should aim for watershed to wetland area ratios between 5:1 and 20:1 (Kovacic et al., 2000).

Overbank Flooding: Overbank flooding from the stream restoration will occur on a frequency and spatial distribution specific for development of PFO wetland.

Planting Schedule: Grading and herbaceous planting will be conducted during reclamation. Tree planting will occur after the mitigation streams are restored and stable. Several factors will determine which tree type will be used: Tree availability, DNR requirements specific to PMLU planting densities and site conditions. If bare root seedlings (BRS) are used they will be planted at 450/acre. If #3 RPMs are used they will be planted at 60/acre. See the table below for a list of tree species to be planted.

Restoration Schedule: Restoration activities will be conducted during the reclaim process. Grading in the restoration area will produce a <0.001% backslope with temporarily flooded hydrology. Discharge will be offsite into an unnamed tributary of Pond Creek. The site will be planted according to the table below.

Tree Species: PFO			
Species	**Common Name**	**Strata**	**Indicator**
Carya glabra	Pignut Hickory	T	FACU
C. laciniosa	Shellbark Hickory	T	FAC
C. ovata	Shagbark hickory	T	FACU
C. Illinoensis	Pecan	T	FACU
Quercus alba	White Oak	T	FACU
Q. lyrata	Overcup Oak	T	OBL
Q. flacata	Southern Red Oak	T	FACU
Q. imbricaria	Shingle Oak	T	FAC
Q. muhlenbergii	Chinkapin Oak	T	NI
Q. rubra	Northern Red Oak	T	FACU
Q. shumardii	Shumardi Oak	T	FAC
Q. bicolor	Swamp White Oak	T	FACW
Q. michauxii	Swamp Chestnut Oak	T	FACW
Q. pagoda	Cherrybark Oak	T	FACW
Q. macrocarpa	Bur Oak	T	FAC
Q. palustris	Pin Oak	T	FACW
Taxodium distichum	Bald Cypress	T	OBL

- Bare root tree seedlings must be at least 30” tall at planting.
- RPM tree saplings must be size #3.
- 6 species minimum will be planted to ensure diversity.
- Species are planted according to their tolerance to water depth. For example, OBL species are planted in wetter areas than FACU species.

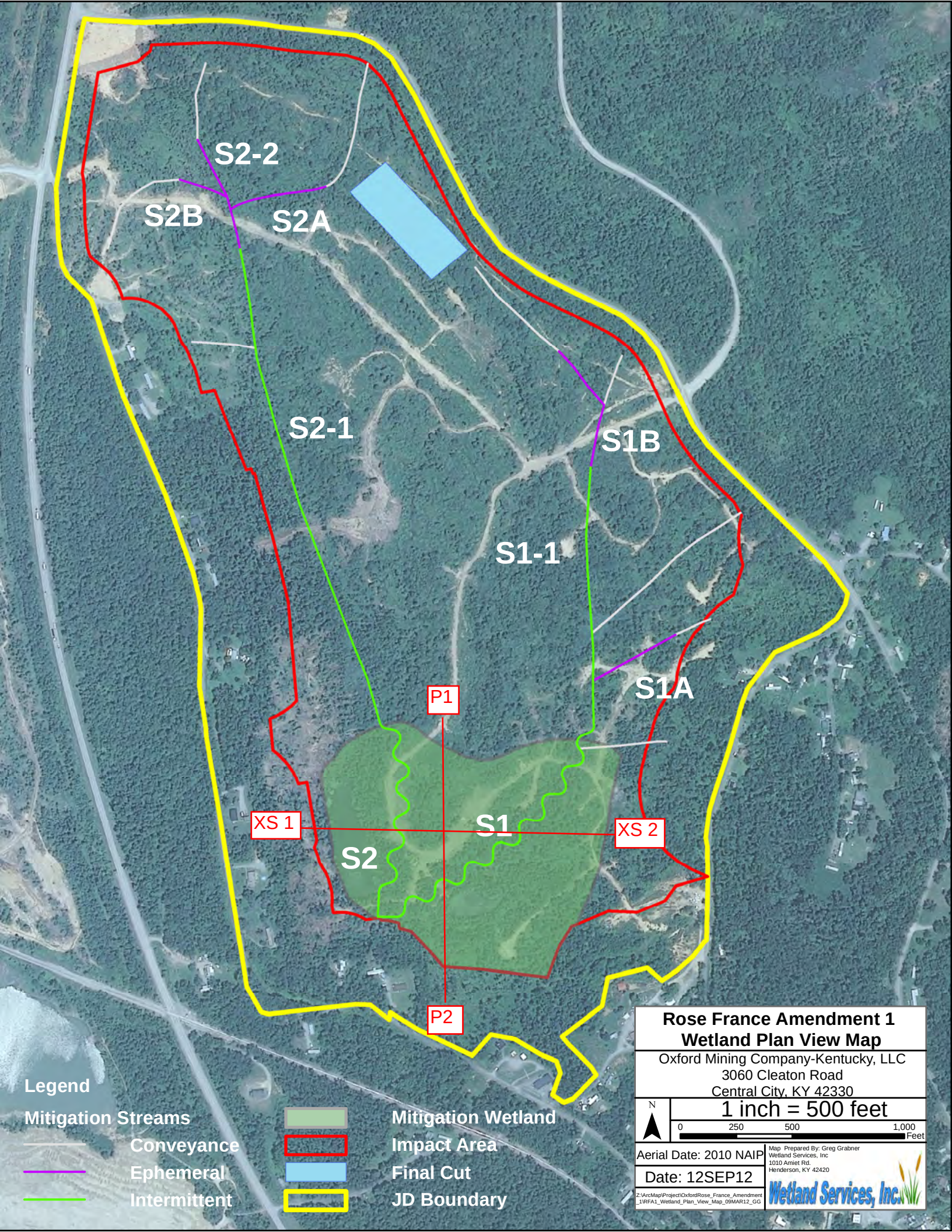
Herbaceous Species: PFO Understory				
Genus and/or Species	**Common Name**	**Propagule/Rate**	**Strata**	**Indicator**
Acorus calamus	Sweet Flag	R 125/ac	H	OBL
Agrostic spp	Bent Grass	S 6oz/ac	H	FACW
Alisma subcordatum	Water Plantain	BRP 50/ac	H	OBL
Alopercurus spp.	Foxtail	S 6oz/ac	H	FACW
Arundinaria Gigantea	Giant Cane	R 50/ac	S	FAC
Asclepias spp.	Milkweed	R 50/ac	H	OBL
Carex spp.	Sedge	S 1-12oz/ac	H	FACW-OBL
Cinna latifolia	Wood Reed	S 1-12oz/ac	H	FACW
Commelina spp.	Dayflower	R 50/ac	H	FACW
Cyperus spp.	Flat Sedge	S 1-13oz/ac	H	FACW-OBL
Echinochloa spp.	Indian Millett	S 3lb/ac	H	FACW
Eleocharis spp.	Spike Rush	S 1/2-2oz/ac	H	OBL
Elymus spp.	Wild Rye	S 2lb/ac	H	FAC-FACW
Glyceria striata	Fowl Manna Grass	S 4oz/ac	H	OBL
Hottonia Inflata	Featherfoil	Any available	H	OBL
Iris spp.	Water Iris	R 125/ac	H	OBL
Juncus spp.	Rush	S 4oz/ac	H	FACW-OBL
Leersia spp.	Cutgrass	S 1lb/ac	H	OBL
Lemna spp.	Duck Weed	BRP 2bu/ac	H	OBL
Nelumbo lutea	American Lotus	T 125/ac	H	OBL
Nuphar spp.	Pond Lilly	R 125/ac	H	OBL
Nymphaea spp.	Water Lilly	T 125/ac	H	OBL
Panicum spp.	Deer Tongue Grass	S 6oz/ac	H	FAC
Peltandra spp.	Arrow Arum	T 125/ac	H	OBL
Polyganum spp.	Smart Weed	R,S 125,5lb/ac	H	FACW-OBL
Pontederia cordata	Pickerel Plant	BRP 125/ac	H	OBL
Potamogeton spp.	Pondweed	T 125/ac	H	OBL
Sagittaria spp.	Arrow Head	T 125/ac	H	OBL
Scirpus spp.	Bull Rush	S 4oz/ac	H	FACW-OBL
Sparganium spp.	Burreed	S 8oz/ac	H	OBL
Tripsacum dactyloides	East. Gamma Grass	S 4lb/ac	H	FACW

- No less than 8 of the above listed Genus and/or Species will be planted.
- Species are planted according to their tolerance to water depth. For example, Milkweed and Dayflower were planted in shallower water from 3” to saturated soil, while Lotus and Lilly will be planted in deeper water up to 18”.

References

Kelly, C. 2006. Stormwater Treatment Areas: Experiences with Nitrate Removal. http://www.dep.state.fl.us/southeast/ecosum/ecosums/NitrateSTA%20final.pdf. Accessed March, 2011.

Kovacic, D., M. David, L. Gentry, K. Starks, and R. Cooke. 2000. Effectiveness of Constructed Wetlands in Reducing Nitrogen and Phosphorus Export from Agriculture Tile Drainage. Journal of Environmental Quality, Vol 29, no. 4: p 1262-1274.


S2-2
S2B
S2A
S2-1
S1B
S1-1
S1A
P1
XS 1
S1
XS 2
S2
P2
Legend
Mitigation Streams
Conveyance
Ephemeral
Intermittent
Mitigation Wetland
Impact Area
Final Cut
JD Boundary
Rose France Amendment 1
Wetland Plan View Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0 250 500 1,000 Feet
Aerial Date: 2010 NAIP
Date: 12SEP12
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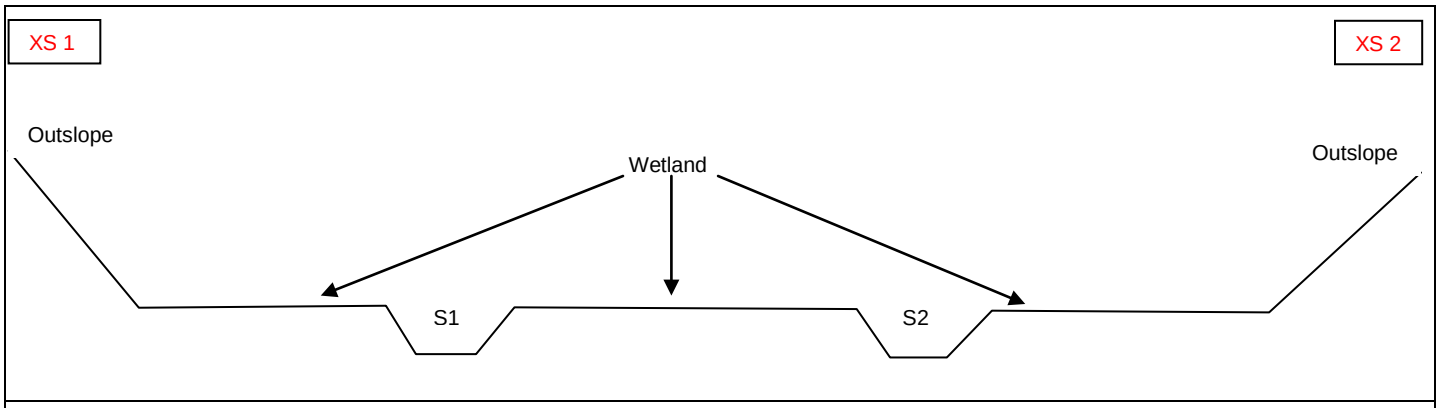
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.



Wetland Mitigation Cross Section – Looking Downstream

Wetland Mitigation Profile

DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION

THIS DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION is made this [*Insert Numerical Day*] day of [*Insert Month*], [*Insert Year*], by [*Insert Names of Declarants and address*] ("Declarants").

RECITALS

WHEREAS, Declarants are the co-owners in fee simple of certain real property located in [*Insert County Name*] County, [*Insert State Name*], as described in Deed Book *[Insert Number]*, Page *[Insert Number]*, in the Office of the [*Insert County Name]* County Clerk, and as more particularly described in legal description attached hereto as Exhibit A and shown on the *[insert one or more of the following: platted survey, approved permit drawings, or site plan]* attached hereto as Exhibit B, both of which are incorporated herein by reference ("Property");

WHEREAS, the discharge of dredged and/or fill material into jurisdictional waters of the United States, including wetlands and streams, pursuant to Sections 404 of the Clean Water Act, requires compensatory mitigation; and

WHEREAS, as compensatory mitigation under Federal law for and in consideration of Department of the Army Permit No. _____ ("Permit") issued by the U.S. Army Corps of Engineers, Louisville District ("Corps") pursuant to Section 404 of the Clean Water Act (33 U.S.C. §1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403), and in recognition of the continuing benefit to the permitted property, and for the protection of waters of the United States and scenic, resource, environmental, and other conservation values, Declarants have agreed to *[insert one or more of the following: restore, create, rehabilitate, establish, re-establish, enhance, or preserve] [insert one or more of the following: aquatic habitats, riparian areas, buffers, and uplands]* and place certain restrictive covenants on the portion of the Property depicted in [*reference recorded Plat (book and page number, county(ies) and date) or approved permit drawings or site plan*] attached hereto as Exhibit C and incorporated herein by reference ("Mitigation Property"), in order that the Mitigation Property shall remain substantially in its natural condition forever, and to grant a right of access and entry to the Property;

NOW THEREFORE, in consideration of the benefits to be derived by the Declarants and each and every subsequent owner and occupant of the Mitigation Property, and as required mitigation for the discharge of dredged and/or fill material into waters of the United States, as authorized by the Permit and Certification, Declarants hereby make this Declaration on the terms and conditions stated below.

1. **Purpose.** The purpose of this Declaration of Restrictive Covenants is to restrict the current and future use of the Mitigation Property in perpetuity in order to protect aquatic resource functions and values, scenic, resource, environmental, and other conservation values, and conservation functions and ecological services; to establish the Mitigation Property as open, common, and undeveloped conservation area; and to preserve the natural condition of the Mitigation Property in perpetuity.

2. **Covenant Running with the Land.** Declarants hereby declare that the Property shall be bound by, held, transferred, sold, conveyed, leased, improved, hypothecated, occupied or otherwise disposed of and used subject to the rights of access and entry provision and property transfer provision of the following restrictive covenants, which shall be perpetual and run with the land and be binding on all the Declarants' heirs, executors, administrators, successors, assigns, lessees, or other persons, firms, associations, corporations or governmental entities having or hereafter acquiring any right, title, or interest in said Property or any part thereof; and that the Mitigation Property shall be held, transferred, sold, conveyed, leased, improved, hypothecated, occupied or otherwise disposed of and used subject to the following restrictive covenants, which shall run with the land and be binding on all the Declarants' heirs, executors, administrators, successors, assigns (which are included in the term "Declarants" below), lessees, or other occupiers and users. The terms and conditions of the following restrictive covenants shall be both explicitly and implicitly included in any subsequent transfer, conveyance, or encumbrance affecting all or part of the Property. Any such transfer, conveyance or encumbrance shall set forth the terms and conditions of this document by reference to this document and its recorded location in accordance with paragraph 9 of this Declaration.

3. **Definitions.**

3.1 Natural Condition. The term "natural condition" shall mean the condition of the Mitigation Property at the time of the declaration and as restored, created, enhanced, and preserved pursuant to the Mitigation Plan. The natural condition shall be evidenced in part by [*insert either:* a surveyed plat of the Mitigation Property recorded in the deed records office for each county in which the Property is situated which shows all relevant property lines, all existing man-made improvements and features, and major, distinct natural features such as waters of the United States and is attached hereto as Exhibit [*Insert Exhibit Reference*]; *or*. the [*permit drawing*/*site plan*] which shows all relevant property lines, all existing man-made improvements and features, and major distinct natural features such as waters of the United States and is attached hereto as Exhibit [*Insert Exhibit Reference*].] The natural condition of the Mitigation Property may also be evidenced by:

(a) A current aerial photograph of the Mitigation Property at an appropriate scale taken as close as possible to the date the declaration is made; [and]
(b) On-site photographs taken at appropriate locations on the Mitigation Property, including major natural features; [and]
(c) [*Other methods of documentation can be inserted subject to approval.*];

3.2 Mitigation Plan. The term "Mitigation Plan" shall mean the plan approved by the Permit and Certification.

4. **Restrictions/Prohibitions.** Any activity on, or use of, the Mitigation Property, which is or may become inconsistent with the purposes of this Declaration is prohibited. Without limiting the generality of the foregoing, the following activities are expressly prohibited except as provided for in the Declarants' Reserved Rights:

4.1 General/Topography. There shall be no filling, flooding, cultivating, excavating, earthmoving, grading, mining or drilling; no removal of natural materials; no dumping of materials; and no alteration of topography in any manner.

4.2 Waters and Wetlands. There shall be no draining, ditching, diking, dredging, channelizing, damming, pumping, or impounding; no changing the grade or elevation, impairing or diverting the flow or circulation of waters, or reducing the reach of waters; and no other discharge or activity requiring a permit under applicable clean water or water pollution control laws and regulations, as amended.

4.3 Trees/Vegetation. There shall be no clearing, burning, cutting, mowing or destroying of trees or vegetation.

4.4 Non-Native/Exotic Species. There shall be no introduction of non-native or exotic species to the Mitigation Property.

4.5 Uses. There shall be no agricultural, commercial, or industrial activity undertaken or allowed on the Mitigation Property, including but not limited to grazing and mining. There shall be no horseback riding, whether on or off an established trail.

4.6 Structures. There shall be no construction, erection, or placement of buildings, billboards, signs, or any other temporary or permanent structure, nor any additions to existing structures.

4.7 Roads. There shall be no construction or building of new roads, trails, or other rights of way without the prior written approval by the Corps.

4.8 Off Road Vehicles. There shall be no use of off road vehicles, 4-wheel drive vehicles, all terrain vehicles, snowmobiles, or other types of motorized recreational vehicles except on existing roads and except as necessary to manage the Mitigation Property.

4.9 Utilities. There shall be no construction or placement of utilities or related facilities without the prior written approval of the Corps.

4.10 Waste. There shall be no placement of refuse, wastes, sewage, dredged spoil, solid waste, incinerator residue, garbage, sewage sludge, munitions, chemical waste, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, or industrial, municipal, or agricultural waste on the Mitigation Property.

4.11 Pest Control. There shall be no application of pesticides or biological controls, including but not limited to insecticides, fungicides, rodenticides and herbicides, without prior written approval from the Corps.

5. Reserved Rights. Notwithstanding the foregoing Restrictions, the Declarants reserve for themselves, their heirs, executors, administrators, successors and assigns the right to use the Mitigation Property for all purposes not inconsistent with the purposes of these restrictive

covenants. Further, the Declarants expressly reserve for themselves, their heirs, executors, administrators, successors, and assigns the following rights, which may be exercised upon providing 30 days prior written notice to the Corps, except where expressly provided otherwise:

5.1 Wildlife and Forestry Management. Declarants reserve the right to naturally manage the Mitigation Property to preserve and improve the existing forest and wildlife resources. Declarants reserve the right to remove or trim vegetation hazardous to persons or property, and harvest and manage timber downed or damaged due to natural forces, such as fire, storms, insects, or infectious organisms, to the extent necessary to protect the environment. Such management activities shall be carried out only after approval by the Corps and in accordance with Best Management Practices as set out by the U.S. Forest Service.

5.2 Landscape Management. Declarants reserve the right to undertake landscaping necessary to prevent severe erosion or damage to the Mitigation Property or portions thereof, or significant detriment to existing or permitted uses, to the extent such landscaping is consistent with preserving the natural condition of the Mitigation Property.

5.3 Recreation. Declarants reserve the right to engage in outdoor, non-commercial recreational activities, including hunting, fishing, and similar recreational or educational activities, consistent with cumulatively very small impacts and with the continuing natural condition of the Mitigation Property, but excluding planting and burning. No prior written notice to the Corps is required.

5.4 Road Maintenance. Declarants reserve the right to maintain existing roads, trails, or other rights of way. Maintenance shall be limited to: removal or pruning of dead or hazardous vegetation; application of permeable materials (e.g., sand, gravel) necessary to correct or impede erosion; grading; replacement of culverts, water control structures, or bridges; and maintenance of roadside ditches.

5.5 Signs. Declarants reserve the right to erect signs on the Mitigation Property to mark the Mitigation Property as a protected area and to convey information on restricted use of the Mitigation Property, including no trespassing signs, no mowing signs, temporary signs indicating the Mitigation Property is for sale, signs identifying the trees, vegetation, wetlands or conservation ecological services of the Mitigation Property, and signs identifying the owner.

5.6 Mitigation Measures. Declarants reserve the right to undertake restoration and mitigation measures required under the Mitigation Plan or otherwise required under law.

6. Rights of Access and Entry. The Declarants grant the Corps and its authorized agents an irrevocable and assignable right to enter in, on, over and across the Mitigation Property to inspect and monitor the Mitigation Property; to implement the Mitigation Plan or take corrective measures under the Mitigation Plan; to take any actions necessary to maintain or restore the natural condition of the Mitigation Property; or to take any actions necessary to verify compliance with these restrictive covenants. The Declarants also grant the Corps and its authorized agents an irrevocable and assignable right to enter and exit over and across the Property as necessary to access the Mitigation Property for the purposes listed above. No rights

of access or entry to or use of any portion of the Mitigation Property or Property is granted or conveyed to members of the general public by these restrictive covenants.

7. Enforcement. The Declarants grant the Corps, as third party beneficiary hereof, a discretionary right to enforce these restrictive covenants in a judicial action against any person or other entity violating or attempting to violate these restrictive covenants; provided, however, that no violation of these restrictive covenants shall result in forfeiture or reversion of title. In any enforcement action for violations of this Declaration, an enforcing agency shall be entitled to complete restoration of the Mitigation Property for any violation, as well as any other remedy available under law or equity, such as injunctive relief and administrative, civil or criminal penalties. No omission or delay in acting by the Corps shall bar subsequent enforcement rights or constitute a waiver of any enforcement right. These enforcement rights are in addition to, and shall not limit, enforcement rights available under other provisions of law or equity, or under any applicable permit or certification. Nothing herein shall limit the right of the Corps to modify, suspend, or revoke the Permit. Nothing herein shall be construed to authorize the Corps to institute proceedings against the Declarants for changes to the Mitigation Property due to acts of God, natural disasters, or unauthorized acts of third parties outside the control of the Declarants, so long as the compensatory mitigation is completed and determined by the Corps to be successful in accordance with the Mitigation Plan.

8. Notice to Government.

8.1 Any permit application, or request for certification or modification, which may affect the Mitigation Property, made to any government entity with authority over wetlands or other waters of the United States, shall expressly reference and include a copy (with the recording stamp) of these restrictive covenants.

8.2 The Declarants shall provide the Corps with written notice of any legal action affecting this Declaration, including but not limited to foreclosure proceedings, tax sales, bankruptcy proceedings, zoning changes, adverse possession, abandonment, condemnation proceedings, and the exercise of the power of eminent domain. For any action that might result in this Declaration being voided or modified, such notice shall be provided at least sixty (60) days before such action would be taken.

9. Property Transfers. The Declarants shall include the following notice on all deeds, mortgages, plats, or any other legal instrument used to convey any interest in the Property and/or Mitigation Property:

> NOTICE: This Property is subject to a Declaration of Restrictive Covenants for Conservation dated [*insert date of Declaration*], recorded in the [*insert County name*] County Clerk's Office on [*insert date recorded*] in Deed Book [*insert number*], Page [*insert number*] and enforceable by the U.S. Army Corps of Engineers.

The Declarants shall provide the Corps with written notice of any such grant, transfer or conveyance of any interest in any or all of the Property at least sixty (60) days prior to the grant, transfer or conveyance. The notice shall include the name, address, and telephone number of the

prospective transferee, a copy of the proposed deed or other documentation evidencing the conveyance, and a survey map that shows the boundaries of the portion of the Property and/or Mitigation Property being transferred. Failure to comply with this paragraph does not impair the validity or enforceability of these restrictive covenants.

10. Warranties.

10.1 The Declarants represent and warrant that:

[Select one of the following paragraphs. Select the first paragraph A if the only encumbrances are utility easements. Select the second paragraph A if there are interests other than utility easements.]

A. The Declarants are the co-owners of the Mitigation Property and hold fee simple title which is free and clear of any and all liens, loans, claims, restrictions, easements and encumbrances, except as otherwise identified in Exhibit [*Insert Exhibit Reference*] hereto;

A. To the extent that other interests in the Mitigation Property exist, the holders of such interests have agreed to subordinate their interests in the Mitigation Property to this Declaration, pursuant to the subordination agreement(*s*) attached hereto as Exhibit [*Insert Exhibit Reference*];

B. The Declarants have identified all other parties that hold any interest (e.g. encumbrances) in the Mitigation Property and has notified such parties of the Declarants' intent to grant this Declaration;

C. This Declaration will not materially violate or contravene or constitute a material default under any other agreement, document, or instrument to which the Declarants are a party, or by which the Declarants may be bound or affected;

D. This Declaration will not materially violate or contravene any zoning law or other law regulating use of the Mitigation Property; and

E. This Declaration does not authorize a use of the Property that is otherwise prohibited by a recorded instrument that has priority over the Declaration.

10.2 The Declarants represent and warrant that, to the best of their knowledge:

A. No substance defined, listed, or otherwise classified pursuant to any federal, state, or local law, or regulation, as hazardous, toxic, polluting, or otherwise contaminating to the water or soil, has been released, generated, treated, stored, used, disposed of, deposited, abandoned, or transported in, on, from, or across the Mitigation Property;

B. There are no underground storage tanks located on the Mitigation Property whether presently in service or closed, abandoned, or decommissioned;

C. The Mitigation Property is in compliance with all federal, state, and local laws, regulations, and permits and there is no pending or threatening litigation in any way affecting, involving, or relating to the Mitigation Property and its use; and

D. The Mitigation Property is not land-locked and there is access to the Mitigation Property by road, dedication of pathway or by an access easement.

11. Notification. Any notice, request for approval, or other communication require by these restrictive covenants shall be sent by registered mail, pre-paid postage, to the following addresses (or such addresses as may be hereinafter specified by notice pursuant to this paragraph):

To Declarants: _____
_____
_____

[Select one of the following address blocks. If the permit action is with the North Section select the first Corps address block. If the permit action is with the South Section select the second Corps address block. If the permit action is with the West Section (Newburgh Office) select the third Corps address block.]

To Corps: U.S. Army Corps of Engineers
OP-FN, Room 752
P.O. Box 59
Louisville, KY 40201-0059

To Corps: U.S. Army Corps of Engineers
OP-FS, Room 752
P.O. Box 59
Louisville, KY 40201-0059

To Corps: U.S. Army Corps of Engineers
Newburgh Regulatory Office
6855 State Road 66
Newburgh, IN 47630-9794

12. Amendment. After recording, these restrictive covenants may only be amended by a recorded document signed by the Corps and Declarants. Amendment shall be allowed at the discretion of the Corps, in consultation with resource agencies as appropriate, and then only in exceptional circumstances. Any amendment must be consistent with the requirements of Sections 404 of the Clean Water Act. There shall be no obligation to allow an amendment.

13. Termination. This Declaration is intended to be perpetual in nature and run with the land as set forth in paragraph 1 of this Declaration. However, if the Corps determines that the compensatory mitigation undertaken on the Mitigation Property set forth in the Mitigation Plan is not successful and the alternative mitigation identified does not involve the Mitigation Property, then the Declarants and Corps may terminate this Declaration by written agreement.

14. Recording. Declarants shall record this Declaration in the official property records of the Office of the [*Insert County Name*] County Clerk within thirty (30) days of execution of this Declaration by the Declarants, and shall, within thirty (30) days of recording, provide the Corps with a copy of the recorded Declaration and exhibits. Declarants may re-record this instrument at any time as may be required to preserve its rights.

15. Successors in Interest. All references to the Corps shall include successor governmental agencies, departments, or divisions, or any other successor entities prescribed by law.

16. Severability Provision. Should any separable part of these restrictive covenants be held contrary to law, unenforceable, or void, the remainder shall continue in full force and effect.

IN WITNESS WHEREOF, the Declarants have duly executed this Declaration effective on the date first written above, but actually on the date set forth below.

DECLARANTS

By: _____
[Type name Under Line]

_____
[Type Title]

_____
Date

[*Insert State or Commonwealth]*)
) ss:
COUNTY OF _____)

On this _____ day of _____, 2011, before me, a Notary Public in and for said County and State, personally appeared _____, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person*(s)* whose name

[is/are] subscribed to the within instrument, and acknowledged to me that *[he/she/they]* executed same for the purposes contained therein.

WITNESS my hand and official seal.

_____
NOTARY PUBLIC

_____
My commission expires:

AS-BUILT CONSTRUCTION, MONITORING, MAINTENANCE, AND SUCCESS CRITERIA

Introduction and Location: This document outlines the mitigation requirements for RFA1. It discusses timing and duration of monitoring. It outlines required maintenance actions. Monitoring materials and methods are then described in detail for both streams and wetlands. Stream and wetland success criteria requirements are detailed.

The permit area is located southeast of Central City, Kentucky. The boundary lies just East of Hwy 431, South of the Wendell H. Ford Western Kentucky Parkway. From east bound on the Western Kentucky Parkway, take the Central City exit, Hwy 431, and proceed south. The entrance is approximately 2-miles, turn left onto St. Hwy 2107. The site gate is approximately 1.5-miles on the right and is marked by a white gate. The contact person is Sean Jones and his phone number is 270-619-2143. Check-in is required.

Conveyance of Information: The locations of all mitigation waters are depicted on the Monitoring Map. The monitoring results and maintenance actions will be recorded on the Summary Tables. Specific information and photos will be included on each data form. The as-built specs (plan/profile/cross-section with structure placements and plantings) and associated map will be included for areas where construction was completed during the previous growing season. HGM, Biology, including MBI, KIBI, and water quality will also be assessed as required by the permit.

Mitigation Requirements: The following tables detail the itemized amount of mitigation required by the permit, amount to be assessed, and amount of existing mitigation determined successful by the monitoring report. It also will give the amount of maintenance conducted, amount of as-built mitigation, and the amount still needed to meet permit requirements.

Stream Mitigation						
Flow Regime	**Linear feet Required**	**Linear feet Assessed**	**Linear feet Successful**	**Linear feet Maintenance**	**Linear feet As-Built**	**Linear feet Needed**
Intermittent	6,254					
Ephemeral	2,196					

Wetland Mitigation						
Cowardin Classification	**Acres Required**	**Acres Assessed**	**Acres Successful**	**Acres Maintenance**	**Acres As-Built**	**Acres Needed**
PFO	25.4					

Timing: The growing season on this site begins 15 March and ends 21 October, or with actual observed growing conditions. As specified in the permit, monitoring will only be conducted on areas where construction was completed prior to the beginning of the growing season. The required monitoring period for this permit is 5-years with the option for ACOE to release earlier if ecological performance criteria are met.

Wetland Monitoring: Soils, vegetation, and hydrology will be assessed biannually and entirely during the growing season.
Riparian Vegetation: Survival, diversity, and volunteers will be assessed biannually and entirely during the growing season.
Stream Flow and Stability: Assessments will be conducted annually at any time during the year.
Biology and Water Quality: Assessments will be conducted annually at any time during the state approved sampling season.

Maintenance: Maintenance actions will be detailed on the summary table. These actions include EX (excavation), EC (erosion control), RP (replanting) and VR (vegetation removal). These maintenance actions are divided into two categories: major and minor. Major actions may constitute a failed monitoring period, minor actions do not when they have been corrected by the end of the monitoring year. Areas with 3 consecutive years of major maintenance go into CON (contingency). Non-approved vegetation must be eradicated from the site every year.

Major actions: Heavy excavation used to completely reshape, relocate, or reorient a channel, replace stream structures, or modify wetland hydrology features such as dikes or ditch plugs.

Minor actions: Light excavation used to backfill settled areas or dress rill erosion, erosion control practices to prevent or repair minor erosion, chemical or mechanical vegetation removal, or replanting.

Stream Monitoring Methods and Materials: This section details the various assessments, sampling and equipment that will be used to conduct stream monitoring.

Stationing and Data: Stream monitoring will consist of one permanent data station per 500-linear feet of intermittent stream and 1500-linear feet of ephemeral stream. Station monuments are iron t-posts painted safety orange. Streams will be assessed at the head of riffle. Information collected at each data station will include photo documentation, Level III Rosgen assessment, and RBP assessment. MBI and KIBI calculations will be collected on both S1 and S2 (See Monitoring Map). The results will be compared to initial biological assessments. These assessments will be conducted using the standard operating procedure (SOP) in place at the time the baseline data was collected. Subsequent changes to the original SOP and relevance in reporting will be detailed as necessary.

Riparian Vegetation Monitoring Methods and Materials: Riparian vegetation will be monitored according to DNR protocol for assessing the survival of woody vegetation. Monitoring consists of one permanent station per 3-ac management unit. Station monuments are iron t-posts painted safety orange. Data consists of photos and survival calculations as detailed below.

RPM Saplings: #3 saplings from the Tree Species list below will be planted at 60/acre. A sampling plot with an area of 7,260-ft^2 will be centered on the monument. When planted at a rate 60/acre, each stem occupies 726-ft^2. As such, 10 stems would be planted in a sample area. Planted stems will be recorded by species and percent survival calculated. The percent survival of each riparian management unit will be calculated.

Bare Root Seedlings: Seedlings from the Tree Species list below will be planted at 450/acre. A circular sampling plot with a 30-ft radius will be centered on the monument. A circular plot with a 30-ft radius samples 2,840-ft^2. When planted at a rate 450/acre, each stem would occupy 96.7-ft^2. As such, 29 stems would be planted in a sample area. Planted stems will be recorded by species and percent survival calculated. The percent survival of each riparian management unit will be calculated.

Herb Strata: At least 8 species from the Herbaceous Species list will be planted. A circular sampling plot with a 5-ft radius will be centered on the monument. Vegetation will be assessed based on percent cover by each planted species. Volunteer species will be counted and their combined percentage of the total cover recorded.

Wetland Monitoring Methods and Materials: This section details the various assessments, sampling, and equipment to be used to conduct wetland monitoring.

Stationing and Data: Wetland monitoring consists of one permanent data station per 3-ac of mitigation wetland. Station monuments will be iron t-posts painted safety orange. Stations will be generally located along the perimeter to ensure the final boundary will meet the required acreage. The amount and location of monitoring wells with data loggers to verify wetland hydrology is dependent upon differential settling in the wetland mitigation valley. Wells will be installed in locations that lack visible hydrology indicators. Further details about wells are found below in the paragraph titled Hydrology. Delineation for the purpose of verifying mitigation success is according to the most current version of the '87 Manual and Regional Supplement. In this case, it is the Eastern Mountains and Piedmont (ERDC/EL TR-10-9, July 2010).

Soils: Verification of hydric soils will be conducted by onsite observation of field indicators per the NTCHS (National Technical Committee on Hydric Soils: *Field Indicators of Hydric Soils in the United States,* NRCS current version). However, growing substrates used in wetland mitigation may not develop field indicators due to parent material, location, chemistry, time, or other reasons according to the NTCHS. In such cases, other techniques will be used to verify hydric soils. These include appropriate scientific means to detect the presence of reducing conditions.

Colorimetric: If a minimum amount of iron is present in the parent material, then reduction may be documented with the use of alpha, alpha-dipyridyl (2, 2'dipyridyl). When saturated by groundwater and wetted with 2, 2'dipyridyl, 60% of a layer at least 4-in thick within the upper 12" must turn pink or red within 30 seconds.

Electrochemical: Reducing conditions may be detected and reported in terms of –eH with the use of Copper/Cadmium soil probes. When employed, these probes would be inserted into the soil at a data station, allowed to equalize, then calibrated and measured with an –eH meter. Reduction may also be detected within the interstitial water column inside of the groundwater monitoring wells. In this case, a calibrated glass probe would be inserted and measured with an –eH meter. In either method, readings less than zero indicate reduction.

Hydrogeomorphic Method (HGM) Variables: The variables that will be used to show a functional increase in the wetland mitigation using the ACOE HGM will include water table depth, soil organic matter, flood storage volume (acre/feet), and overbank flooding frequency. The variables selected for annual comparison are consistent with restoration goals and will reflect hydrologic, biochemical, and habitat functional progression (see table below).

Vegetation: Success is generally contingent on a specific assemblage of hard-mast trees. The use of field indicators is limited to circumstances approved by ACOE. Sampling methods for verifying successful establishment of hydrophytic vegetation are detailed below.

RPM Saplings: #3 saplings from the Tree Species list below will be planted at 60/acre. A sampling plot with an area of 7,260-ft^2 will be centered on the monument. When planted at a rate 60/acre, each stem occupies 726-ft^2. As such, 10 stems would be planted in a sample area. Planted stems will be recorded by species and percent survival calculated. The percent survival of each riparian management unit will be calculated.

Bare Root Seedlings: Seedlings from the Tree Species list below will be planted at 450/acre. A circular sampling plot with a 30-ft radius will be centered on the monument. A circular plot with a 30-ft radius samples 2,840-ft^2. When planted at a rate 450/acre, each

stem would occupy 96.7-ft^2. As such, 29 stems would be planted in a sample area. Planted stems will be recorded by species and percent survival calculated. The percent survival of each riparian management unit will be calculated.

Herb Strata: At least 8 species from the Herbaceous Species list will be planted. A circular sampling plot with a 5-ft radius will be centered on the monument. Vegetation will be assessed based on percent cover by each planted species. Volunteer species will be counted and their combined percentage of the total cover recorded.

Hydrology: Verification of wetland hydrology will include the use of data loggers. These devices will be employed in conjunction with ACOE ERDC TN-WRAP-05-02. Field indicators will also be documented. The supplement is not limited to only those indicators listed therein, and affords the use of other evidence when supported with appropriate documentation.

Stream Success Criteria: Streams are considered successful when they meet the criteria listed below. Flow regimes must be at least as strong as proposed or stronger.

RBP: RBP scores will be taken at each stream data station referenced on the monitoring map. Scores will be recorded on EPAs Physical Characterization/Water Quality Data Sheets and will be included in the monitoring report.

As the mitigation streams are getting established in years 1-3 of monitoring, scores are projected to range in the marginal category or higher with minimum scores of 80 for ephemeral streams and 85 for intermittent streams. In years 4-5, scores are expected to begin to transition from the marginal category to sub-optimal or higher. Ephemeral streams shall have a total score of at least 95 and intermittent streams 100. (see tables below).

Riparian Vegetation: This section details the criteria for success.

RPM Saplings: #3 saplings from the Tree Species list below will be planted at 60 stems/acre. These areas must have at least 90% survival across each riparian management unit.

Bare Root Seedlings: Seedlings from the Tree Species list below will be planted at 450/acre. These areas must have at least 80% survival across each riparian management unit.

Volunteer Species: Beneficial volunteer species may be maintained on site with ACOE approval. To control proliferation of unapproved species, mitigation sites will be maintained by chemical or mechanical methods to the extent that targeted species are not compromised.

Diversity: No single planted tree species may comprise significantly more than 25% of the surviving species. No single planted herbaceous species may comprise significantly more than 30% of the surviving species.

Wetland Success Criteria: Wetlands are considered successful when the minimum required acreage of wetland meets the criteria listed below.

Soils: Hydric soils are considered successful when, based on the Eastern Mountains and Piedmont, “the soils are sufficiently wet in the upper part to develop anaerobic conditions during the growing season”.

Hydrology: Wetland hydrology is considered successful when, based on the Eastern Mountains and Piedmont, "the soils are sufficiently wet in the upper part to develop anaerobic conditions during the growing season".

Vegetation: Hydrophytic vegetation is considered successful when *more than* 50% of the dominant species from all strata are OBL, FACW, or FAC and meets the Cowardin classification of PFO.

RPM Saplings: #3 saplings from the Tree Species list below will be planted at 60 stems/acre. These areas must have at least 90% survival. A sampling plot with an area of 7,260-ft^2 will be surveyed. When planted at a rate 60/acre, each stem occupies 726-ft^2. As such, of 10 stems planted in a sample area, 9 must survive.

Bare Root Seedlings: Seedlings from the Tree Species list below will be planted at 450/acre. These areas must have 80% survival. A sampling plot with an area of 2,840-ft^2 will be surveyed. When planted at a rate 450/acre, each stem occupies 96.7-ft^2. As such, of 29 stems planted in a sample area, 23 must survive.

Volunteer Species: Beneficial volunteer species may be maintained on site with ACOE approval. To control proliferation of unapproved species, mitigation sites will be maintained by chemical or mechanical methods to the extent that targeted species are not compromised.

Diversity: No single planted tree species may comprise significantly more than 25% of the surviving species. No single planted herbaceous species may comprise significantly more than 30% of the surviving species.

Tree Species: Riparian and PFO			
Species	**Common Name**	**Strata**	**Indicator**
Carya glabra	Pignut Hickory	T	FACU
C. laciniosa	Shellbark Hickory	T	FAC
C. Ovata	Shagbark hickory	T	FACU
C. Illinoensis	Pecan	T	FACU
Quercus alba	White Oak	T	FACU
Q. lyrata	Overcup Oak	T	OBL
Q. flacata	Southern Red Oak	T	FACU
Q. imbricaria	Shingle Oak	T	FAC
Q. muhlenbergii	Chinkapin Oak	T	NI
Q. rubra	Northern Red Oak	T	FACU
Q. shumardii	Shumardi Oak	T	FAC
Q. bicolor	Swamp White Oak	T	FACW
Q. michauxii	Swamp Chestnut Oak	T	FACW
Q. pagoda	Cherrybark Oak	T	FACW
Q. macrocarpa	Bur Oak	T	FAC
Q. palustris	Pin Oak	T	FACW
Taxodium distichum	Bald Cypress	T	OBL
- Where used, bare root tree seedlings will be planted at 450/acre and must be at least 30" tall at planting. - Where used, RPM tree saplings will be planted at 60/acre and must be size #3. - Species are planted according to their tolerance to water depth. For example, OBL species are planted in wetter areas than FACU species.			

Herbaceous Species: PFO Understory, Alluvial Valley & Stream Banks				
Genus and/or Species	**Common Name**	**Propagule/Rate**	**Strata**	**Indicator**
Acorus calamus	Sweet Flag	R 125/ac	H	OBL

Agrostic spp	Bent Grass	S 6oz/ac	H	FACW
Alisma subcordatum	Water Plantain	BRP 50/ac	H	OBL
Alopercurus spp.	Foxtail	S 6oz/ac	H	FACW
Arundinaria Gigantea	Giant Cane	R 50/ac	S	FAC
Asclepias spp.	Milkweed	R 50/ac	H	OBL
Carex spp.	Sedge	S 1-12oz/ac	H	FACW-OBL
Cinna latifolia	Wood Reed	S 1-12oz/ac	H	FACW
Commelina spp.	Dayflower	R 50/ac	H	FACW
Cyperus spp.	Flat Sedge	S 1-13oz/ac	H	FACW-OBL
Echinochloa spp.	Indian Millett	S 3lb/ac	H	FACW
Eleocharis spp.	Spike Rush	S 1/2-2oz/ac	H	OBL
Elymus spp.	Wild Rye	S 2lb/ac	H	FAC-FACW
Glyceria striata	Fowl Manna Grass	S 4oz/ac	H	OBL
Hottonia Inflata	Featherfoil	Any available	H	OBL
Iris spp.	Water Iris	R 125/ac	H	OBL
Juncus spp.	Rush	S 4oz/ac	H	FACW-OBL
Leersia spp.	Cutgrass	S 1lb/ac	H	OBL
Lemna spp.	Duck Weed	BRP 2bu/ac	H	OBL
Nelumbo lutea	American Lotus	T 125/ac	H	OBL
Nuphar spp.	Pond Lilly	R 125/ac	H	OBL
Nymphaea spp.	Water Lilly	T 125/ac	H	OBL
Panicum spp.	Deer Tongue Grass	S 6oz/ac	H	FAC
Peltandra spp.	Arrow Arum	T 125/ac	H	OBL
Polyganum spp.	Smart Weed	R,S 125,5lb/ac	H	FACW-OBL
Pontederia cordata	Pickerel Plant	BRP 125/ac	H	OBL
Potamogeton spp.	Pondweed	T 125/ac	H	OBL
Sagittaria spp.	Arrow Head	T 125/ac	H	OBL
Scirpus spp.	Bull Rush	S 4oz/ac	H	FACW-OBL
Sparganium spp.	Burreed	S 8oz/ac	H	OBL
Trifolium hybridum	Alsike Clover	S 4oz/ac	H	FAC
Tripsacum dactyloides	East. Gamma Grass	S 4lb/ac	H	FACW
- No less than 8 of the above listed Genus and/or Species were planted. - Species were planted according to their tolerance to water depth. For example, Milkweed and Dayflower were planted in shallower water from 3” to saturated soil, while Lotus and Lilly will be planted in deeper water up to 18”.				
Live Stakes: Stream Banks				
Genus and/or Species	**Common Name**	**Propagule/Rate**	**Strata**	**Indicator**
Acer spp.	Maple	LS 1/3ft^2	T/S	FAC-FACW
Alnus sp.	Alder	LS 1/3ft^2	T/S	FAC-FACW
Cornus sp.	Dogwood	LS 1/3ft^2	T/S	FAC-FACW
Platanus occidentalis	Sycamore	LS 1/3ft^2	T/S	FACW
Populus deltoides	Cottonwood	LS 1/3ft^2	T/S	FAC
Salix spp.	Willow	LS 1/3ft^2	S	OBL
- Live stake use is limited to bioengineering in developing stream bank stability. The planting zone generally extends from the toe of bank to 5’ beyond the top of bank, not across the riparian area. Stakes are generally oriented in staggered rows along riffles, runs, glides, and outside bends, with clusters around vane structures.				

RFA1 Mine – Stream Monitoring Summary Table

Stream ID	Lat	Long	Eph' ≤1500	Int' ≤500	Meets Success	RBP Score	Issue	Reason	Action	Year 1	Year 2	Year 3	Year 4	Year 5
S1	37.25828	-87.09860												
S1-1	37.25913	-87.09885												
S1-2	37.26022	-87.09912												
S1-3	37.26160	-87.09939												
S1-4	37.26269	-87.09976												
S1-5	37.26355	-87.10005												
S1-6	37.26465	-87.10042												
S1-7	37.26615	-87.10097												
S2	37.25811	-87.09781												
S2-1	37.25879	-87.09721												
S2-2	37.25980	-87.09629												
S2-3	37.26071	-87.09568												
S2-4	37.26175	-87.09553												
S2-5	37.26275	-87.09538												
S2-6	37.26401	-87.09525												

Type	Eph'	Int'
Assessed		
Successful		
Maintenance		

Abbreviation Key

EX - Excavation
EC – Erosion Control
RP - Replanting
VR - Vegetation Removal
CON -Contingency

Minimum RBP Scores to Meet Success on Mitigation Streams (Monitoring Years 1-3)		
Habitat Parameter	**Intermittent**	**Ephemeral**
Epifaunal Substrate/Available Cover	6-10	6-10
Pool Substrate Characterization	6-10	6-10
Pool Variability	6-10	6-10
Sediment Deposition	6-10	6-10
Channel Flow Status	6-10	6-10
Channel Alteration	6-10	6-10
Channel Sinuosity	6-8	6-8
Bank Stability	6-10	6-10
Vegetative Protection	6-10	6-10
Riparian Vegetative Zone Width	6-10	6-10
Total	**85**	**80**

Minimum RBP Score to Meet Success on Mitigation Streams (Monitoring Years 4-5)		
Habitat Parameter	**Intermittent**	**Ephemeral**
Epifaunal Substrate/Available Cover	8-12	8-12
Pool Substrate Characterization	8-12	8-12
Pool Variability	8-12	8-12
Sediment Deposition	8-12	8-12
Channel Flow Status	8-12	8-12
Channel Alteration	8-12	8-12
Channel Sinuosity	6-8	6-8
Bank Stability	8-12	8-12
Vegetative Protection	8-12	8-12
Riparian Vegetative Zone Width	8-12	8-12
Total	**100**	**95**

RFA1 Mine – Riparian Buffer Monitoring Summary Table

Stream ID	Lat	Long	Meets Success	Tree Survival ≥80%	Veg ≥70% Listed	Dom ≤25% 1 sp.	Issue	Reason	Action	Year				
										1	2	3	4	5
RB1	37.26188	-87.09918												
RB2	37.26330	-87.10025												
RB3	37.26478	-87.10017												
RB4	37.26617	-87.10122												
RB5	37.26741	-87.10133												
RB6	37.26134	-87.09531												
RB7	37.26291	-87.09568												
RB8	37.26436	-87.09506												

ACRES	
Assessed	
Successful	
Maintenance	
Avg. Survival Rate	

Abbreviation Key	
EX - Excavation	
EC - Erosion Control	
RP - Replanting	
VR - Vegetation Removal	
RB - Riparian Buffer	
CON - Contingency	

RFA1 Mine – Wetland Monitoring Summary Table

Wetland ID	Lat	Long	PFO AC.	Meets Success	Tree survival ≥80%	Veg ≥70% listed	Dom ≤25% 1 sp.	Issue	Reason	Action	Year				
											1	2	3	4	5
W1	37.25799	-87.09721													
W1-1	37.25886	-87.09949													
W1-2	37.26106	-87.09994													
W1-3	37.26090	-87.09830													
W1-4	37.25952	-87.09801													
W1-5	37.25996	-87.09688													
W1-6	37.26079	-87.09680													
W1-7	37.26065	-87.09524													
W1-8	37.25934	-87.09601													

ACRES	PFO
Assessed	
Maintenance	
Successful	

Abbreviation Key
EX - Excavation
EC - Erosion Control
RP - Replanting
VR - Vegetation Removal
CON - Contingency

HGM Monitoring Table

Variable	Year 1	Year 2	Year 3	Year 4	Year 5
Water Table Depth					
Soil Organic Matter					
Flood Storage Volume					
Overbank Flood Frequency					

Biological Assessment and Water Quality Monitoring

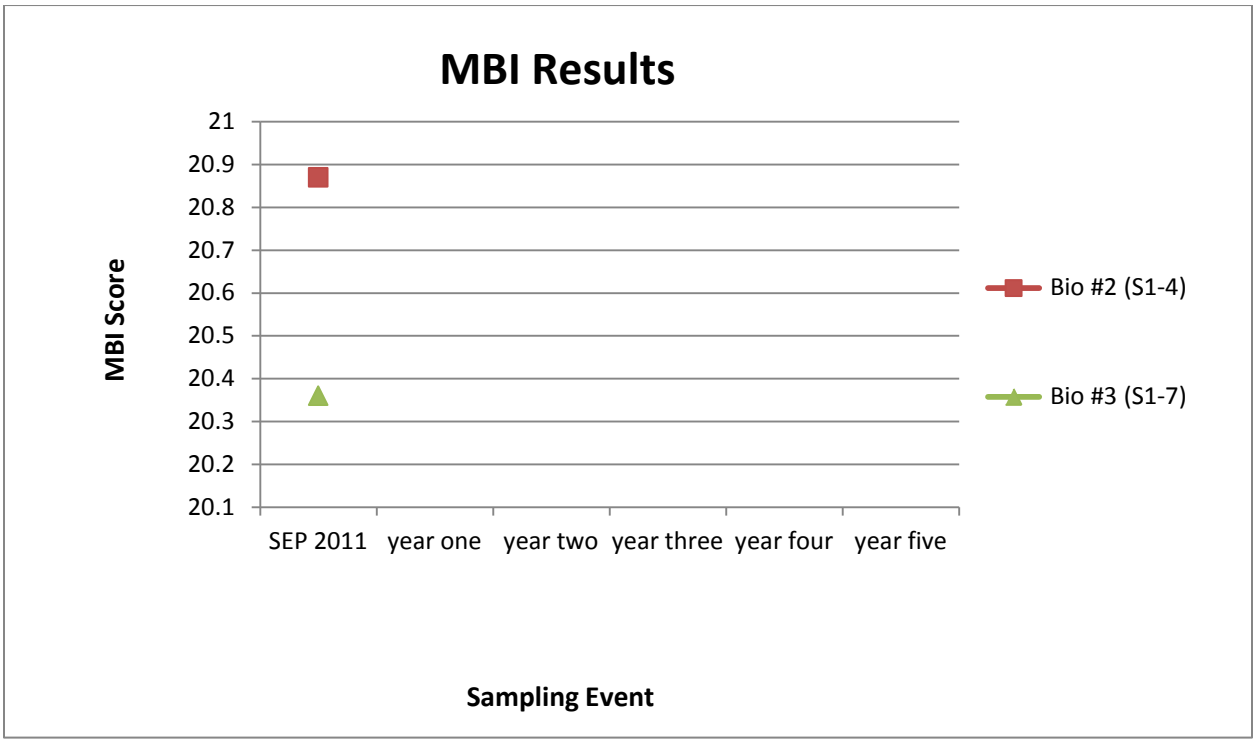
Upon completion of stream mitigation, biological monitoring will resume as water flow becomes reestablished. Monitoring will follow the same methods, procedures, and scoring used in the initial Biological Assessment and Water Quality Report. This allows for comparison and analysis of the return of biological communities to mitigation streams. For ease of comparison, graphs will be established documenting the Index of Biotic Integrity (IBI) results for the RFA1 site as the biological communities return over time. Each graph will display the scores for a number of sampling sites; MBI and KIBI will be separated. A graph showing the average of all MBI and KIBI scores will also be included. In the graph legend, bio-assessment sites are listed with the corresponding mitigation monitoring site (example, Bio #2 (S1-4)). A graph set is attached.

Macroinvertebrate and fish assessments were done at different times by different consulting firms. Therefore, there are variations between reports, maps, sample locations, and nomenclature. Every effort has been made to make a clear distinction between the two in the following graphs and tables.

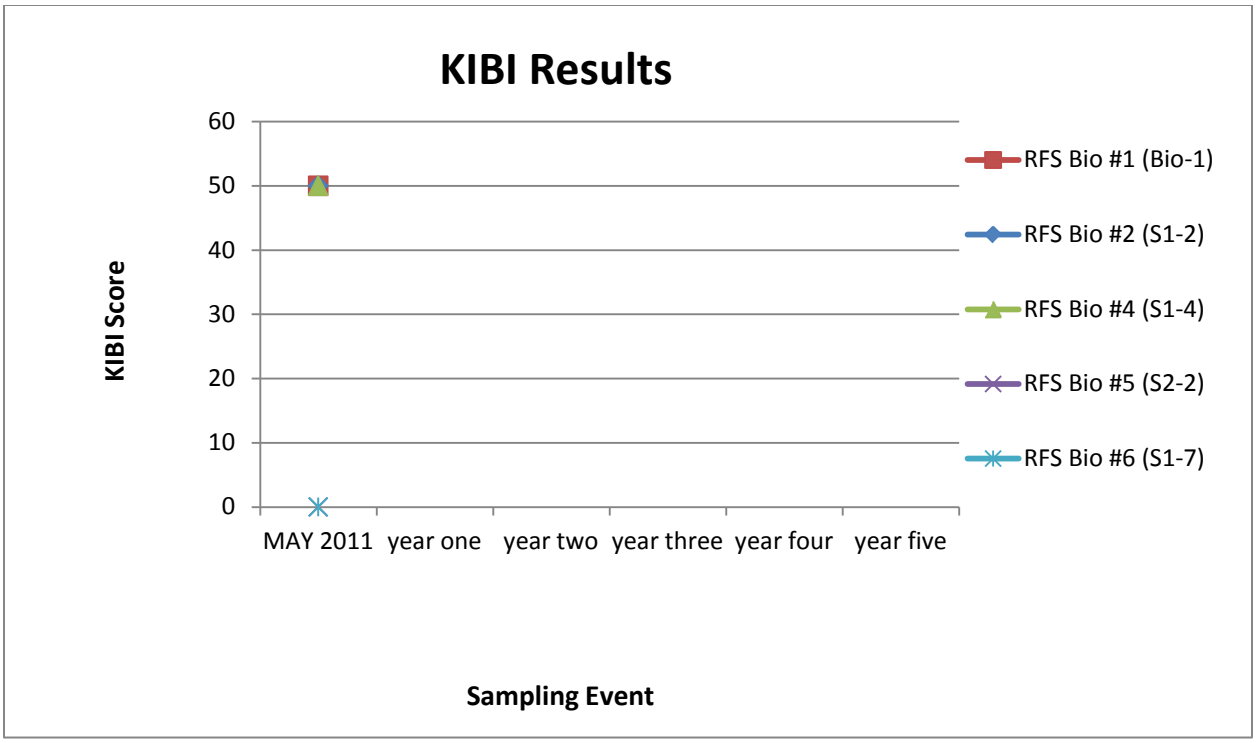
Initial bio-assessment sites (MBI) Bio #1, 4, 5, and 6 did not have water and had no MBI score. Therefore, it is only possible to compare these results to the two sites that did have water when sampled.

Initial bio-assessment site (KIBI) Bio #3 did not have water and had no KIBI score.

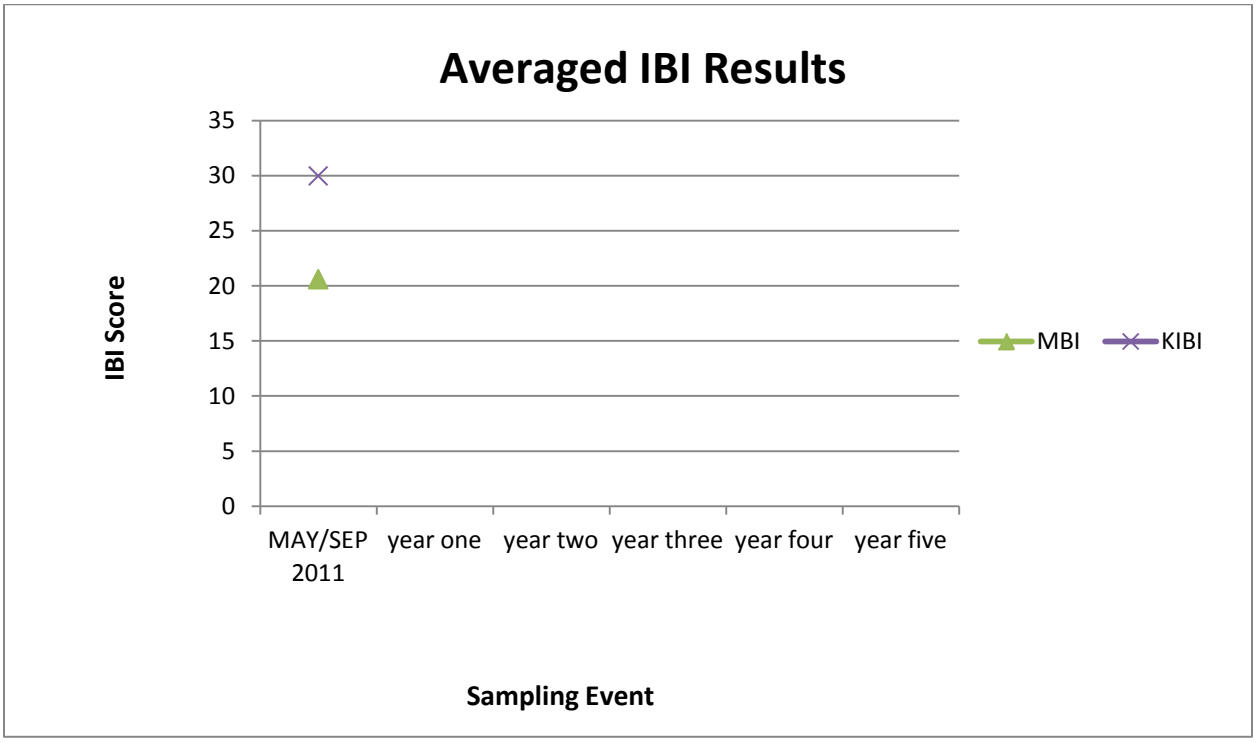
Graph set will look similar to the following.



Sampling Event	SEP 2011	year one	year two	year three	year four	year five
Bio #2 (S1-4)	20.87					
Bio #3 (S1-7)	20.36					



Sampling Event	MAY 2011	year one	year two	year three	year four	year five
RFS Bio #1 (Bio-1)	50					
RFS Bio #2 (S1-2)	50					
RFS Bio #4 (S1-4)	50					
RFS Bio #5 (S2-2)	0					
RFS Bio #6 (S1-7)	0					



Sampling Event	MAY/SEP 2011	year one	year two	year three	year four	year five
MBI	20.62					
KIBI	30					

CUMULATIVE IMPACTS ANALYSIS

Introduction and Location: This document was developed to address cumulative impacts to the following watershed based on past, present, and reasonably foreseeable future activities. This document was developed in conjunction with permitting the proposed RFA1 surface mine. The area of this project is located near Pond Creek which is in the Plum Creek - Pond Creek Watershed. Based on the existing conditions of this project area and the proposed reclamation and mitigation activities, this project will have a long-term, net beneficial impact to the ecosystem functions of this site and the parent watershed.

Definitions: Impacts refer to the modification of an environmental resource by an outside action. Impacts may be beneficial or detrimental depending on the current existing condition and targeted future conditions of the project. The extent of an impact can be spatial and/or temporal. The degree of the impact can be major, minor, or negligible.

Cumulative Impacts: Two or more individual effects which, when considered together, are considerable and increase other environmental implications.

Short-term Impacts: Impacts that generally do not affect a site beyond completion of the project, i.e. site preparation, mining, and reclamation.

Long-term Impacts: These impacts generally are the affects that extend into future conditions after project completion.

Existing Conditions: The Plum Creek - Pond Creek Watershed has been extensively impacted by logging, agriculture, and mining. Development type impacts also exist in the watershed and include residential and transportation. However, development impacts only account for a minor percentage of the total land use in the watershed.

Pond Creek, Plum Creek, and an unnamed tributary to Pond Creek are on the 303d list of impaired streams (KDOW, 2010) (See Impaired Streams Map). According to the Environmental Protection Agency (EPA), the probable sources causing the impairments are: acid mine drainage, unspecified nonpoint source, surface mining (resource extraction), irrigated crop production, loss of riparian habitat, managed pasture grazing, non-irrigated crop production, urban related runoff/stormwater, and hydromodification (EPA, 2010) (See Land Cover and Coal Mine Maps).

	UT to Pond Creek 0 – 2.4	Plum Creek 0 – 1.7	Plum Creek 1.7 – 3.9	Pond Creek 4.8 – 7.6	Pond Creek 7.6 – 11.7
Impairment	1. Cause Unknown	1. Chloride – Salinity/TDS/Sulfates	1. Fecal Coliform – Pathogens 2. Physical Habitat Alterations 3. Sedimentation/Siltation	1. Chloride – Salinity/TDS/Sulfates 2. Sedimentation/Siltation	1. Chloride – Salinity/TDS/Sulfates 2. Sedimentation/Siltation

Overview: The Plum Creek - Pond Creek Watershed is a twelve digit (051100030404) HUC watershed located in central Kentucky (see HUC Map). The watershed encompasses approximately 21,249-acres in Muhlenberg County. The majority of the watershed (50.6%) is classified as forest/shrubland and agricultural comprises 16%.

Land Cover: The following is a summary of vegetative cover in the watershed determined from ArcGIS (USDA, 2001):

Agriculture (Row Crop and Pasture): 16%
Developed: 7%
Open Water: 4%
Natural Forest and Shrubland Vegetation: 51%
Natural Grassland: 15%
Wetlands (Forested and Emergent): 7%

Anthropogenic Watershed Impacts: All land-use activities, including agriculture, landfills, coal mines, logging, gas and oil production, concentrated animal feeding operations, and urban sprawl, affect water quality. The predominant land-use activities within a watershed are good indicators of the potential contaminant sources within that watershed (KDOW, 2001).

Population: The 2010 total population in the watershed is approximately 3,544 (Census 2010).

Agriculture: 16% of the watershed is covered by agriculture as described in the land cover section above. Farming utilizes chemicals such as fertilizers, herbicides, or insecticides that could be carried off into a stream by stormwater runoff. Other impacts include soil erosion, resulting in sediments entering the streams, and pathogens and nutrients from animal wastes entering the streams (KDOW, 2001).

Livestock: An Agricultural Feeding Operation (AFO) is defined as a lot or facility where animals are confined and maintained for a total of 45 days or more in any 12-month period and are fed by means other than grazing. Concentrated Animal Feeding Operations (CAFOs) must meet the definition of an AFO, and there must be a specified number of animals confined at the operation. A facility is a CAFO if the operation contains more than 300 Animal Units confined and there is a discharge to the waters of the Commonwealth or if there are more than 1000 Animal Units confined. Operations that are defined as CAFOs are required to obtain a Kentucky Pollutant Discharge Elimination System (KPDES) Permit (KDOW, 2001). Currently, there are no KPDES permits for CAFOs in the watershed.

Crop Production: Field crops suited to the soils and climate of the watershed include many that are not commonly grown. Corn and soybeans are the main row crops. Grain sorghum, popcorn, sunflowers, navy beans, sugar beets, peanuts, potatoes, and similar crops also are suited to these soils. Wheat is the main close growing crop. Rye, barley, and oats are also grown. Tobacco is the main special crop (USDA, 1980).

Water Pollution: A number of substances including nutrients, bacteria, oxygen-demanding wastes, metals, and toxic substances, cause water pollution. Sources of these pollution-causing substances are divided into two broad categories: point sources and nonpoint sources. Point sources are typically piped discharges from wastewater treatment plants, large urban and industrial storm water systems, and other facilities. Nonpoint sources can include atmospheric deposition, groundwater inputs, and runoff from urban areas, agricultural lands and others (IDEM, 2000).

Point Sources: The State of Kentucky requires all point source discharges of pollutants to the waters of the Commonwealth to be permitted. This includes stormwater runoff

discharges from certain types of industries and construction sites exceeding five (5) acres. The permitting program known as the Kentucky Pollution Discharge Elimination System (KPDES) is managed by the Division of Water. Any person or entity proposing a new discharge must submit an application for approval at least 180 days prior to the proposed date that discharge is anticipated (KDOW, 2001).

There are three active KPDES permits within the watershed. All three are categorized as minor discharges.

There may be unpermitted, illegal discharges to the Plum Creek - Pond Creek Watershed system. Illegal discharges of residential wastewater (septic tank effluent) to streams and ditches from straight pipe discharges and old inadequate systems likely exist within the watershed.

Nonpoint Sources: Nonpoint source pollution is also known as runoff or diffuse pollution. Unlike pollution from industrial and sewage treatment plants, NPS pollution is caused by rainfall or snowmelt moving over and through the ground. NPS pollution is the No. 1 contributor to water pollution in Kentucky, accounting for approximately two-thirds of the water quality impairments in Kentucky's streams and lakes. As the runoff moves, it picks up and carries pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground aquifers.

While the bulk of water quality data is presented in terms of surface water, NPS pollution affects all water resources including rivers, streams, lakes, wetlands, and groundwater. Groundwater and surface water are often difficult, and sometimes impossible, to separate. From sinking streams to springs to large karst rivers, groundwater and surface water are intimately linked in Kentucky (KDOW, 2011).

Agriculture: Tons of topsoil washes off cultivated fields every year and much of it ends up in streams and lakes. The problem grows when fertilizers and pesticides applied to that soil get washed into the water. Improperly managed waste from livestock also damages streams and lakes, robbing them of oxygen. (KDOW, 2011).

Urban/Residential: Chemicals and fertilizers used on grass or in gardens, along with car emissions, oil, antifreeze, paint, battery acid, pet waste, household cleaners and other impurities can get into our water. They are carried by runoff from parking lots, driveways, lawns, through storm drains and melts, or placed on the ground by unsuspecting homeowners. (KDOW, 2011).

Failing Septic Systems: Properly functioning septic systems separate out solids into a holding tank, and filter liquid waste through the soil. When they are improperly maintained, or poorly located, pathogen-containing waste may emerge at the surface where it can be washed into streams and lakes by rain, or it can seep directly into groundwater (KDOW, 2011).

Straight Pipes: Some homes or other buildings are neither on sewers nor have an installed septic system. Instead, wastes are illegally "straight piped" to a creek, ditch or other area outside the structure. In addition to the odor this creates, straight pipes directly contribute pathogenic wastes to our streams, posing a health hazard (KDOW, 2011).

Construction: When soil is disturbed by grading work and best management practices (BMPs) are not properly used and maintained, sediment may enter streams, rivers and lakes through runoff. Oils, paints, cleaners and other pollutants used in construction can also damage our waters (KDOW, 2011).

Forestry: Poor logging roads and skid trails made as timber is dragged from an area can cause erosion. Operating machinery in or near a stream can also cause erosion (KDOW, 2011).

Mining: When mines are not properly constructed, operated or reclaimed, they cause significant NPS pollution. Sediment is washed into streams when reclamation is inadequate. The impurities in coal create acids when exposed to water and air, and these acids often wash into streams or seep into groundwater (KDOW, 2011).

Resource Concerns: The success in restoring water quality in the Plum Creek - Pond Creek Watershed is fundamentally based on identifying the specific geographic problem areas; identifying all sources contributing to the impairment of the water body; and quantifying the contribution of a pollutant by each source.

Failing Septic Systems and Straight Pipe Discharges: Septic system failure and straight pipe discharges can result in harmful bacteria, pathogens, and nutrients contaminating ground wells or local streams, threatening public health and aquatic life.

Fish Consumption Advisories: Currently, there are no fish consumption advisories in the watershed.

Nonpoint Source Pollution: Nonpoint source pollution is contamination of ground water and waterways that results from everyday activities such as fertilizing the lawn, walking pets, changing motor oil, and littering. With each rainfall, pollutants are washed into storm drains that flow into our waterways and ocean. They also can soak into the ground, contaminating the ground water below.

Point Sources: There are three active KPDES permitted dischargers in the Plum Creek - Pond Creek Watershed. However, there are likely illegal point source discharges, such as tiles discharging septic tank effluent.

KDOW has been working to ensure regulations are current relative to federal regulations, new federal rules, applicable case law, and technological advances. In the past year, KDOW has updated regulations pertaining to KPDES permits and water quality standards, including antidegradation.

Biological Conditions: According to the Kentucky Department for Natural Resources Division of Mine Permits Cumulative Hydrologic Impact Assessment (CHIA), only the lower 4.8 miles Pond Creek fully support aquatic communities. No specific sampling information was available.

Coal Mining: Coal was first discovered and used in Kentucky in 1750. The first commercial mine was opened near Paradise, Muhlenberg County in 1820. According to the Kentucky Coal Association, Kentucky has been one of the top three coal producers in the United States for the last fifty years (KCA, 2011).

Approximately 20% of the watershed has been impacted by surface mining. There is a larger percentage that has been mined, but the data available is not specific whether it was surface or underground (See HUC Coal Mine Map). Mining continues today. Information is based on best available data. (KY Mine Mapping Information System 2011).

Contribution to Economy: The Kentucky coal industry brought approximately $5.3 billion (assuming average $58 coal price) into Kentucky during 2009 through coal sales to customers in 25 other states and 4 foreign countries. Kentucky coal companies paid $270.34 million in coal severance taxes in Fiscal Year 2009-10. After nearly three decades of declining employment due to increased efficiency and fewer mines, Kentucky mining employment has risen in the last decade. Western Kentucky mines have added 1,200 employees for a total now of approximately 3,831 persons. Muhlenberg County directly employs 951 people which were 6.8% of the labor force. Mining wages for the county in 2009 was over $60-million which was 25.8% of total county wages (KCA, 2011).

Coal Production: The most recent production of coal in the Plum Creek - Pond Creek Watershed occurs at Oxford's Briar Hill Mine.

The following table shows the production there:

COAL PRODUCTION AT BRIAR HILL MINE

Year	Total Tonnage
2011	1,287,946
2010	1,006,567
2009	955,062
2008	913,347
2007	952,977

(KY Mine Mapping Information System, 2011)

Reclamation Efforts: The Division of Abandoned Mine Lands (AML) works throughout the coal fields of Kentucky to protect the public from health and safety problems caused by mining that occurred prior to 1982. AML restores abandoned mines and the problems they cause to a safe and environmentally stable condition through reclamation projects. AML administers a bond forfeiture reclamation program, acid mine drainage program, and water supply replacement program (KDNR, 2011). Attempts were made to contact Kentucky DNR Division of Abandoned Mine Lands to find out if there have been any AML projects in the watershed, however no information was provided.

RFA1 Mine Site: This site is a prototypical example of the evolution of land use in this watershed. 48% of this site has been previously mined. As such, the physical, chemical and/or biological integrity of streams on this site has been degraded. The majority of streams on site are drains formed naturally through erosional processes.

Stream existing conditions: Streams were assessed and stream restoration was designed according to Rosgen and the North Carolina Stream Restoration Program. Cumulative Stream impacts are based on existing vs. future stream conditions. Stream conditions are based on Entrenchment, Flood Prone Area (flood plain), Bank Height ratio (access to flood plain), Riparian Zone, Stream impacts and Channel stability. Excessive Entrenchment is the #1 detriment of stream stability and function. "The consequence of an entrenched channel is accelerated stream bank erosion, land loss, aquatic habitat loss, lowered water table, reduced land productivity and downstream sedimentation" (Rosgen, 1997). Entrenchment is the most

determining factor of channel stability and function. Current regulatory standards for mitigation success are based on channel stability.

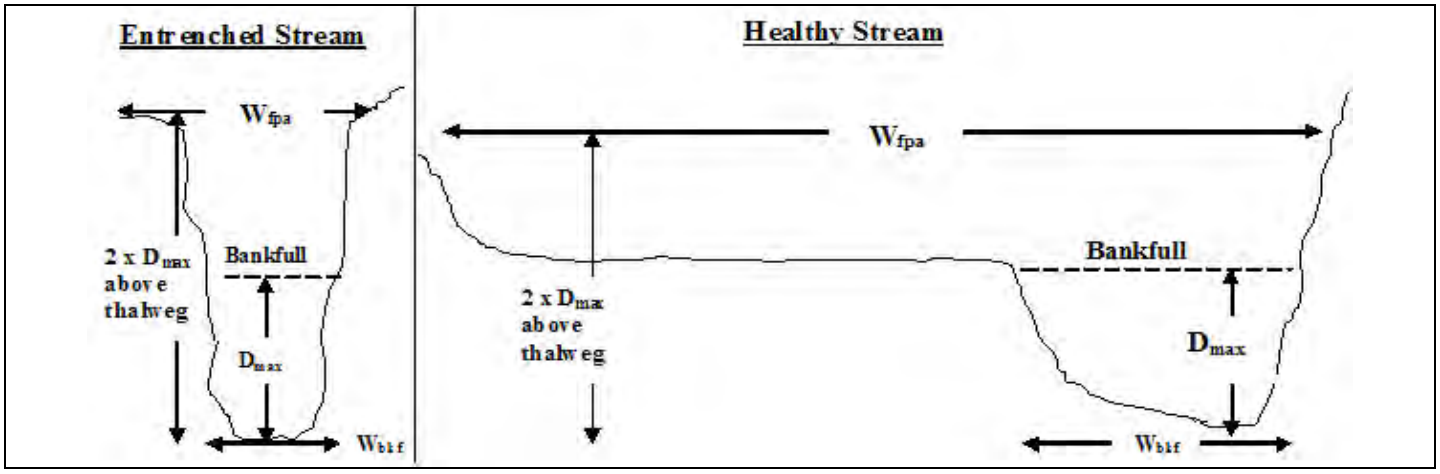
Definitions and Calculations:

ER = Wfpa / Wbkf

Wfpa = Width of the flood prone area

Wbkf = Width bank full

The minimum acceptable floodplain ratio is 2.2X Wbkf. The minimum acceptable range in restoration is 3X-5X Wbkf, with ≥10X being optimum. This restoration program targets a 10X flood prone area.



Streams on-site are mostly incised channels. Most streams are entrenched and have very little to no floodplain access. This increases the amount of concentrated runoff. These scenarios preclude the development of natural stream morphology with respect to meander length, radius of curvature, width to depth ratios, riffle/run/pool series and multiple other indicators of natural stream morphology. High bank height ratios retard the streams access to flood plain relief, and create high energy flows capable of suspending excessive sediment loads. This detrimental effect compounds stream impairment by increasing entrenchment and wiping out habitat features. The concentrated and expedited movement of water off the site also short circuits ground water recharge and reduces the flow regime of intermittent streams. Riparian and stream bank vegetation is almost exclusively exotic, invasive, shallow rooted or otherwise non-target. Below is an itemized list of stream conditions based on stream length and percent total of the area to be impacted.

Stream Existing Conditions (Impact Area) – 10,634 linear feet total	
Condition	Percent of Site
10,634-linear feet are Channels with compromised geomorphology; Riparian zones are <10'-wide deep-rooted on both banks or developed in shallow-rooted vegetation or bare; Bank erosion is High, Very High or Extreme; The channel has five or more stream impacts within 0.5-mile upstream including culverts, pipes, or other manmade modifications; or the channel is aggrading/degrading.	100%
0-linear feet are Channels with slightly compromised geomorphology; Riparian zones 10' to 25'-wide deep-rooted on both banks or developed in medium-rooted vegetation; Bank erosion is Moderate; The channel has no more than three upstream impacts within 0.5-mile including culverts, pipes, or other manmade modifications totaling less than 100'; or the channel is slightly aggrading/degrading.	0%
0-linear feet are Channels with appropriate geomorphology; Riparian zones >25' wide on both banks and developed in deep-rooted native vegetation (target); Bank erosion is Very Low or Low; The channel has no more than one impact within 0.5-mile less than 30' long; and the channel is stable.	0%

Cumulative Stream Benefits: Benefits are based on existing and future stream conditions. The increase in Flood Prone Area (stream access to floodplain relief during high flow conditions) is the single largest contributor to stream benefits associated with this project.

Cumulative Stream Benefits (Impact Area)		
Parameter	Existing	Future
Channels with appropriate geomorphology; Bank erosion is Very Low or Low; The channel has no more than one impact within 0.5-mile less than 30' long; and the channel is stable.	0-feet	8,439 feet
Flood Prone Area	2.0-acres	20.0-acres

Wetlands: The wetlands on-site are PFO, PSS, and PEM. The vegetation consists of predominately non-target, invasive, and/or exotic species such as sycamore, sweetgum, maple, autumn olive, poison ivy, honeysuckle, and P hragmites. This composition of species is considered undesirable. Furthermore, most of the existing wetlands are separated and have no interaction with surrounding streams. The lack of connectivity and poor species composition makes these wetlands less functionally effective. Re-establishing connectivity with the mitigation streams floodplains and planting target vegetation is believed to create a long-term ecological lift to the watershed.

Cumulative Wetland Benefits: Benefits are determined based on a percent increase in target species composition, wetland/stream interaction, and enhanced hydroperiod.

Species Composition: The new PFO species composition will include hard-mast trees naturally found in a climax wetland community.

Wetland/Stream Interaction: All wetlands on-site will have well established interaction with intermittent streams. Some of the wetlands on-site are connected by swales or gullies or otherwise lack direct stream interaction. This plan proposes to reorient streams and wetlands in proximity to maximize wetland and stream interaction. The value of wetland and stream interaction is mainly relevant to physical water quality benefits as well as the migration of aquatic and terrestrial organisms.

Enhanced Hydroperiod: The establishment of wetland hydrology with increased frequency and duration and greater potential of reduction will create an enh anced hydroperiod. Re-establishing wetlands within stream floodplains facilitates more frequent flooding and enhanced nutrient cycling via redox. Redox conditions are the biochemical reduction of nitrogen, iron, manganese, sulfur, and carbon compounds in the soil due to saturation. Ionically charged plant surfaces degrade polluting compounds suspended in water. Enhanced hydroperiod increases the time of contact between pollution and charged surfaces to provide water quality enhancement. The value of enhanced hydroperiod is mainly relevant to chemical water quality benefits and nutrient cycling.

Cumulative Wetland Benefits (Impact Area)			
Parameter	Existing (acres)	Increase (acres)	Future (acres)
Palustrine Forested Wetland	5.6	19.8	25.4
Target Species Composition	0.0	25.4	25.4
Wetland/Stream Interaction	9.1	16.3	25.4
Enhanced Hydroperiod	9.1	16.3	25.4

Cumulative Impacts of the Project: Impacts are short-term in the temporal context and minor with respect to the degree of effect. The vegetation lost during the operation is predominately non-target, and erosion is always controlled according to SMCRA standards.

Conclusion: Coal mining has had a great deal of impact in the Plum Creek - Pond Creek Watershed. This is because of the amount of coal that was/is present within this area and also because until SMCRA laws were put into place, much less was known about the negative effects mining was having on the environment and what efforts could be made to reduce them. Oxford recognizes the need to minimize mining impacts while still contributing to the nations need for coal as a source of energy.

Because this proposed operation will contribute a considerable cumulative benefit to the local ecosystem, it can actually be viewed as an opportunity for ecosystem restoration. It is important for all stakeholders to consider that landscape level ecosystem restoration of this watershed is a free by-product of the proposed mining operation. In closing, this project undoubtedly produces a considerable long-term net cumulative benefit ecologically to Pond Creek and the larger Plum Creek - Pond Creek Watershed.

References

Kentucky Division of Water (KDOW). February 2010. 2010 Integrated Report to Congress on the Condition of Water Resources in Kentucky. Volume II. 303(d) List of Surface Waters.

U.S. Department of Agriculture (USDA). 2001. National Land Cover Dataset. Accessed with ArcGIS October, 2011.

Kentucky Division of Water (KDOW). March 2001. Green and Tradewater Basins Status Report. Accessed October 2011. http://water.ky.gov/watershed/Documents/Green%20and%20Tradewater%20Rivers/GTBasinStatusComplete.pdf

Kentucky Division of Water (KDOW). 2011. Nonpoint Source Pollution. Accessed October 2011. http://water.ky.gov/nsp/Pages/default.aspx

USDA Soil Conservation Service, 1980. Soil Survey of McClean and Muhlenberg Counties, KY.

IDEM, Office of Water Management, June 2000. Watershed Restoration Action Strategy for the Highland-Pigeon Watershed, Accessed January 2011. http://www.in.gov/idem/4349.htm

Kentucky Coal Association (KCA) and Kentucky Geological Survey, 2011. Kentucky Coal Facts – 11th Edition Pocket Guide.

Reinelt, L.E. and R.R. Horner. 1990. *Characterization of the Hydrology and Water Quality of Palustrine Wetlands Affected by Urban Stormwater.* Puget Sound Wetlands and Stormwater Management Research Program. King County Department of Natural Resources, King County, WA.

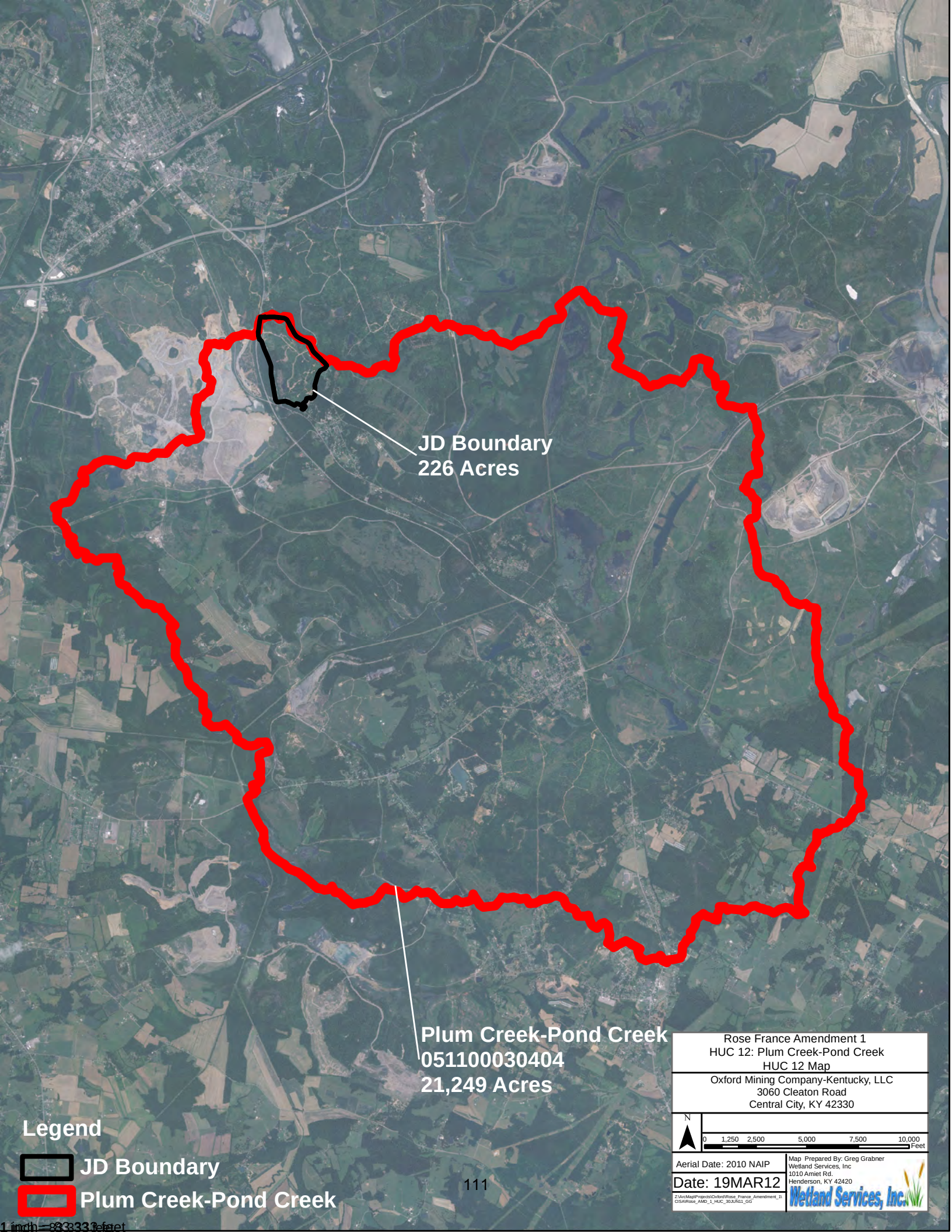
USEPA. 2001. *National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution.* Washington, DC: U. S. Environmental Protection Agency. *EPA 841-B-01-001*.

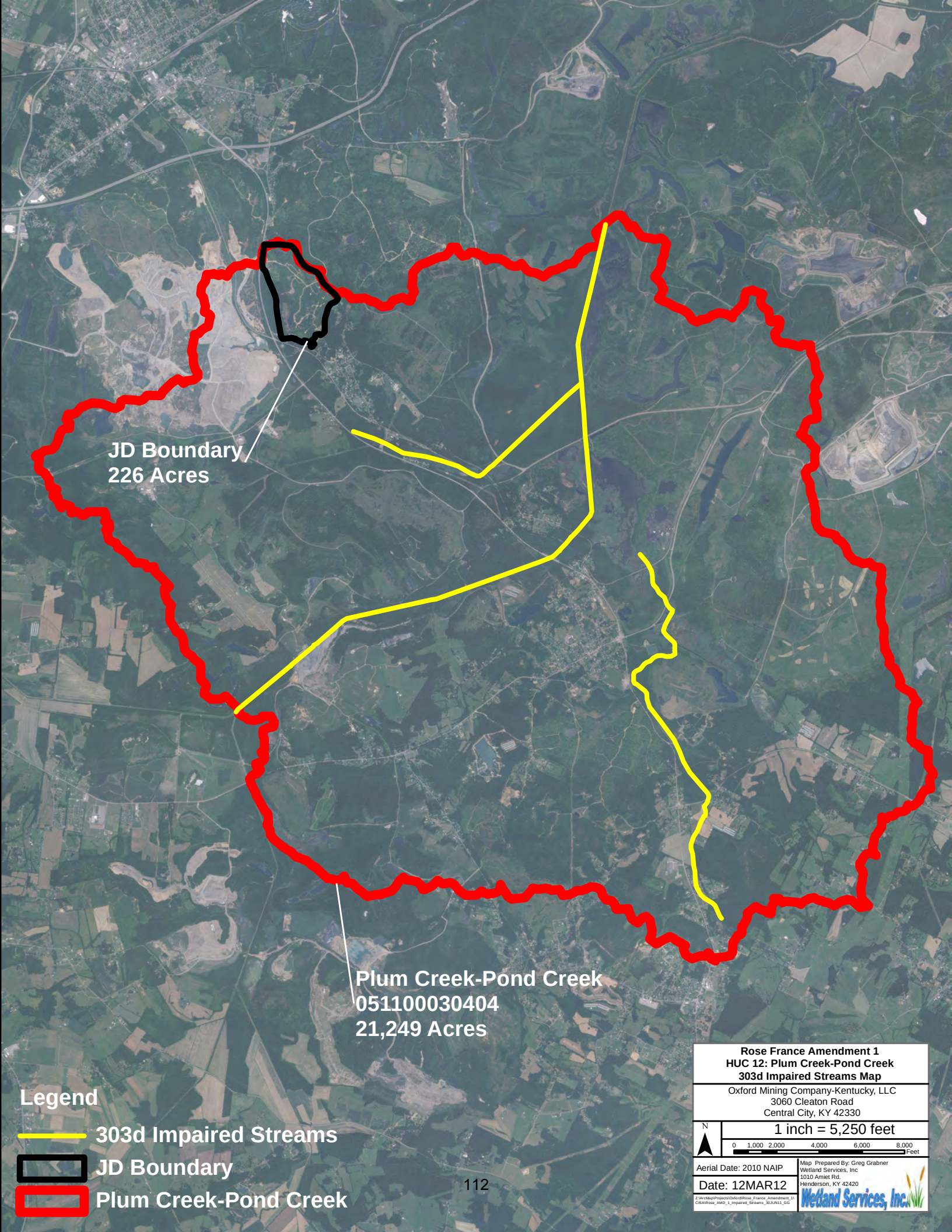
Rosgen, D.L. 1997. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision, 1481 Stevens Lake Road, Pagosa Springs, CO 81147. Pg 1 – Introduction

EPA 2010. Watershed Assessment, Tracking, & Environmental Results. Kentucky, Pond Watershed. Causes of Impairment for Reporting Year 2010. http://iaspub.epa.gov/tmdl_waters10/attains_watershed.control?p_huc=05110006&p_cycle=&p_report_type=T

Sparrow, F.T. and Associates, CCTR Briefing: Coal, Steel and the Industrial Economy Hammond IN, December 12, 2008. Measuring the Contribution of Coal to Indiana's Economy.

Kentucky Mine Mapping Information System, Office of Mine Safety and Licensing. 1025 Capital Center Drive. Frankfort, Kentucky 40601. 502-573-0140, e-mail: John.Hiett@ky.gov


JD Boundary
226 Acres
Plum Creek-Pond Creek
051100030404
21,249 Acres
Legend
JD Boundary
Plum Creek-Pond Creek
Rose France Amendment 1
HUC 12: Plum Creek-Pond Creek
HUC 12 Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
0 1,250 2,500 5,000 7,500 10,000
Feet
Aerial Date: 2010 NAIP
Date: 19MAR12
Z:\ArcMapProjects\Oxford\Rose_France_Amendment_1\CISAlRose_AMD_1_HUC_30JUN11_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.
1 inch = 833333 feet


JD Boundary
226 Acres
Plum Creek-Pond Creek
051100030404
21,249 Acres
Legend
303d Impaired Streams
JD Boundary
Plum Creek-Pond Creek
Rose France Amendment 1
HUC 12: Plum Creek-Pond Creek
303d Impaired Streams Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 5,250 feet
0 1,000 2,000 4,000 6,000 8,000 Feet
Aerial Date: 2010 NAIP
Date: 12MAR12
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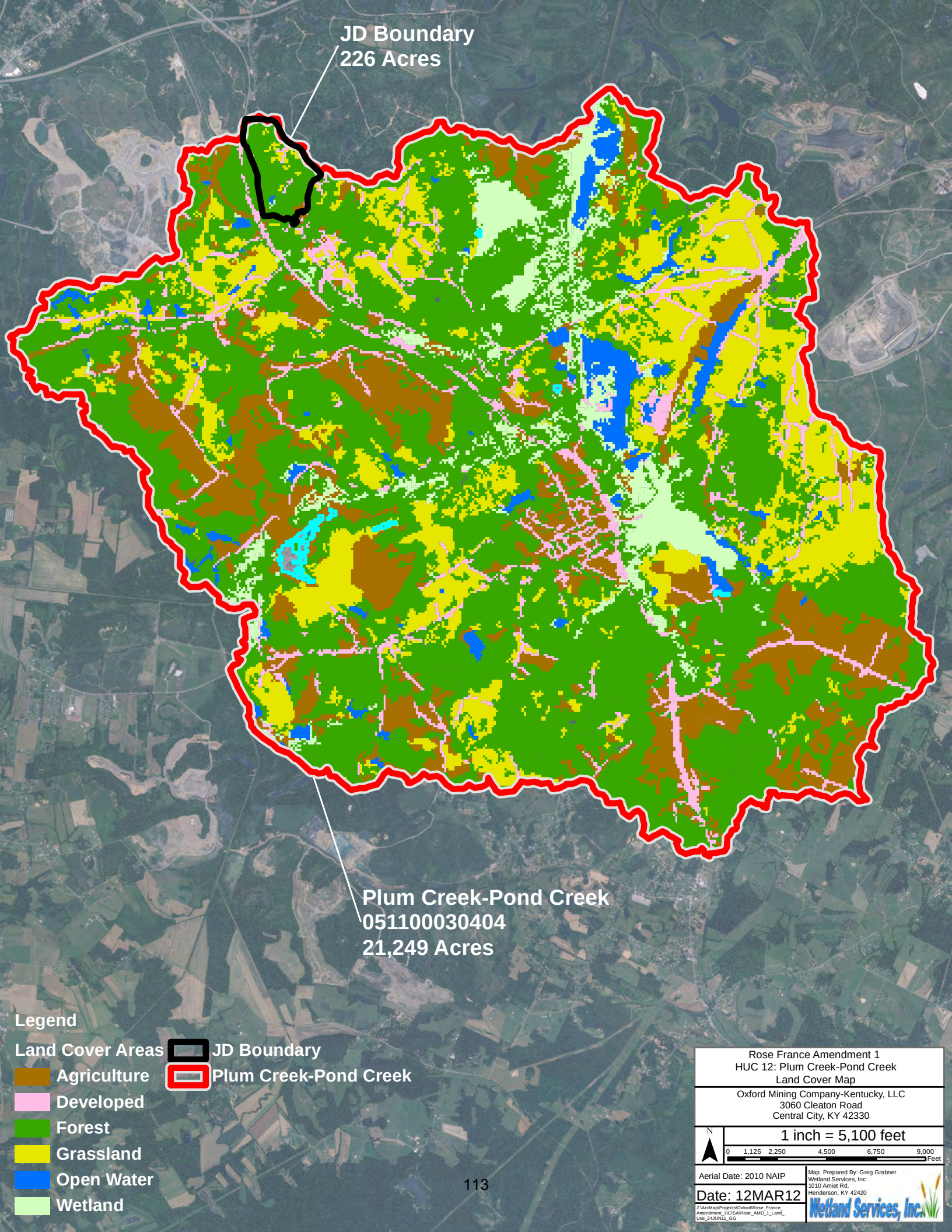
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


JD Boundary
226 Acres
Plum Creek-Pond Creek
051100030404
21,249 Acres
Legend
Land Cover Areas
Agriculture
Developed
Forest
Grassland
Open Water
Wetland
JD Boundary
Plum Creek-Pond Creek
Rose France Amendment 1
HUC 12: Plum Creek-Pond Creek
Land Cover Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 5,100 feet
0 1,125 2,250 4,500 6,750 9,000
Feet
Aerial Date: 2010 NAIP
Date: 12MAR12
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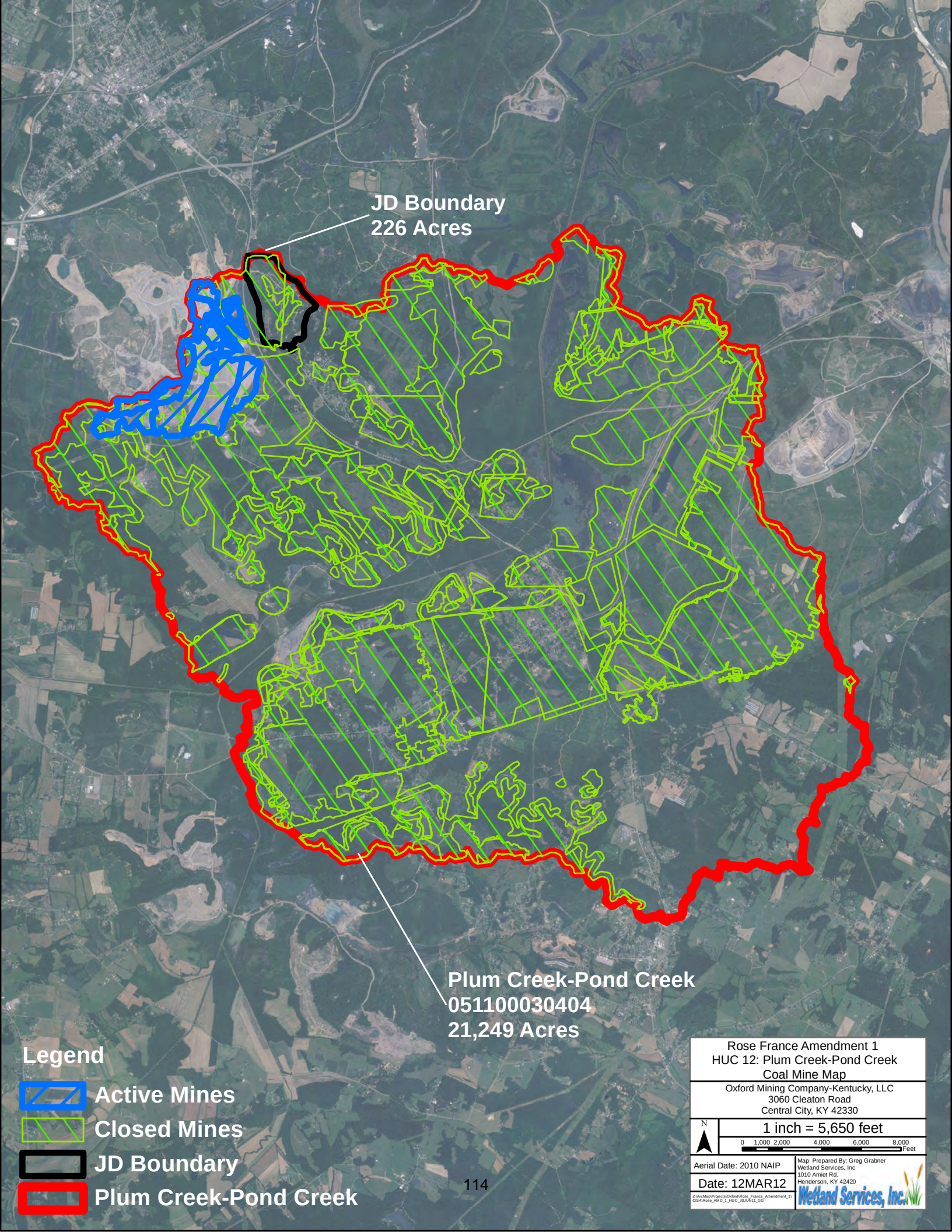
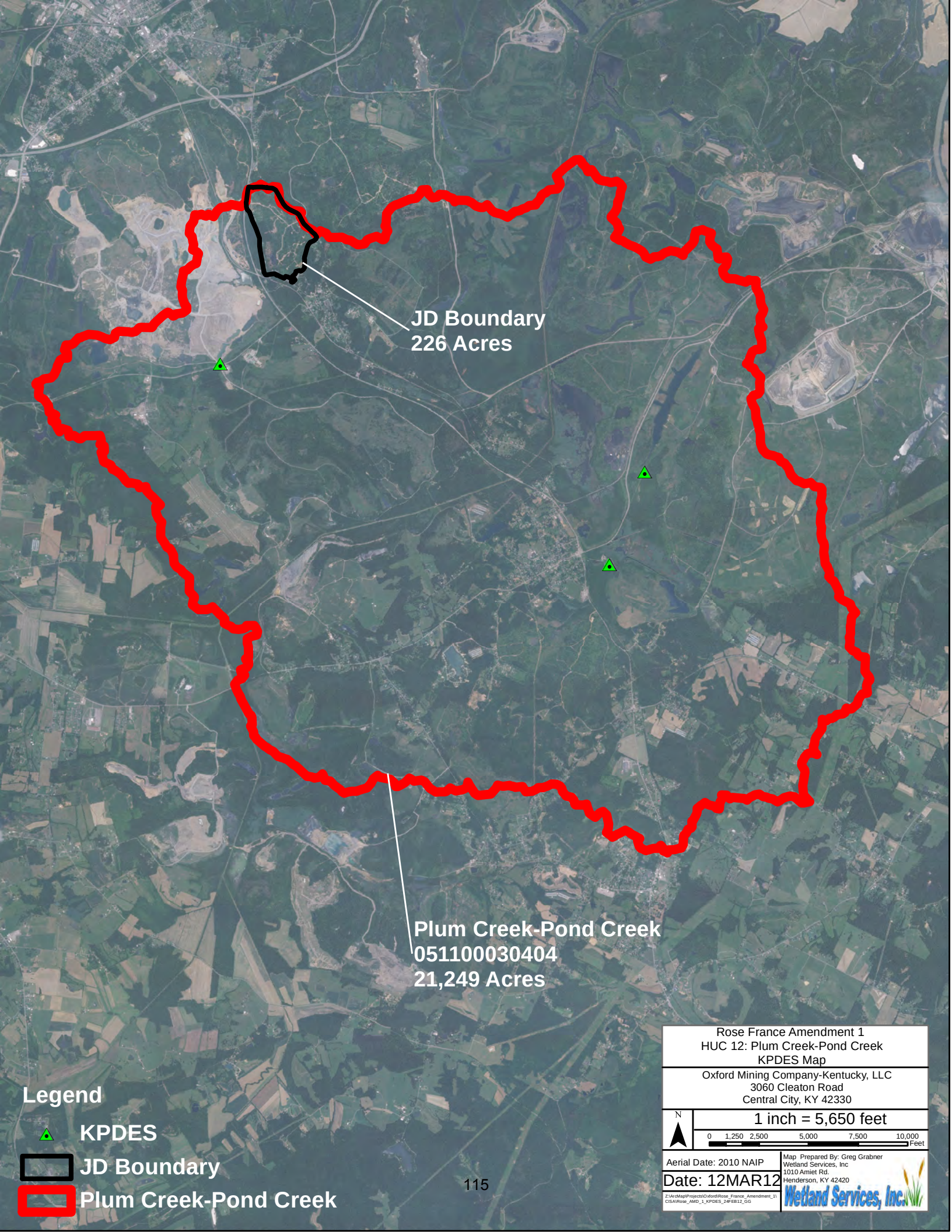
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


JD Boundary
226 Acres
Plum Creek-Pond Creek
051100030404
21,249 Acres
Legend
Active Mines
Closed Mines
JD Boundary
Plum Creek-Pond Creek
Rose France Amendment 1
HUC 12: Plum Creek-Pond Creek
Coal Mine Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 5,650 feet
0 1,000 2,000 4,000 6,000 8,000
Feet
Aerial Date: 2010 NAIP
Date: 12MAR12
Z:\ArcMap\Projects\Oxford\Rose_France_Amendment_1\CISA\Rose_AMD_1_HUC_30JUN11_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


JD Boundary
226 Acres
Plum Creek-Pond Creek
051100030404
21,249 Acres
Legend
KPDES
JD Boundary
Plum Creek-Pond Creek
Rose France Amendment 1
HUC 12: Plum Creek-Pond Creek
KPDES Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 5,650 feet
0 1,250 2,500 5,000 7,500 10,000
Feet
Aerial Date: 2010 NAIP
Date: 12MAR12
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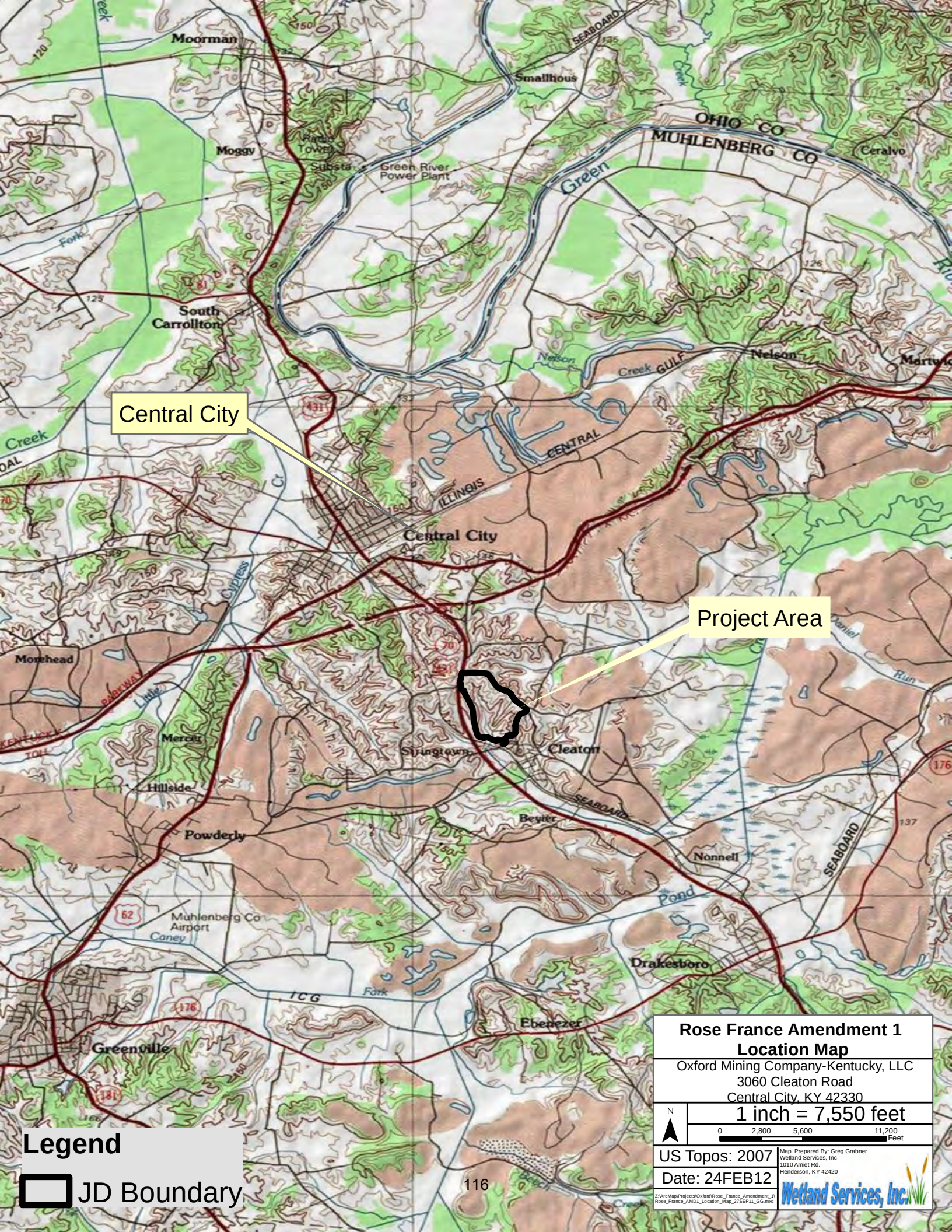
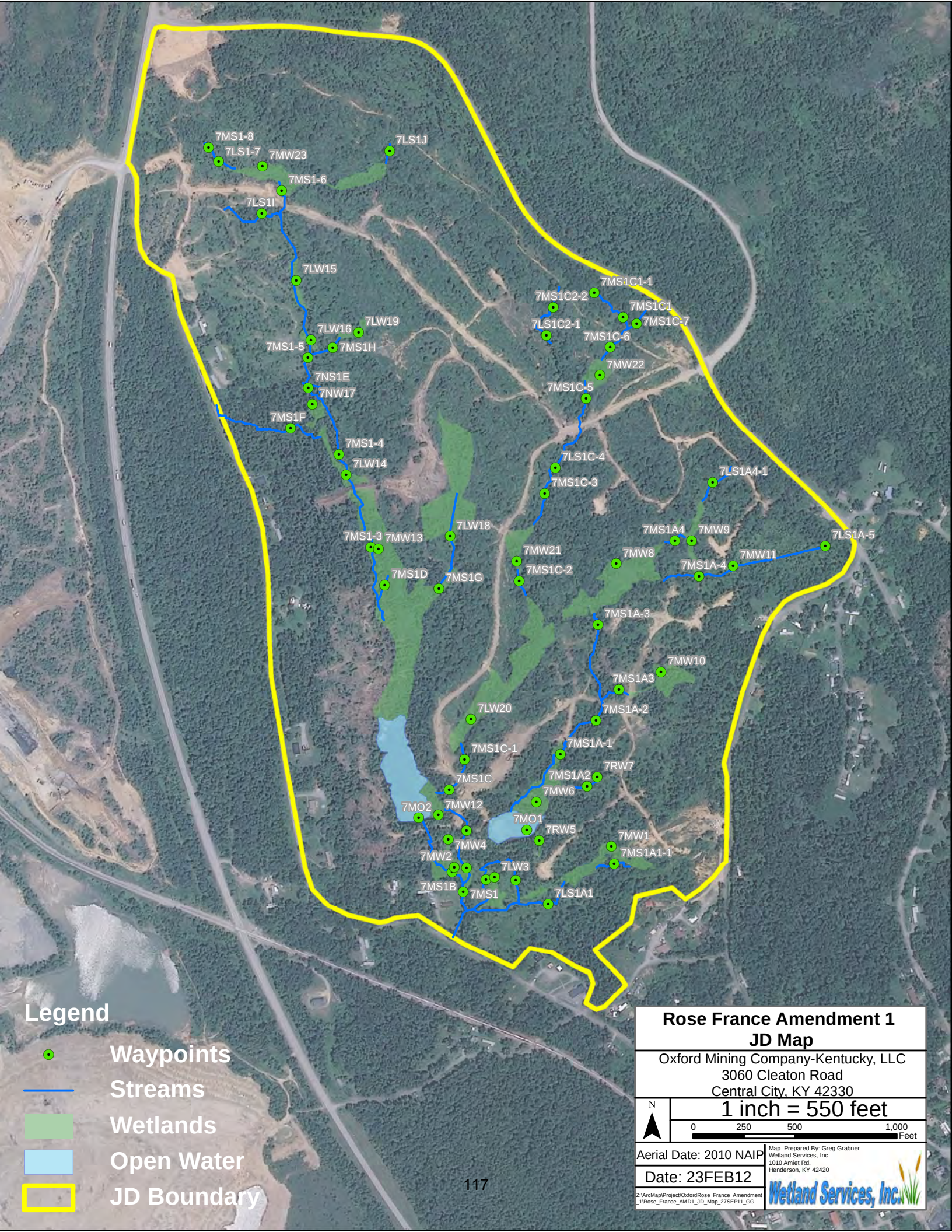
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


Central City
Project Area
Moorman
Smallhouse
Moggy
Green River Power Plant
OHIO CO
MUHLENBERG CO
Ceralvo
Green
South Carrollton
Nelson
Central City
Cleaton
Morehead
Mercer
Hillside
Powderly
Beyler
Nonnell
Muhlenberg Co Airport
Drakesboro
Ebenezer
Greenville
Legend
JD Boundary
Rose France Amendment 1
Location Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
1 inch = 7,550 feet
0 2,800 5,600 11,200 Feet
US Topos: 2007
Date: 24FEB12
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.



Legend

- Waypoints
- Streams
- Wetlands
- Open Water
- JD Boundary

Rose France Amendment 1
JD Map

Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330

N

1 inch = 550 feet

0 250 500 1,000 Feet

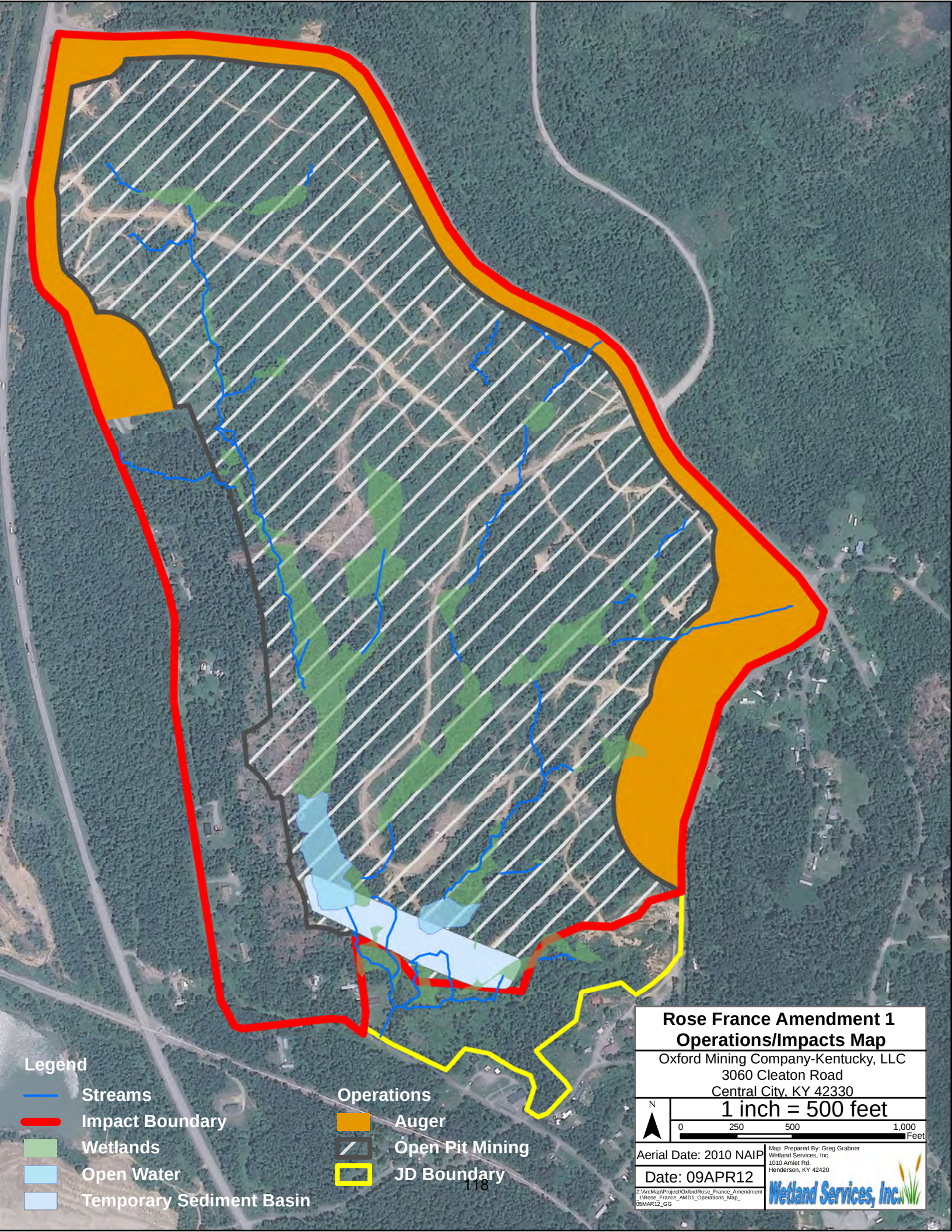
Aerial Date: 2010 NAIP

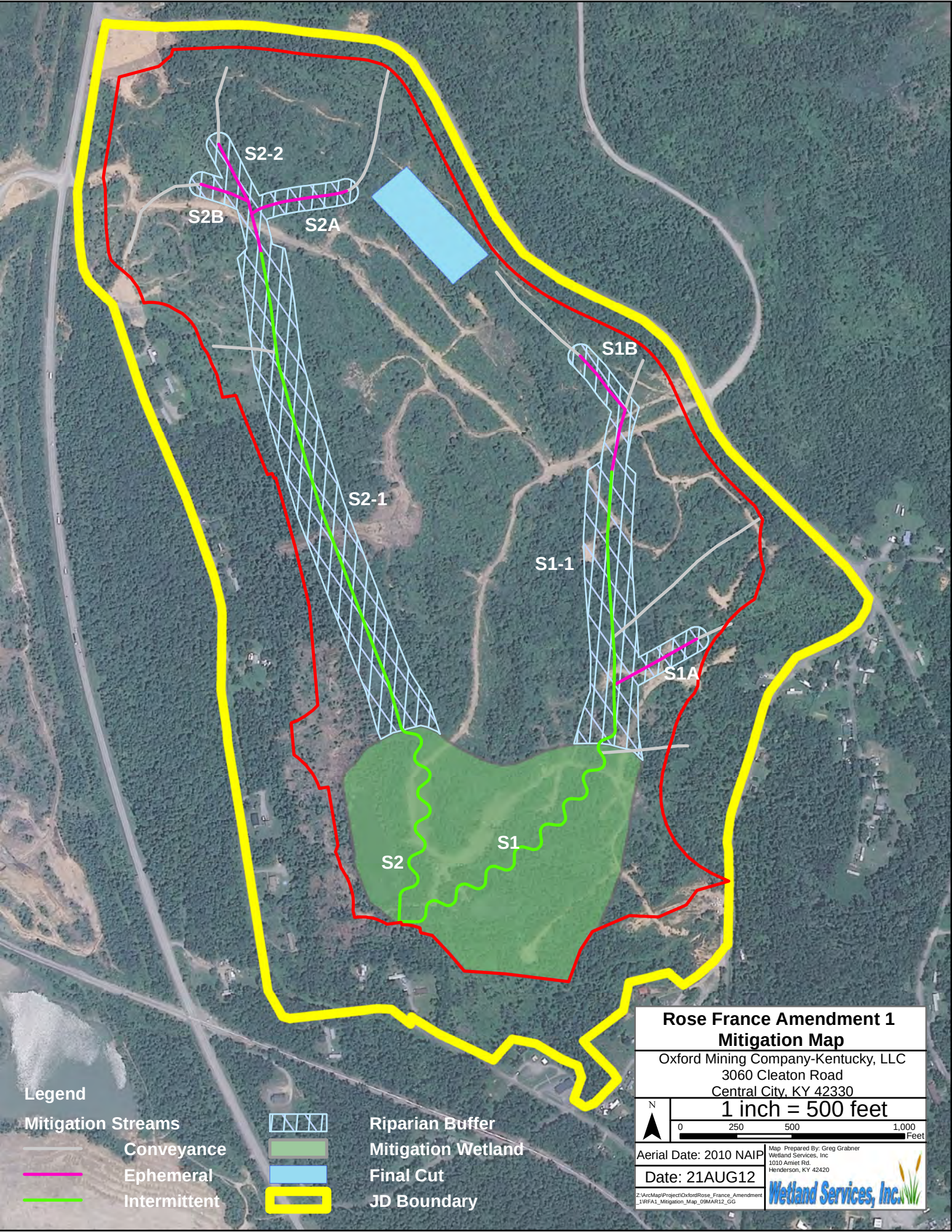
Date: 23FEB12

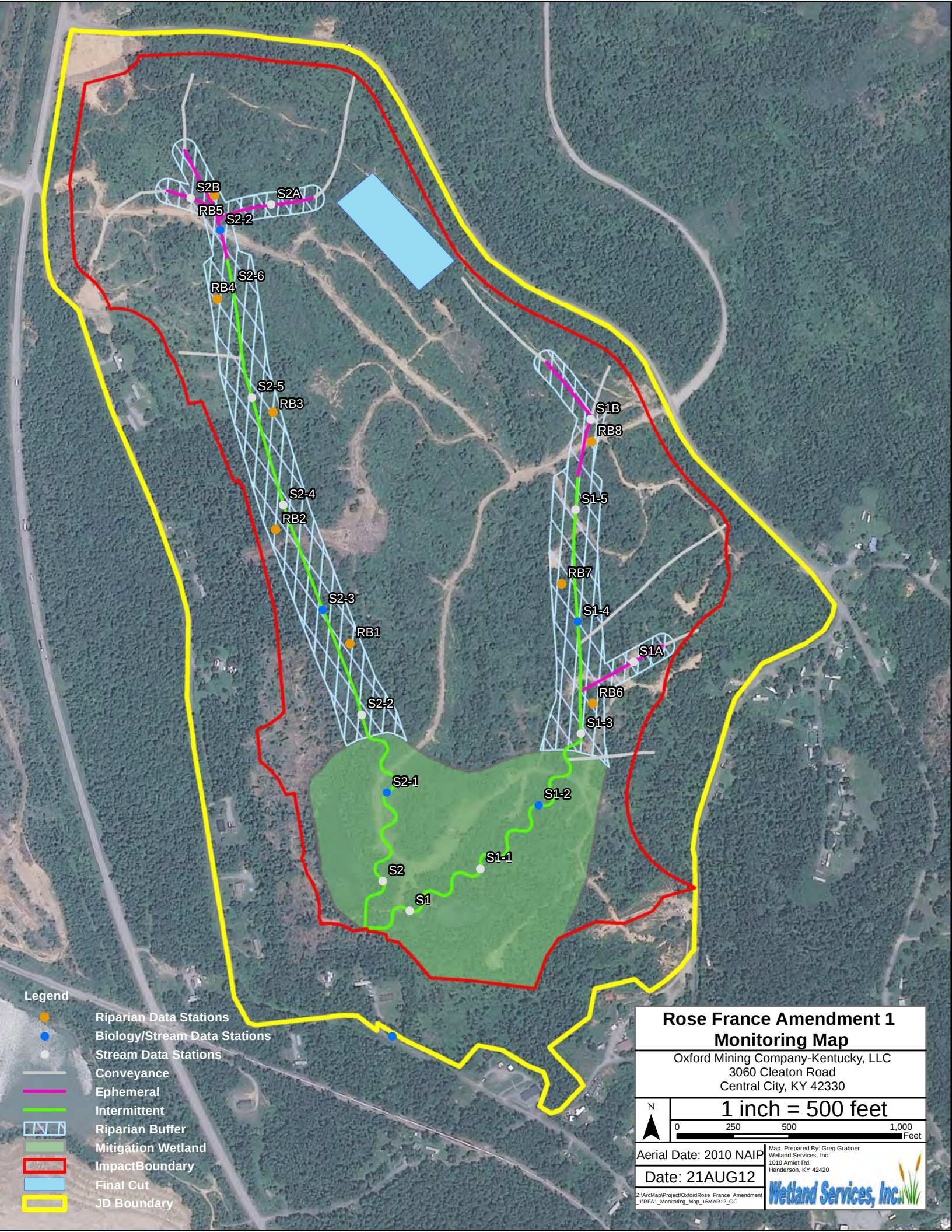
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\Rose_France_AMD1_JD_Map_27SEP11_GG

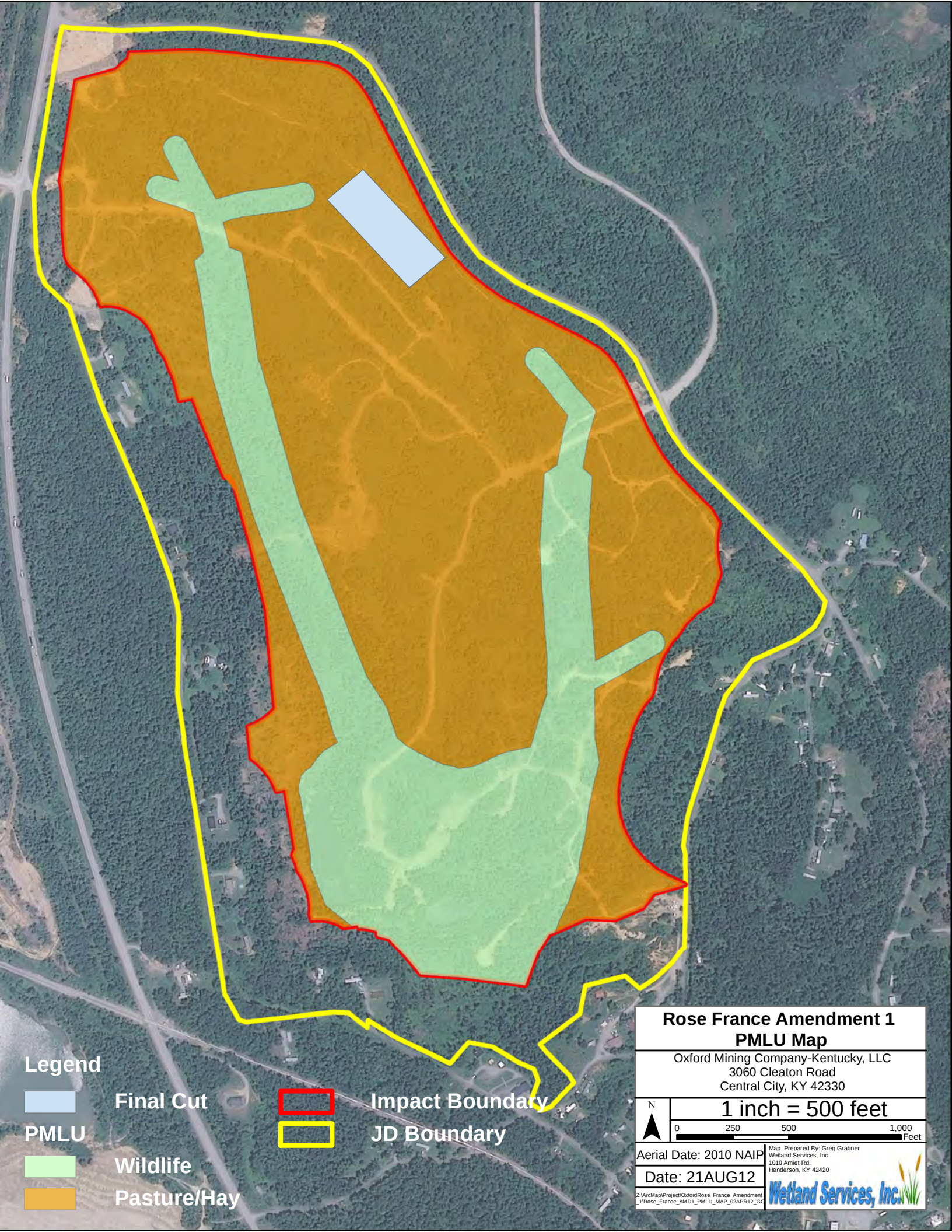
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420

Wetland Services, Inc.


Rose France Amendment 1
Operations/Impacts Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0
250
500
1,000
Feet
Aerial Date: 2010 NAIP
Date: 09APR12
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\Rose_France_AMD1_Operations_Map_05MAR12_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.
Legend
Streams
Impact Boundary
Wetlands
Open Water
Temporary Sediment Basin
Operations
Auger
Open Pit Mining
JD Boundary


S2-2
S2B
S2A
S1B
S2-1
S1-1
S1A
S1
S2
Legend
Mitigation Streams
Conveyance
Ephemeral
Intermittent
Riparian Buffer
Mitigation Wetland
Final Cut
JD Boundary
Rose France Amendment 1
Mitigation Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0 250 500 1,000 Feet
Aerial Date: 2010 NAIP
Date: 21AUG12
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\RFA1_Mitigation_Map_09MAR12_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


S2B
S2A
RB5
S2-2
S2-6
RB4
S2-5
RB3
S2-4
RB2
S2-3
RB1
S2-2
S2-1
S2
S1
S1-1
S1-2
S1-3
S1B
RB8
S1-5
RB7
S1-4
S1A
RB6
Legend
Riparian Data Stations
Biology/Stream Data Stations
Stream Data Stations
Conveyance
Ephemeral
Intermittent
Riparian Buffer
Mitigation Wetland
ImpactBoundary
Final Cut
JD Boundary
Rose France Amendment 1
Monitoring Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0
250
500
1,000
Feet
Aerial Date: 2010 NAIP
Date: 21AUG12
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\RFA1_Monitoring_Map_16MAR12_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.


Legend
Final Cut
PMLU
Wildlife
Pasture/Hay
Impact Boundary
JD Boundary
Rose France Amendment 1
PMLU Map
Oxford Mining Company-Kentucky, LLC
3060 Cleaton Road
Central City, KY 42330
N
1 inch = 500 feet
0
250
500
1,000
Feet
Aerial Date: 2010 NAIP
Date: 21AUG12
Z:\ArcMap\Project\OxfordRose_France_Amendment_1\Rose_France_AMD1_PMLU_MAP_02APR12_GG
Map Prepared By: Greg Grabner
Wetland Services, Inc
1010 Amiet Rd.
Henderson, KY 42420
Wetland Services, Inc.