5H Technologies, Inc.

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January 7, 2009

George DeLancey
Regulatory Specialist
U.S. Army Corps of Engineers
Post Office Box 489
Newburgh, Indiana 47629-0489

Re: James Properties, Inc.
James Sanders Boulevard Mitigation
5H Tech Ref. #231.02

Dear Mr. DeLancey,

Enclosed you will find a hard copy of the updated mitigation plan for James Properties, Inc. Please utilize the information enclosed to aid in your review of the project. Any assistance you can give our client in expediting this permit will be greatly appreciated.

If you have any questions or require additional information, do not hesitate to contact us at the number listed above.

Sincerely,

Susannah Hardy
Environmental Scientist

DFH:SLH:plb
231.02-L-James Prop-James Sanders Blvd Mitigation- 01-07-09-slh

Attachment: Mitigation Plan

cc: Joyce Fry – KDOW
File - RC

# WETLANDS MITIGATION

James Properties, Inc.
Paducah, KY

Submitted to:

James Properties, Inc.
Paducah, Kentucky 42003

January 2009


**5H Technologies, Inc.**

**1646 Kentucky Avenue**
**Paducah, Kentucky 42003**


5H Ref. #231.02
January 2009

# TABLE OF CONTENTS

1. Section 1 - Baseline Information ..... 1
   A. Proposed Impact Site ..... 1
   B. Proposed Wetland and Stream Mitigation Site – Highway 60 ..... 2
      a. Present Owner of Property ..... 3
2. Section 2 - Goals and Objectives of the Proposed Mitigation ..... 3
3. Section 3 & 4 – Monitoring Plan and Success Criteria ..... 5
   A. Stream and Wetland Mitigation Site ..... 5
4. Section 5 – Monitoring ..... 10
5. Section 6 – Contingency Plan ..... 12

# ATTACHMENTS

## Impact Site

Wetland Delineation. ..... 1
USGS Quadrangle Map ..... 2
National Wetlands Indicator Map ..... 3
Flood Hazard Map ..... 4
USDA McCracken / Ballard County Soil Survey ..... 5
Hydrology Map ..... 6
Aerial Photograph of Impact Site ..... 7
Photographs of Proposed Impact Site ..... 8
McCracken/Ballard County Hydric Soils List ..... 16

## Stream and Wetland Mitigation Site

USGS Quadrangle Map ..... 9
National Wetlands Indicator Map ..... 10
Flood Plain Map ..... 11
USDA Livingston County Soil Survey ..... 12
Hydrology Map ..... 13
Aerial Photograph with Permanent Photo Station ..... 14
Photographs of Proposed Mitigation Property ..... 15
Livingston County Hydric Soils List ..... 18

## General Information

McCracken/Ballard County Hydric Soils List ..... 16
McCracken County Road Map ..... 17
Livingston County Hydric Soils List ..... 18
Livingston County Road Map ..... 19
Map of Gage Stations ..... 20
Graph of Gage Data ..... 21

# 1. Section 1 - Baseline Information

## A. Proposed Impact Site

The James Properties Inc. impact site is located on James Sanders Boulevard in Paducah, Kentucky. It was delineated on October 24, 2006 by 5H Technologies, Inc. (See Attachment 1). The delineation found 2.2 acres of forested wetlands and 2,383 linear feet of stream to exist on the property located west of Interstate 24, just off Hinkleville Road, N37.07104°, W88.68341°. In order to proceed with the construction of this commercial development site, it is necessary to mitigate both wetlands and streams. It is proposed that 2.2 total acres of wetland be mitigated at a ratio of 3:1. This constitutes the need for a wetland mitigation area of 6.6 acres. This wetland will be classified as a palustrine forested wetland, composed of species commonly found in forested wetlands.

In addition to mitigating the wetlands found on this property, the streams must also be mitigated. A total of 2,383 linear feet of stream were delineated at the site, but only 500 linear feet of stream will be affected by the project, and thus must be mitigated. Normal stream mitigation is done at a 1:1 ratio. It is proposed that stream enhancement be performed by establishing a riparian buffer zone along 1,250 linear feet of unnamed tributary which drains into Chestnut Lake. Creation of a 25 foot riparian buffer zone on one side of a stream is worth 0.1 credits. In this project, it is proposed to create a 50 foot riparian buffer zone on both sides of the unnamed tributary, for a total of 1.0 credits, which ensures the 1:1 ratio is met.

The proposed wetland mitigation area is currently used as an agricultural field. Several site visits were conducted in order to assess the surrounding areas to ensure success criteria for this wetland mitigation. The mitigation property is located just north of the Tennessee River and south of the Ohio River in Ledbetter, Kentucky, Latitude N 37.039469° and Longitude W 88.522217° at an elevation of ~318 feet.

There are a total of three wetland areas found at the impact site totaling 2.2 acres, all of which will need to be mitigated in order to utilize the site for commercial development. All of the immediate land surrounding the site on James Sanders Boulevard is developed as commercial property. Additional fill material will not be required to level the site. Existing material already onsite will be used to prepare the site for commercial development.

In order to better define the impact site, the following maps have been attached in connection with the impact site located on the James Sanders Boulevard property:

| | |
|---|---|
| USGS Quadrangle Section Map | Attachment 2 |
| National Wetlands Indicator Map | Attachment 3 |
| Flood Hazard Map | Attachment 4 |
| USDA McCracken / Ballard County Soil Survey | Attachment 5 |
| Hydrology Map | Attachment 6 |
| Aerial Photograph of Impact Site | Attachment 7 |

| | |
|---|---|
| Photographs of Proposed Impact Site | Attachment 8 |
| McCracken County Hydric Soil List | Attachment 16 |
| McCracken County Road Map | Attachment 17 |

The responsible parties for this site are as follows:

1) **Applicant**: James Properties Inc.
2) **Contact Person of Company**: Jeff James
3) **Consultant or Agency**: 5H Technologies, Inc.
4) **Consultant or Agency Contact Person**: Susannah Hardy
5) **Property Owner**: James Properties Inc.

**B. Proposed Wetland and Stream Mitigation Site – Highway 60**

The proposed mitigation site is located off of Highway 60 in Ledbetter, Kentucky. From Interstate East 24, proceed to Exit 11. Proceed northwest 2.90 miles on John Puryear Drive to the Clarks River Road intersection. Turn right onto Clarks River Road and head east approximately 1.87 miles to the Ledbetter exit. Follow Highway 60 west approximately 1.0 mile to a dirt driveway located on the East side of the road. The property is located approximately 2,000 feet on the right side of the property, Latitude N37.039469° and Longitude W88.522217°. The Ohio River is located northeast of the property. The Tennessee River is located south of the property. The mitigation area in Livingston County is labeled as an unmapped area by the Federal Emergency Management Area. Therefore, a map was provided by the Natural Resource Conservation Service which denotes the Nolin and Ashton silt loam soil types on the designated wetland mitigation area. These soil types are frequently flooded and are most likely found in the 100 – year flood plain even though a FEMA map of this area is not currently available. Local farmers concurred that farming was difficult at times due to heavy flooding. The USGS Topographic Map contour lines indicate that the site is fairly level with an elevation of approximately 318 feet (Attachment 9). Past use of the property included crop production.

Flood gage data for the Ohio and Tennessee Rivers was collected from three stations. A map showing the locations of these three stations showing where flood gage data of the Ohio and Tennessee Rivers was collected is included in Attachment 20. Graphs of gage data during the past ten growing seasons collected from the USGS at Paducah, Kentucky and Golconda, Illinois, and from the Kentucky Lake Longterm Monitoring Program (KLLMP) through Murray State University's Center for Reservoir Research at Kentucky Dam have been included in Attachment 21. The maximum elevation of the Ohio River reached for ten consecutive days in five of the past ten years during the growing season at the USGS Gage 03611000 Paducah, Kentucky was 318 feet above sea level. The maximum elevation of the Ohio River reached for ten consecutive days in five of the past ten years during the growing season at the USGS Gage 03384500 Golconda, Illinois was 330 feet above sea level. The maximum elevation of the Tennessee River reached for ten consecutive days in five of the past ten years during the growing season at the Kentucky Dam was 360 feet above sea level. This data illustrates that the mitigation area should have appropriate wetland hydrology.

All of the immediate land surrounding the proposed stream mitigation site on Highway 60 is farmland. The creation of protected forested wetlands that could never be destroyed would help to sustain these wildlife species in the future, thus aiding in the preservation of wildlife in Livingston County. The wetland would also offer enhanced sediment filtration in a highly agricultural area and much needed flood control for both the Ohio and Tennessee Rivers.

In order to better define the mitigation site, the following maps have been attached in connection with the Highway 60 property:

| | |
|---|---|
| USGS Quadrangle Map | Attachment 9 |
| National Wetlands Indicator Map | Attachment 10 |
| Flood Plain Map | Attachment 11 |
| USDA Livingston County Soil Survey | Attachment 12 |
| Hydrology Map | Attachment 13 |
| Aerial Photograph with Photo Stations shown | Attachment 14 |
| Photographs of Proposed Mitigation Property | Attachment 15 |
| Livingston County Hydric Soils List | Attachment 18 |
| Livingston County Road Map | Attachment 19 |

The responsible parties for this site are as follows:

1) **Applicant**: James Properties Inc.
2) **Contact Person of Company**: Jeff James
3) **Consultant or Agency**: 5H Technologies, Inc.
4) **Consultant or Agency Contact Person**: Susannah Hardy
5) **Property Owner**: James Properties Inc.

**a. Present Owner of Property**

The current owner of the Highway 60 property is James Properties Inc.

**b. Long Term Management**

Upon approval from the Army Corps of Engineers (COE), James Properties Inc. will utilize the property and assume responsibility for the management and protection of the site. Contingent to the approval from the COE and Kentucky Department of Water (KDOW), a conservation easement will be placed on the property. Note that the conservation easement can be dissolved in the event that the restoration is not successful.

## 2. Section 2 - Goals and Objectives of the Proposed Mitigation

The impact site on James Sanders Boulevard currently has approximately 2.2 acres of forested wetlands and 500 linear feet of streams that are proposed to be filled. As shown in the attached delineation, the Cowardin Classification of the impact site was characteristic of a

PFO1A classification wetland. Onsite inspection of the proposed wetland mitigation site was performed to verify suitable wetland conditions. Onsite inspection of the proposed stream mitigation site was also performed to verify the need for stream enhancement. The proposed wetland mitigation site contains hydrologic conditions and soils characteristic of a wetland.

Based on the delineation that was performed at the impact site on October 24, 2006, several species of wetland plants were found. They include *Acer saccharinum, Plantanus occidentalis, Asimina triloba, Acer negundo, Betula nigra, Salix nigra, Typa sp., and Polygonum sp.* These species represent a mixture of the tree, shrub, vine, and herbaceous varieties. This property is located near a commercial area, which attracts limited wildlife. It is thought that this wetland would not be as beneficial to the environment as the proposed mitigation property, which is located in a more rural area allowing for increased immigration and emigration of wildlife.

Based on identification of species surrounding the proposed mitigation sites and the poorly drained silt loams found at the mitigation sites, the establishment of a hardy oak association is recommended through the mitigation process in both the forested wetland area and the enhanced riparian buffer zone. Surrounding the stream mitigation site is an existing community of *Ulmus americana, Acer rubrum, Acer saccharinum, Carya glabra, and Gleditisia tricanthos.* Surrounding the wetland mitigation is an existing community of *Ulmus americana, Acer rubrum, Acer saccharinum, Acer negundo, Gleditsia tricanthos and Fraxinus pennsylvanica.* It is recommended that several other native tree species commonly found in association with these already established species be planted at both the proposed wetland mitigation area and the stream mitigation area, creating a valuable wildlife habitat.

The planting of hardy species of oak trees is recommended in the wetland mitigation area, including such types as *Quercus palustris, Q. bicolor, Q. macrocarpa, Q. pagoda* and *Q. lyrata*, as well as *Carya aquatica, Carya lacinosia,* and *Liriodendron tulipifera* (Table 1). This mixture of trees includes both facultative wetland species and obligate wetland species, and thus should not have a problem surviving in the mitigation area. It is recommended that understory trees and shrub species, such as *Ilex deciduas, Cornus amomum,* and *Cephalanthus occidentalis*, also be planted in the wetland mitigation area to provide the necessary habitat for wildlife. It is recommended that these trees be planted in the spring of 2010. Multiple species of trees are recommended in order to ensure that a minimum of five different species can be obtained at the nursery when the order is placed.

A wetland seed mix will be planted in the fall of 2010 as soon as site preparation has been completed, contingent upon the permitting process approval. It is recommended that a wooded wetland establishment seed mix that includes multiple permanent grass species and temporary cover species be planted. The permanent grass species will include *Calamagrostis canadensis, Carex lupulina, Carex vulpinoidea, Cyperus sp., Eleocharis sp., Elymus virginicus, Glyceria striata, Juncus sp., Leersia oryzoides, Scirpus atrovirens,* and *Spartina pectinata,* based upon availability at the nursery. For temporary cover, we recommend *Lolium mutliflorum*. These species can all tolerate moist conditions and will survive in shaded areas once the planted trees have flourished.

In the enhanced riparian buffer zone of the stream, numerous grass species will be planted to aid in the filtration of sediments, nutrients, pesticides and microbes. These species will include *Elymus riparius, Elymus virginicus, Panicum clandestinum, Leersia oryzoides,* and

*Lolium multiflorum*, depending on their availability at the nursery. Shrub and tree species will be planted to aid in bank stabilization, erosion prevention, and provide aquatic and wildlife habitat. These species will include *Ilex deciduas, Cornus amomum, Cephalanthus occidentalis, Quercus bicolor, Quercus lyrata, Quercus macrocarpa, Quercus palustrus, Quercus pagoda, Carya aquatica, Carya lacinosia* and *Liriodendron tulipifera,* depending on availability at nurseries.

# 3. Section 3 & 4 – Monitoring Plan and Success Criteria

### A. Stream and Wetland Mitigation Site

The property designated for stream and wetland mitigation is located off of Highway 60 in Smithland, Kentucky. The geology of the area is made up of alluvium. The area is fairly flat with an elevation of 330 – 340 feet. An attached topographic map shows that the according to the elevation of this area much of the surrounding area should lie in the 100 – year flood plain. However, this cannot be verified because currently this is an unmapped area according to the Federal Emergency Management Area. The map attached shows that due to the existing wetlands in this area incorporating the mitigation site will not be unmanageable.

Attached are aerial photos, topographic maps, and a soil survey. As the soil survey shows, the particular soils located on this site are of the Nolin series which is listed on the Livingston County Hydric Soils List. Below is the description of this soil series that was taken from the Soil Survey of Livingston County, Kentucky.

The Nolin silt loam is listed as a soil that is frequently flooded. This very deep, well drained, nearly level soil is found in the flood plains all over the county. Individual areas range from about 3 to 230 acres in size. Some areas are dissected by drainage ditches and small streams. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of about 40 inches. It is a silt loam. The upper part is dark yellowish brown, and the lower part is brown. The substratum to a depth of about 72 inches is yellowish brown, silty clay loam.

This soil is high in natural fertility and moderate in organic matter content. Permeability is moderate and the available water capacity is high. Tilth is good. The soil can be cultivated throughout a wide range in moisture content. The root zone is very deep and can be easily penetrated by plant roots. A high water table is at a depth of 3 to 6 feet. The soil is frequently flooded for brief periods.

Included with this soil in mapping are small areas of Huntington, Lindside, Nelse, and Newark soils. This soil's landscape positions are similar to those of the Nolin soil. Also included are small areas that have a surface layer of fine sandy loam. Included areas make up less than 10 percent of this map unit. They are less than 2 acres in size.

Most areas of the Nolin soil are used for row crops. A few areas are wooded.

This soil is well suited to pasture and hay. Applications of fertilizer, control of weeds, and rotation grazing are suitable management practices. Hay crops can be damaged in some years by the flooding.

This soil is well suited to woodland. According to the Livingston County soil survey, species preferred for planting in this area include black walnut, yellow poplar, cherry bark oak, eastern white pine, eastern cottonwood, sweet gum, and pin oak. The main management concern is plant competition.

This soil is well suited to habitat for open land and woodland wildlife.

This soil is poorly suited for most urban uses. The flooding is the main limitation. Low strength is a limitation on sites for local roads and streets. It is also a concern if the soil is used as a source of road fill.

Soil samples were taken onsite to ensure that they were indeed of the Nolin series. The Munsell Soil Chart was used to determine that the soils ranged between 10YR 4/2 and 10YR 4/3.

The Ashton silt loam is a very deep, well drained soil that is nearly level and gently sloping. It is on low stream terraces along the Cumberland, Ohio, and Tennessee Rivers. Individual areas range from about 4 to 374 acres in size.

Typically, the surface area is dark brown silt loam about 10 inches thick. The subsoil is silty clay loam. The upper part is dark brown or brown. The next part is dark yellowish brown. The lower part to a depth of about 60 inches is strong brown.

This soil is high in natural fertility and moderate in organic matter content. Permeability is moderate, and the available water capacity is high. Tilth is only fair because of past intensive cultivation. The soil can be cultivated within only a narrow range in moisture content. The soil can be cultivated within only a narrow range in moisture content. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded for very brief periods.

Included in this soil in mapping are small areas of Elk, Huntington, Lindside, and Nolin soils. These areas have short, sloping, or moderately steep slopes and small areas of soils that are similar to the Ashton soil but have a surface layer of silty clay loam and are moderately well drained. Included areas make up less than 10 percent of this map unit.

Most of the areas of Ashton soil are used for row crops, but a few areas are wooded. This soil is well suited for hay and pasture. It is also well suited for woodland. Species preferred for planting include eastern white pine, yellow poplar, black walnut, sweetgum, cherrybark oak, eastern cottonwood, and white ash.

This soil is poorly suited to most urban areas because of the hazard of flooding. Low strength is a limitation on sites for local roads and streets. It is also a concern if the soil is used as a source of road fill.

The wetland mitigation is proposed to begin in the spring of 2009, which is the best time to

prepare the land for the planting season. Site preparations associated with the development of the new wetland, including tilling and construction activities, are requested to be approved for congruent construction. In the spring and fall of 2009, the land will be tilled and prepared for planting. In the fall of 2009, a wetland seed mix will be planted. This seed mix will consist of a mixture of grasses, sedges, and temporary cover species, depending on their availability at nurseries (Table 1). In the spring of 2010, tree planting will occur.

**Table 1. Species to be planted in the forested wetland and their respective indicator status.**

| PFO - Forested Wetland Species | | | |
|---|---|---|---|
| **Scientific Name** | **Common Name** | **Indicator Status** | **Propagule** |
| *Calamagrotis canadensis* | Blue joint grass | FACW+ | Seed |
| *Carex lupulina* | Hop sedge | OBL | Seed |
| *Carex vulpinoidea* | Fox sedge | OBL | Seed |
| *Cyperus sp.* | Flat sedge | FACW-OBL | Seed |
| *Eleocharis sp.* | Spike rush | OBL | Seed |
| *Elymus virginicus* | Virginia wild rye | FACW- | Seed |
| *Glyceria striata* | Fowl manna grass | OBL | Seed |
| *Juncus sp.* | Rush | FACW-OBL | Seed |
| *Leersia oryzoides* | Rice cut grass | OBL | Seed |
| *Scirpus atrovirens* | Green bulrush | OBL | Seed |
| *Spartina pectinata* | Prairie cord grass | OBL | Seed |
| *Lolium multiflorum* | Annual rye | FACU- | Seed |
| *Ilex decidua* | Deciduous holly | FACW | RPM |
| *Cornus amomun* | Silky dogwood | FACW | RPM |
| *Cephalanthus occidentalis* | Buttonbush | OBL | RPM |
| *Quercus bicolor* | Swamp white oak | FACW+ | RPM |
| *Quercus lyrata* | Overcup oak | OBL | RPM |
| *Quercus macrocarpa* | Bur oak | FAC- | RPM |
| *Quercus palustris* | Pin oak | FACW | RPM |
| *Quercus pagoda* | Cherry bark oak | FACW | RPM |
| *Carya aquatica* | Water hickory | OBL | RPM |
| *Carya lacinosia* | Shellbark hickory | FAC | RPM |
| *Liriodendron tulipifera* | Tulip poplar | FACU | RPM |

Planting a wetland seed mix in the fall that contains a temporary cover species before planting trees will allow stabilization of the wetland mitigation site. This will allow the mitigation site to be protected from erosion and prevent invasive species from becoming established. This will also allow for the stratification of the wetland species in the seed mix which is necessary before germination will occur in these species.

According to planting requirements for Forested Wetlands Mitigation, the COE requires:

1) A minimum planting rate of 60 RPM trees per acre
2) A minimum of 5 different species planted
3) No one species may represent over 20% of the initial planting stock

4) A 50% survival rate will be established onsite for five consecutive successful years.
5) No one species may represent over 25% of the final surviving stock.

Tree species suggested to be planted in the forested wetland area are shown in Table 1. These tree species are commonly found in wetland habitats and will meet the requirements for mitigation purposes. These species include a mixture of understory tree and shrub species and overstory tree species. The total amount that will be planted will vary slightly in excess of 60 RPM trees per acre in order to achieve the COE standards, based upon availability of the trees at the nursery. A subsoiling step is recommended to aid in tree survival, especially since the proposed property is an abandoned agricultural field. All agricultural sites develop a hard pan 12" to 18" deep from years of tillage. This hard pan is impervious to tree roots and will result in limited growth and development. The subsoiling process shatters this pan and creates alleys within which the trees are planted. Tree roots easily penetrate the shattered pan and can grow deeper into the soil.

Based upon input received from local nurseries and botanists, RPM trees are best suited for fall planting schemes. The plants will be ordered according to the time schedule approved by the COE and KDOW. However, in order to expedite the process for James Properties Inc., it is suggested that RPM trees be planted in the spring of 2010, assuming site preparation and the sowing of the wetland seed mix occurs in the fall of 2009. Should this portion of the project be delayed, the planting of RPM trees will also be delayed until the fall of 2010, spring of 2011 or fall of 2011 when all site preparations have been completed and temporary cover species have germinated.

A row marking and slitting step is essential to establish correct spacing when planting trees. Essentially the field is assessed and patterned in order to create a planting scheme. Trees are planted in linear rows using a planting machine. However, each row has its own spacing so as to create an eye pleasing natural looking wetland. The tree planting machine will place the trees in a linear fashion along each row. However, the interstitial spacing between trees can be varied along each row and adjacent rows would be set at alternate spacing as well. The end result would be a random appearance of the planted wetland when viewed at any angle other than parallel to the row direction.

Below is a table which was developed in order to assess the most important issues with creating the mitigation site.

| Advantages To Planting Linear | Disadvantages to Planting Linear |
|---|---|
| More effective methods available for controlling invasive species – linear rows allow mowing, weed-eating, and herbicide applications | Initially looks more natural to plant sporadically |
| More accurate monitoring data | |
| Better survival rate on average | |
| Over time, trees that die out will leave gaps, thus allowing for a more natural looking wetland | |
| More Cost Efficient – When planting this amount of trees by hand, it is much more costly than using a tree planter | |

In addition to the above mentioned items, it can also be noted again that the property offset from the road prevents observers from determining whether or not trees are planted in a linear fashion.

At the time of planting in the fall of 2009, a herbicide will be sprayed on the site to control exotic invasive species. Herbicides that are used in the field will be of the water-safe variety, such as Rodeo. The Kentucky Exotic Pest Plant Council list will be consulted during time periods when vegetation will be monitored. Herbicides will keep the invasive species under control until the next application is required. After that, a follow up treatment may be necessary. At a minimum, the site needs to be sprayed in areas where invasive species seem to be overtaking the seedlings. It can also be disked between tree rows to help facilitate the successful growth of the trees. This should be done at least twice during the first two to three growing seasons. Invasive species, which can comprise no more than 10% of the total vegetation tally at the end of the five-year monitoring period, are a serious competition to young trees and can choke out these small plants. Once the trees grow to around 3' to 4' tall, they are much hardier. It is also recommended that a strand of wire be placed around the planted area. Periodically along the strand, aluminum pie plates should be placed to scare away unwanted animals to keep the plants from being trampled.

Planting in the enhanced riparian buffer zone will follow a similar scheme to that occurring in the wetland. Once site preparations associated with the enhanced riparian buffer zone, including tilling and construction activities, have been completed, an herbicide will be sprayed to control any exotic invasive species. A seed mix containing numerous grass species typically found in riparian buffer zones that will aid in filtration and erosion control will be planted in the fall of 2009, following site preparation activities (Table 2). Included in this seed mix is a temporary cover species that will aid in erosion control in the newly enhanced riparian buffer zone.

Tree planting in the enhanced riparian buffer zone will follow the same COE planting requirements as a forested wetland mitigation project, including:

1) A minimum planting rate of 60 RPM trees per acre
2) A minimum of 5 different species planted
3) No one species may represent over 20% of the initial planting stock
4) A 50% survival rate will be established onsite for five consecutive successful years.
5) No one species may represent over 25% of the final surviving stock.

Tree species suggested to be planted in the enhanced riparian buffer zone are shown in Table 2. These tree species are commonly found in riparian buffer zones and will meet the requirements for mitigation purposes. These species include a mixture of understory tree and shrub species and overstory tree species. The total amount that will be planted will vary slightly in excess of 60 RPM trees per acre in order to achieve the COE standards, based upon availability of the trees at the nursery. A subsoiling step is recommended to aid in tree survival, especially since the proposed property is an abandoned agricultural field. All agricultural sites develop a hard pan 12" to 18" deep from years of tillage. This hard pan is impervious to tree roots and will result in limited growth and development. The subsoiling

process shatters this pan and creates alleys within which the trees are planted. Tree roots easily penetrate the shattered pan and can grow deeper into the soil.

**Table 2. Species to be planted in the riparian buffer zone and their respective indicator status.**

| Riparian Buffer Zone Species | | | |
|---|---|---|---|
| **Scientific Name** | **Common Name** | **Indicator Status** | **Propagule** |
| *Elymus riparius* | Riverbank wild rye | FACW- | Seed |
| *Elymus virginicus* | Virginia wild rye | FACW | Seed |
| *Panicum clandestinum* | Deer tongue panicum | FAC+ | Seed |
| *Leersia oryzoides* | Rice cut grass | OBL | Seed |
| *Lolium multiflorum* | Annual rye | FACU- | Seed |
| *Ilex decidua* | Deciduous holly | FACW | RPM |
| *Cornus amomun* | Silky dogwood | FACW | RPM |
| *Cephalanthus occidentalis* | Buttonbush | OBL | RPM |
| *Quercus bicolor* | Swamp white oak | FACW+ | RPM |
| *Quercus lyrata* | Overcup oak | OBL | RPM |
| *Quercus macrocarpa* | Bur oak | FAC- | RPM |
| *Quercus palustris* | Pin oak | FACW | RPM |
| *Quercus pagoda* | Cherry bark oak | FACW | RPM |
| *Carya aquatica* | Water hickory | OBL | RPM |
| *Carya lacinosia* | Shellbark hickory | FAC | RPM |
| *Liriodendron tulipifera* | Tulip poplar | FACU | RPM |

Assuming site preparations and the sowing of the seed mix is completed in the fall of 2009, it is suggested that RPM trees be planted in the spring of 2010. Should this portion of the project be delayed, the planting of RPM trees will also be delayed to the fall of 2010, the spring of 2011, or the fall of 2011 after all site preparations have been completed and the temporary cover species have germinated protecting the site from erosion.

# 4. Section 5 – Monitoring

A five year monitoring plan is also required in order to fulfill the Compensatory Wetland Mitigation and Monitoring Guidelines for Kentucky (1997). According to the Draft Stream Relocation/Mitigation Guidelines created by the KDOW (2002), projects involving relocation or restoration for compensatory mitigation will typically require annual physical monitoring for a period of three to eight years. It is suggested that stream monitoring be conducted for three years in a manner similar to wetland monitoring.

Evaluations of the wetland mitigation sites and follow-up reports including wetland data forms will be submitted on an annual basis to the COE and KDOW no later than 31 December. These evaluations and reports will be based on the 1987 COE Wetland Manual. If unforeseen circumstances develop and require more data, biannual reports will be submitted and/or the monitoring period will be extended if the success criteria are not met. Inspections will be completed in the first and the last months of the growing season for each calendar year by collecting representative samples in order to demonstrate the site's progress.

Evaluations of the stream mitigation site and follow up reports, including vegetative monitoring and habitat assessment data sheets will be submitted on an annual basis to the COE and KDOW no later than 31 December. Stream inspections will be completed annually for each calendar year by collecting representative samples to demonstrate the site's progress.

According to the COE 87' Manual, permanent photo stations must be placed onsite in mitigated wetlands at a ratio of one per every three acres. Due to the size of the proposed mitigation site, 2 permanent photo stations will be placed onsite at the Highway 60 property. Each photo station will monitor the success of the newly constructed wetland habitats. These photo stations can be seen on the attached aerial photo of the sites. Additional photos may be taken in order to ensure successful portrayal of the monitoring process. For the purpose of determining percent aerial coverage, these photo stations will be used to locate randomly selected plots which will be designated the first year of the monitoring period. These selected plots will be at least 15 to 20 feet inside of the property boundaries.

One photo station will be established in Lee Creek downstream of any restoration to provide an upstream view. Biannual photographs will be taken in the summer and winter. Summer photos will document vegetation in the enhanced riparian buffer zone, and winter photos will document stream stability and geomorphology. Vegetative monitoring in the enhanced riparian buffer zone will be conducted manually each year using the same methods as vegetative monitoring in the adjacent wetland.

Vegetation sampling must result in the assignment of an indicator status for the dominant plants in each strata of the flora. The flora strata are:

1. **Herb** – all nonwoody plants and woody plants < 3.2 feet in height
2. **Shrub/Sapling** – any woody vegetation having a height >3.2 feet tall but a stem diameter of < 3.0 inches;
3. **Tree** – woody vegetation that has DBH (diameter at breast height) of > 3.0 inches regardless of height.

The suggested percent aerial coverage will be measured using the following sampling area sizes:

- **Herb** – use a representative 9 square foot plot and determine percent aerial coverage by species (a 6 foot carpenters rule, open and folded at the center to a 90 degree angle);
- **Shrub, Sapling, Tree** – pace-off or measure a 30 foot diameter circle and conduct a stem count.

Using this information, it will be easy to determine percent aerial coverage by species. They will be ranked from the most abundant to the least abundant. After estimating the percent aerial coverage for each species, the 50/20 rule for determining dominance will be applied. Under the 50/20 rule, any plant species that equals or exceeds 20% of the aerial coverage of the plot is a dominant plant. In addition, the cumulative total of all dominant plants must be equal to or greater than 50% of the aerial coverage of the plot. If no plant species equals or exceeds 20% of the cumulative total aerial coverage of the plot, then the dominant plants are the plants that when ranked in decreasing order of abundance and summed, immediately exceed 50% of the plots aerial coverage when added together.

To determine the dominance in the shrub, sapling, and tree strata, there are three options that could be used: percent aerial coverage, percent basal area, and stem counts. It is recommended that the stem count be the primary means for determining percent aerial coverage, but if this method does not provide sufficient information then the other methods can be used. Determining dominance using stem count involves simply counting all the stems for each species, ranking them from the most abundant to the least abundant, and then recording these numbers. After adding them together, the 50/20 rule would be applied. If the shrubs or saplings are very numerous, determination of percent aerial coverage would be the preferred method. Also, in a tree strata where a few, very large individuals of a few species dominate the overstory and many small trees dominate the understory, determination by basal area would better reflect relative dominance.

Hydrology in the wetland mitigation area will be measured according to the COE delineation manual. Data sheets will be completed according to standards. The actual method of determining depth to the hydraulic layer will be of the lowest possible impact to the planted vegetation. The initial hydrology determination will be reliant on visual observation of inundation, saturation, water marks, etc..... If surface water or evidence of recent surface water is not visible, then the next preferred option would be to dig a soil pit to a depth of 16 inches and to observe the level at which water stands in the hole after sufficient time has been allowed for water to drain into the hole. The required time will vary depending on soil texture. In some cases, the upper level at which water is flowing into the pit can be observed by examining the wall of the hole. This level represents the depth to the water table. If hydrology becomes too difficult to measure by visual observation and by soil pits, shallow depth monitoring wells can be installed.

Vegetation in the wetland mitigation area will be monitored by the use of the 1987 COE Delineation Manual data sheets. Visual observation will be used to determine whether a plant species is growing in areas of prolonged inundation and/or soil saturation. Also, technical literature such as taxonomic references, botanical journals, technical reports, technical workshops, conferences, symposia, and wetland plant database will be used to correctly identify and study the plant species.

Each report submitted will address the soils, vegetation, hydrology, water quality, and remediation using the COE delineation manual or EPA's Rapid Bioassessment Protocol Habitat sheets. Maps will be provided to depict the assessed points.

Upon completion of the 5-year monitoring process in the wetland mitigation area, a full delineation will be performed on both sites using the 1987 Corps of Engineers Wetland Delineation Manual. Along with this delineation the acreage requirements will also be shown in the final report.

# 5. Section 6 – Contingency Plan

In the event that the success criterion is not met for all or any portion of the mitigation project in any year, and/or if the success criteria are not satisfied, James Properties Inc. shall prepare a report which will examine the cause of the mitigation's failure. The report shall address any complaints or comments made by the COE and the KDOW. The report will

examine what can be done to ensure the success of the project and the options that are available. It will discuss whether or not a new proposed site must be found, or if the current site could be altered to achieve successful criterion. All proposed remedial actions will be presented to the COE and the KDOW for pre-approval.

# Attachment 1

# WETLANDS DELINEATION
## Jeff James Property
## Poor Farm Road
## Paducah, Kentucky


5H Technologies, Inc.

1646 Kentucky Avenue, Suite 2
Paducah, KY 42003

David F. Hutcheson Jr., CHMM


August 29, 2006
203.04

## TABLE OF CONTENTS


1.0 INTRODUCTION & LOCATION.....2

2.0 REGULATORY DEFINITIONS.....2

3.0 TECHNICAL DEFINITIONS.....3

4.0 SITE DESCRIPTION.....4

5.0 WETLAND DESCRIPTIONS.....4

6.0 STREAM DESCRIPTIONS.....12

## 1.0 INTRODUCTION & LOCATION

**1.1** On 24OCT06 an Army Corps of Engineers jurisdictional wetland delineation and stream assessment was conducted on the site of JAMES PROPERTY DEVELOPMENT. From I-24 West in Paducah take exit 4 onto US HWY 60 East. Turn left at the first light onto James Sanders Blvd. The south end of the site is marked by culverts discharging from new development to the west. N37.07104° W-88.68341°

**1.2** Wetland delineation was conducted according to guidelines set forth in the *Corps of Engineers Wetland Delineation Manual (1987)* and associated Regulatory Guidance Letters found in 33 CFR 328.2 of the Federal Register. Stream Assessment was conducted in accordance with the EPA's Rapid Bio Assessment Protocol. As the regulating authority of Section 404 of the Clean Water Act, the Corps of Engineers must make the final determination as to the jurisdictional status of this site. KDOW (Kentucky Division of Water) has jurisdiction over "Waters of the Commonwealth".

**1.2.1 3 wetlands were located on site totaling 2.2-acres*.**
**1.2.2 3 surface drains were located on this site totaling 2379-linear feet*.**
***Please refer to Tables 1 & 2 when making Jurisdictional Determination.**

## 2.0 REGULATORY DEFINITIONS

**2.1** **"Waters of the United States"** are regulated by the Corps of Engineers based on authority from Section 404 of the Clean Water Act. They include waters that are or could be used for interstate commerce such as rivers, wetlands, lakes, territorial seas and ponds, as well as streams, waterways and ditches below the ordinary high water mark. Manmade water bodies and farmed wetlands may also be considered jurisdictional depending on their connection to other "Waters of the U.S." if they are not actively mined, farmed or otherwise managed for five years. Streams include the areas of surface drains below the ordinary high-water mark and with bed and bank features. Activities in these areas will require an ACOE 404 permit if they include the discharge of dredged or fill material into "Waters of the U.S.".

**2.2** **"Waters of the Commonwealth"** are regulated by the Kentucky Division of Water based on authority from Section 401 of the Clean Water Act 33USC 1314 and KRS 224.16-070. They are defined as Section 404 jurisdictional wetlands and solid or dashed blue-line streams on the most recent version of the USGS 1:24.000 topographic map. Activities that include a physical disturbance to "Waters of the Commonwealth" will require a KDOW 401 Water Quality Certification.

**2.3** **Other Permits** typically associated with Section 401 & 404 may include KDOW Floodway Construction, USFWS Threatened & Endangered Species and Historic Preservation Office - Archaeology.

## 3.0 TECHNICAL DEFINITIONS

**3.1** **Wetlands** are defined as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. They are identified based on the three-parameter approach outlined in the *Corps of Engineers Wetland Delineation Manual (1987).* The three criteria include hydrophytic vegetation, hydric soils and wetland hydrology. All three criteria must be present to make a positive wetland determination. The criteria are defined as follows:

**3.1.1** **Hydrophytic vegetation**, due to morphological, physiological and/or reproductive adaptation(s), has the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. Individual species have been assigned indicator status by the USFWS - National Wetland Inventory and the National Plant List Panel. Vegetation is considered hydric when *more than* 50% of the dominant species from all strata are OBL, FACW, FAC+ or FAC. If all dominants are FAC, the vegetation criteria is disregarded and the determination is based on soil and hydrology criteria.

| Indicator Status | Probability of Occurrence in Wetlands |
|---|---|
| Obligate Wetland - OBL | > 99% |
| Facultative Wetland - FACW | 67-99% |
| Facultative - FAC | 34-66% |
| Facultative Upland - FACU | 1-33% |
| Obligate Upland - UPL | <1% |

Secondary vegetation rules include observed physiological adaptations, plants growing in saturated soils, and the FAC neutral test.

**3.1.2** **Hydric soils** are present if they have been classified as hydric or when they possess characteristics associated with reducing soil conditions. Hydric soils in this report are those that are gleyed, or have a low chroma matrix (2 or less) with high chroma mottles (3 or more), or a matrix chroma 1 with or without mottles in the upper 10- inches. Colors were determined using the Munsell soil color chart.

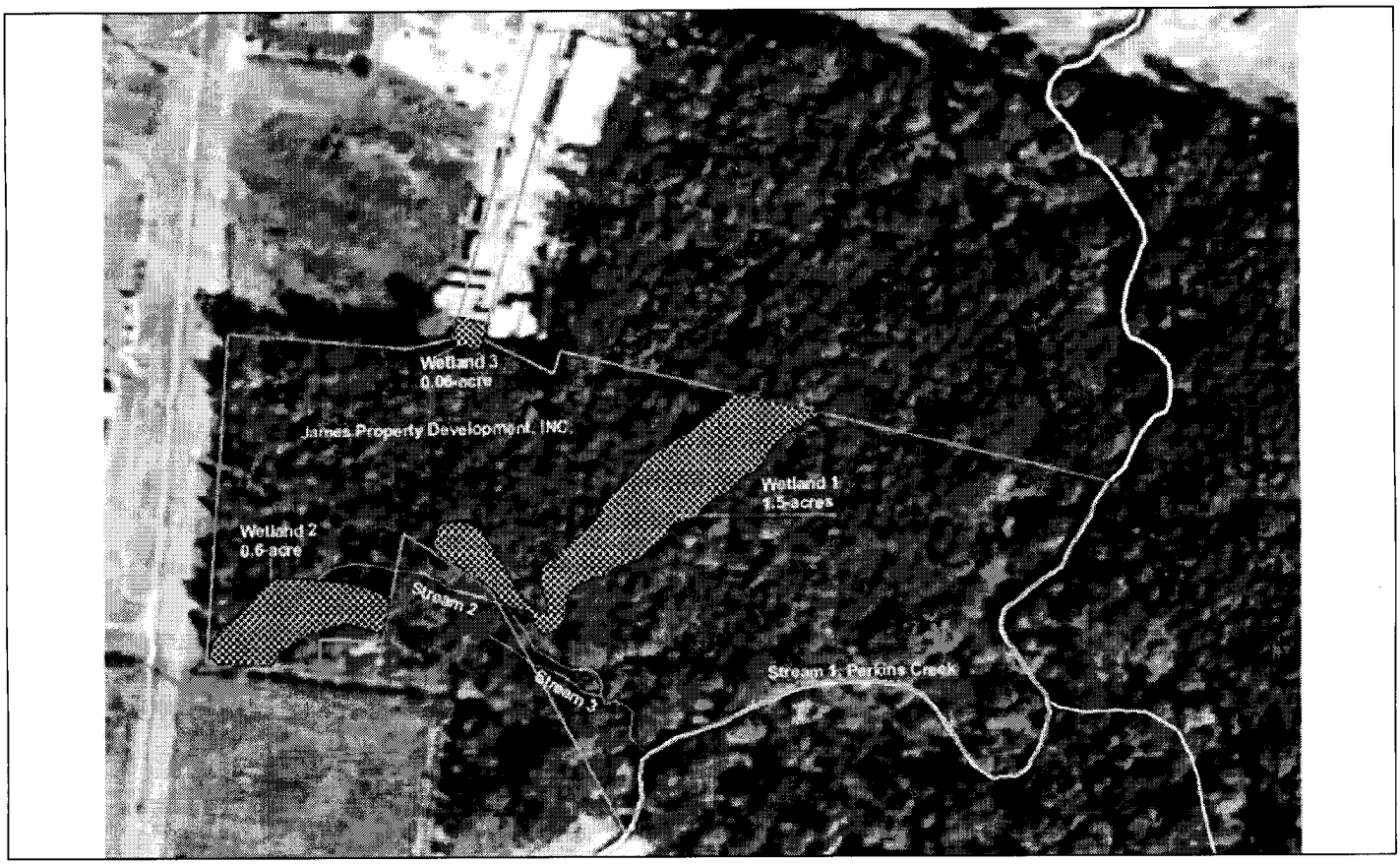
**3.1.3** **Hydrology** in wetlands occurs in areas inundated permanently or periodically at mean water depths ≤6.6 feet, or if the soil is saturated to the surface for days consecutively during the growing season of the prevalent vegetation[1]. Wetland hydrology indicators may be present above or below the surface. Primary indicators include inundation, saturation in the upper 12 inches, water marks on standing structure, sediment deposits and wetland drainage patterns. Secondary indicators (two or more required) include oxidized rhizospheres, water stained leaves, FAC neutral test and local soil survey data.

[1] 11 days of consecutive saturation meets the hydrology criteria in Western Kentucky.

## 4.0 SITE DESCRIPTION

**4.1** Background information on this site was gathered from the McCracken County Soil Survey, the USGS Quadrangle & NWI maps and aerial photos. These data were studied and used in making formal Wetland Delineation and Stream Assessment on 24OCT06.

**4.2** The James Site is essentially rectangular beginning along the east side of James Sanders Blvd, and continuing east down slope to Perkins Creek. Based on recent soil map updating by local NRCS, flood frequency and duration along Perkins Cr. is not sufficient to meet wetland hydrology. Headwater ponding and seasonally high groundwater currently supports hydrology of the three wetlands on site. Upland soils are developed in Calloway and Grenada SiL. Hydric soils are developed in Falaya and Vicksburg SiL.




## 5.0 WETLAND DESCRIPTIONS

| Table 1 – WETLAND INVENTORY | | | | | |
|---|---|---|---|---|---|
| Wetland ID | Latitude | Longitude | Jurisdiction | Class | Area |
| 1 | 37.07138 | 088.68157 | Connected | PFO | 1.5-acres |
| 2* | 37.07120 | 088.68300 | Connected | PFO | 0.6-acre |
| 3 | 37.07252 | 088.68224 | Connected | PEM | 0.1-acre |
| | | | | Total | 2.2-acres |
| *Should ACOE determine 0.3-acre of wetland is recently developed and not jurisdictional the total area of wetlands on the James site is: | | | | | 1.9-acres |

5.1 Wetland 1 is a back slope depression developed narrow, linear and parallel along Perkins Creek. This area is likely an old oxbow or meander scroll. Soils are strongly hydric with a shallow but noticeable rise in topography at the non-wet boundary. Silver maple and Sycamore dominate the overstory.

5.2 Wetland 2 is developed directly down slope from new shopping center. Storm water collection directly upslope is now centralized and discharges via culverts directly into the area of wetland 2. No central drain exists thru this area, and laminar flow has recently developed wetland drainage patterns, increased hydrology and hydric soils development. The area slopes 2-4%. Because of the above listed circumstances it is likely that the size of this community has roughly doubled from ~0.3-acre to 0.6-acre. ***ACOE should determine if 0.3-acre or 0.6-acre of the area is currently jurisdictional.**

5.3 Wetland 3 is shallow drain along the ingress easement to the north. The drain provides some drainage of the area, but is shallow and wide and developed as a wetland. As the easement crosses the drain 0.1-acre of the drain exists on the James site. The area is also developed in Gas line corridor and repeated mowing and spraying have maintained this community as PEM.

# WETLAND DELINEATION FORM

| | |
|---|---|
| **Project/Site: James** | **Date: 24OCT06** |
| **Applicant/Owner: James Property Development, INC** | **County: McCracken** |
| **Investigators: Tim Sandefur** / **Lat: N 37.07138°** | **Long: W0 88.68157°** / **State: KY** |

## Wetland

| | | |
|---|---|---|
| Community I.D. 1 | Plot I.D. | Transect: |

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Acer saccharinum | T | FACW |
| 2 | Platanus occidentalis | T | FACW |
| 3 | Asimina triloba | S | FAC |
| 4 | Microstegium vininum | H | FAC |
| 5 | | | - |
| 6 | | | - |
| 7 | | | - |
| 8 | | | - |

Percent of dominants OBL, FACW, FAC+ or FAC: 100%

**Remarks:**

### Hydrology

**Field Observations:** **Depth to Surface Water (in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil (in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☐ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☐ | Water-stained leaves | ☐ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☐ | FAC-neutral test | ☐ |
| Drainage Patterns | ☒ | Morphologic Adaptations | ☐ |
| Drift Lines | ☒ | Other (Remarks) | ☐ |

**Remarks:**

### Soils

**Soil Map Unit Name: Vicksburg**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-6 | A | 10YR4/4 | - | SiL,gr |
| 6-12+ | Bt | 10YR5/2(1) | 10YR4/6 | SiCL,sb |
| | | | | |
| | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☒ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☒ | Other (Remarks) | ☐ |

**Remarks:**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | YES |
| Wetland Hydrology Present? | YES |
| Hydric Soils Present? | YES |
| Is this Sampling Point Within a Wetland? | YES |

**Class: PFO**
**Area: 65778ft²**

**Remarks: Backslope depression ~250' away from Perkins Creek**

## Non-Wetland

| | | |
|---|---|---|
| Community I.D. 1 | Plot I.D. | Transect: |

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Acer sacharinum | T | FACW |
| 2 | Platanus occidentalis | T | FACW |
| 3 | Asimina triloba | S | FAC |
| 4 | Lonicera japonica | V | FAC- |
| 5 | Smilax sp. | V | FACU+ |
| 6 | Rubus sp. | V | FAC- |
| 7 | | | - |
| 8 | | | - |

Percent of dominants OBL, FACW, FAC+ or FAC: 50%

**Remarks:**

### Hydrology

**Field Observations:** **Depth to Surface Water (in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil (in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☐ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☐ | Water-stained leaves | ☐ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☐ | FAC-neutral test | ☐ |
| Drainage Patterns | ☐ | Morphologic Adaptations | ☐ |
| Drift Lines | ☒ | Other (Remarks) | ☐ |

**Remarks: Drift lines from 10-inch (100-year) rain event not represtntative of 6/10-year hydrology.**

### Soils

**Soil Map Unit Name: Vicksburg**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-10 | A | 10YR4/4 | - | SiL,gr |
| 10-12+ | Bt | 10YR5/3 | 10YR4/6 | SiCL,gr |
| | | | | |
| | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☒ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☐ | Other (Remarks) | ☐ |

**Remarks: Chroma not hydric**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | YES |
| Wetland Hydrology Present? | YES |
| Hydric Soils Present? | NO |
| Is this Sampling Point Within a Wetland? | NO |

**Remarks: Shallow rise (natural levee) between Perkins Creek and backslope depression.**

W 1

# WETLAND DELINEATION FORM

| | |
|---|---|
| **Project/Site: James** | **Date: 24OCT06** |
| **Applicant/Owner: James Property, INC** | **County: McCracken** |
| **Investigators: Tim Sandefur** / **Lat: N 37.07120°** | **Long: W0 88.68300°** / **State: KY** |

## Wetland

| Community I.D. 2 | Plot I.D. | Transect: |
|---|---|---|

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Acer negundo | T | FACW- |
| 2 | Betula nigra | T | FACW |
| 3 | Morus alba | T | FAC |
| 4 | Liquidambar stryciflua | t | FACW |
| 5 | | | OBL |
| 6 | | | OBL |
| 7 | | | OBL |
| 8 | | | OBL |

Percent of dominants OBL, FACW, FAC+ or FAC: 100%

**Remarks:**

### Hydrology

**Field Observations: Depth to Surface Water (in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil 2(in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☐ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☒ | Water-stained leaves | ☒ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☒ | FAC-neutral test | ☒ |
| Drainage Patterns | ☒ | Morphologic Adaptations | ☐ |
| Drift Lines | ☒ | Other (Remarks) | ☐ |

**Remarks: Recent increase in hydrology via diversion from adjoning development**

### Soils

**Soil Map Unit Name: Vicksburg**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-7 | A | 10YR5/4 | 10YR4/6 | SiL,gr |
| 7-12+ | Bt | 10YR5/2 | 10YR4/6 | SiCL,sb |
| | | | | |
| \ | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☒ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☒ | Other (Remarks) | ☐ |

**Remarks:**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | YES |
| Wetland Hydrology Present? | YES |
| Hydric Soils Present? | YES |
| Is this Sampling Point Within a Wetland? | YES |

**Class: PFO**

**Area: 24092ft²**

**Remarks: Sloping area of drainage patterns**

## Non-Wetland

| Community I.D. 2 | Plot I.D. | Transect: |
|---|---|---|

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Carya ovata | T | FACU |
| 2 | Prunus serotina | T | FACU |
| 3 | Quercus falcata | T | FACU |
| 4 | Acer negundo | T | FACW- |
| 5 | | | OBL |
| 6 | | | OBL |
| 7 | | | OBL |
| 8 | | | OBL |

Percent of dominants OBL, FACW, FAC+ or FAC: 25%

**Remarks:**

### Hydrology

**Field Observations: Depth to Surface Water (in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil (in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☐ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☐ | Water-stained leaves | ☐ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☐ | FAC-neutral test | ☐ |
| Drainage Patterns | ☐ | Morphologic Adaptations | ☐ |
| Drift Lines | ☐ | Other (Remarks) | ☐ |

**Remarks:**

### Soils

**Soil Map Unit Name: Calloway**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-8 | A | 10YR4/3 | - | SiL,gr |
| 8-12+ | Bt | 10YR4/4 | - | SiCL,sb |
| | | | | |
| | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☐ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☐ | Other (Remarks) | ☐ |

**Remarks:**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | NO |
| Wetland Hydrology Present? | NO |
| Hydric Soils Present? | NO |
| Is this Sampling Point Within a Wetland? | NO |

**Remarks: Wooded slope**

Increase in wetland drainage patterns, sediment deposition and drift lines with recent channelization. Extent of hydric soils likely increased recently.

# WETLAND DELINEATION FORM

| | |
|---|---|
| **Project/Site: James** | **Date: 24OCT06** |
| **Applicant/Owner: James Property, INC** | **County: McCracken** |
| **Investigators: Tim Sandefur** **Lat: N 37.07252°** | **Long: W0 88.68224°** **State: KY** |

## Wetland

| | | |
|---|---|---|
| Community I.D. 3 | Plot I.D. | Transect: |

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Salix nigra | S | OBL |
| 2 | Typha sp. | H | OBL |
| 3 | Polyganum sp. | H | FACW |
| 4 | microstegium vininum | H | FAC |
| 5 | | | OBL |
| 6 | | | OBL |
| 7 | | | OBL |
| 8 | | | OBL |

Percent of dominants OBL, FACW, FAC+ or FAC: 100%

**Remarks:**

### Hydrology

**Field Observations: Depth to Surface Water 3(in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil (in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☒ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☒ | Water-stained leaves | ☒ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☐ | FAC-neutral test | ☒ |
| Drainage Patterns | ☒ | Morphologic Adaptations | ☐ |
| Drift Lines | ☐ | Other (Remarks) | ☐ |

**Remarks:**

### Soils

**Soil Map Unit Name: Manmade**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-12 | A | 10YR5/1 | 10YR4/6 | SiL,gr |
| | | | | |
| | | | | |
| | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☐ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☒ | Other (Remarks) | ☐ |

**Remarks:**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | YES |
| Wetland Hydrology Present? | YES |
| Hydric Soils Present? | YES |
| Is this Sampling Point Within a Wetland? | YES |

**Class: PEM**

**Area: 2857ft²**

**Remarks: Shallow drainage swale thru gas pipline corridor**

## Non-Wetland

| | | |
|---|---|---|
| Community I.D. 3 | Plot I.D. | Transect: |

| | |
|---|---|
| Do normal circumstances exist on the site? | YES |
| Significant disturbance (atypical situation)? | NO |
| Is this a potential problem area? | NO |

### Vegetation

| | Dominant Species | Stratum | Indicator |
|---|---|---|---|
| 1 | Quercus imbricaria | T | FAC- |
| 2 | Symphoricarpos orbiculatus | S | FACU |
| 3 | Morus alba | T | FAC |
| 4 | | | OBL |
| 5 | | | OBL |
| 6 | | | OBL |
| 7 | | | OBL |
| 8 | | | OBL |

Percent of dominants OBL, FACW, FAC+ or FAC: 33%

**Remarks:**

### Hydrology

**Field Observations: Depth to Surface Water (in.)**
**Depth to Free Water (in.)**
**Depth to Saturated Soil (in.)**

| Primary Indicators | | Secondary Indicators | |
|---|---|---|---|
| Inundated | ☐ | Oxidized Rhizospheres | ☐ |
| Saturated <12" | ☐ | Water-stained leaves | ☐ |
| Water Marks | ☐ | Local soil survey data | ☐ |
| Sediment Deposits | ☐ | FAC-neutral test | ☐ |
| Drainage Patterns | ☐ | Morphologic Adaptations | ☐ |
| Drift Lines | ☐ | Other (Remarks) | ☐ |

**Remarks:**

### Soils

**Soil Map Unit Name: Grenada**

| Depth (in.) | Horizon | Matrix Color | Mottle Colors | Texture |
|---|---|---|---|---|
| 0-7 | A | 10YR4/3 | - | SiL,gr |
| 7-12+ | Bt | 10YR4/4 | - | SiCL,sb |
| | | | | |
| | | | | |

### Hydric Soil Indicators

| | | | |
|---|---|---|---|
| Histosol | ☐ | Concretions | ☐ |
| Histic Epipedon | ☐ | Organic Content (sandy) | ☐ |
| Sulfidic Odor | ☐ | Organic Streaking (sandy) | ☐ |
| Aquic Moisture Regime | ☐ | Local Hydric Soils List | ☐ |
| Reducing Conditions | ☐ | National Hydric Soils List | ☐ |
| Gleyed or Low-Chroma | ☐ | Other (Remarks) | ☐ |

**Remarks:**

### Wetland Determination

| | |
|---|---|
| Hydrophytic Vegetation Present? | NO |
| Wetland Hydrology Present? | NO |
| Hydric Soils Present? | NO |
| Is this Sampling Point Within a Wetland? | NO |

**Remarks: Upland woods to the south, parking lot to the north.**

W
3

## 6.0 STREAM DESCRIPTIONS

| Table 2 – STREAM INVENTORY | | | |
|---|---|---|---|
| Stream ID | RBP Scores | Class | Length |
| 1 | 144 | Perennial | 1353-lineat feet |
| 2 | 103 | Intermittent | 802-linear feet |
| 3 | 88 | Ephemeral | 114-linear feet |
| | | TOTAL | 2383-linear feet |

Note: Orientation of the property boundary causes portions of streams 2 & 3 to be off the property. Total length of Stream 2 on the ground is 846-linear feet, Stream 3 on the ground is 180-linear feet.

6.1 Stream 1 is Perkins Creek. Perkins Creek is an adjoining property boundary between James and other owners to the southeast. It is a large perennial with a sandy substrate typical in the Jackson Purchase physiographic region.

6.2 Stream 2 is an upland drain with minor groundwater influence near the Perkins creek confluence.

6.3 Stream 3 is anthropogenic in nature. A long run of old clay field tile was installed on the hillside straight down slope into stream 2. The tile filled with sediment and failed, water flowed over top of the tile and developed an erosional feature similar to an ephemeral stream.

RBP Data Sheets and Photos:

## Physical Characterization/Water Quality Field Data Sheet

| | | | |
|---|---|---|---|
| Project ID: James | | Stream Class: Perennial | |
| Stream ID: Perkins Creek, Stream 1 | | Location: McCracken County, KY | |
| Lat:37.07202° | Long:088.67944° | River Basin: Ohio | |
| Investigators: Tim Sandefur | | | |
| Date: 24OCT06<br>Time: 1030 | Reason for Survey:<br>404 Functional Assessment | Signature: Timothy D. Sandefur | |
| WEATHER CONDITIONS | Current<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Past 24-Hours<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Heavy Rain in Last 7-Days ☐NO ☒YES<br>Air Temp °F 40<br>Other |
| STREAM CHARACTERIZATION | Stream Subsystem<br>☒Perennial ☐Intermittent ☐Ephemeral<br>☐Headwater ☐Excavated Ditch ☐Other<br><br>Stream Origin<br>☒Upland Runoff<br>☒Spring-fed/Ground water<br>☐Wetland<br>☐Mixture of Origins<br>☐Other | Stream Type<br>☐Coldwater<br>☒Warmwater<br><br>Catchment Area<br>$ac^2$ | |
| WATERSHED FEATURES | Surrounding Land use & Percentage<br>☒Forest60%<br>☐Field/Pasture %<br>☐Agriculture %<br>☐Residential %<br>☒Commercial40%<br>☐Industrial %<br>☐Other % | Local Watershed NPS Pollution<br>☐No Evidence<br>☒Some Potential Sources<br>☐Obvious Sources<br>Source:<br><br>Local Watershed Erosion<br>☐None<br>☒Moderate<br>☐Heavy<br>Source: | |
| RIPARIAN VEGETATION (18 meter buffer) | Dominant Strata<br>☒Trees ☒Shrubs ☐Grasses ☐Herbs ☐None<br><br>Dominant Species: Gum, birch, ash, sycamore, maple, panicum, dicanthelium, lonicera,vitis, toxicodendron | | |
| LARGE WOODY DEBRIS | Large Woody Debris $ft^2$ | Density of Large Woody Debris $ft^2$ /ac | |
| INSTREAM FEATURES | Estimated Stream Length 1353ft<br><br>Estimated Stream Distance 892ft<br><br>Estimated Stream Width 49ft<br><br>Sampling Area 4900$ft^2$<br><br>Stream Aerial Coverage1.52ac<br><br>Estimated Water Depth 0.3ft<br><br>Surface Velocity 1ft/sec | Canopy Cover<br>☐Open ☐Partly Open<br>☐Shaded ☒Partly Shaded<br><br>High Water Mark >10ft<br><br>Percentage of Stream Morphology<br>☒Riffle 30%☒Run 30%☒Pool 40%<br>☐Step Pool Series<br><br>Channelized ☐YES ☒NO<br>Dam Present ☐YES ☒NO | |

| | |
|---|---|
| AQUATIC VEGETATION | Dominant Strata<br>☐Rooted Emergent ☐Rooted Submergent ☐Rooted Floating ☒None<br>☐Free Floating ☐Attached Algae ☐Floating Algae<br>Species:<br><br>Portion of Reach with Aquatic Vegetation % |
| SEDIMENT / SUBSTRATE | Odors<br>☒Normal ☐Sewage ☐Petroleum ☐Chemical ☐Anaerobic ☐None<br>☐Other:<br>Deposits<br>☐Sludge ☐Sawdust ☐Paper Fiber ☐Sand ☐Silt ☒None<br>☐Other:<br>Oils<br>☐Slight ☐Moderate ☐Profuse ☒None<br>Partially Embedded Stones Black on Underside ☐YES ☒NO ☐No Stones |

| | | |
|---|---|---|
| WATER QUALITY<br><br>NA | Temperature °C<br>Conductivity µs/cm<br>Dissolved Oxygen mg/L<br>pH<br>Turbidity<br>☐Clear ☐Slightly Turbid ☐Turbid<br>☐Opaque ☐Stained ☐Other<br>TDS mg/L<br>Salinity ms/cm<br>ORP mv<br>Instrument: HACH 156 | Water Odors<br>☒Normal/None ☐Sewage ☐Petroleum<br>☐Chemical ☐Anaerobic<br>☐Other<br><br>Water Surface Oils<br>☐Slick ☐Sheen ☐Globs ☐Flecks<br>☒None<br>Other |

| INORGANIC SUBSTRATE COMPONENTS | | | ORGANIC SUBSTRATE COMPONENTS | | |
|---|---|---|---|---|---|
| Substrate Type | Diameter | % Composition in Sampling Reach | Substrate Type | Characteristic | % Composition in Sampling Reach |
| Bedrock | | | Detritus | Sticks, wood, coarse plant material | |
| Boulder | >10" | | | | |
| Cobble | 2.5-10" | 15 | Muck-Mud | Black, very fine organic matter | |
| Gravel | 0.1-2.5" | 70 | | | |
| Sand | gritty | 15 | Marl | Grey, shell fragments | |
| Silt | gooey | | | | |
| Clay | slick | | | | |

| Habitat Parameter | HABITAT ASSESSMENT – LOW GRADIENT STREAMS | | | |
|---|---|---|---|---|
| | Optimal | SubOptimal | Marginal | Poor |
| EPIFAUNAL SUBSTRATE/ AVAILABLE COVER | Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at a stage to allow full colonization potential.<br>☐ ☐ ☒ ☐ ☐<br>20 19 18 17 16 | 30-50% mix of stable habitat; well sited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

| | | | | |
|---|---|---|---|---|
| POOL SUBSTRATE CHARACTER | Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.<br>☐ ☐ ☐ ☐ ☒<br>20 19 18 17 16 | Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | All mud or clay or sand bottom; little or no root mat; no submerged vegetation.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Hard pan clay or bedrock; no root mat or vegetation.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| POOL VARIABILITY | Even mix of large-shallow, large-deep, small-shallow, small-deep pools.<br>☐ ☐ ☐ ☒ ☐<br>20 19 18 17 16 | Majority of pools large-deep, few shallow.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Shallow pools much more prevalent.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Majority of pools small or absent.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| SEDIMENT DEPOSITION | Little or no enlargement of islands or point bars and less than 20% of the bottom affected by deposition.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | 20-50% of bottom affected by increase in bar formation, mostly from gravel, sand or fine sediment.<br>☐ ☐ ☒ ☐ ☐<br>15 14 13 12 11 | 50-80% of bottom affected by bar formation and deposition. Buildup at obstructions.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | 80% or more of bottom affected by sediment deposition.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL FLOW STATUS | Water reaches base of both banks, minimal substrate exposed.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Water fills 75% of channel.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Water fills 25-75% of channel, riffle substrate mostly exposed.<br>☒ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Very little water in channel, mostly present as standing pools.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL ALTERATION | Channelization or dredging absent or minimal, normal stream pattern.<br>☐ ☐ ☐ ☒ ☐<br>20 19 18 17 16 | Minor channelization in areas of abutment. Other channelization greater than 20-years<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 40-80% of channel disturbed by dredging on both banks.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Over 80% of channel disrupted Instream habitat greatly diminished / removed.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

| | | | | |
|---|---|---|---|---|
| CHANNEL SINUOSITY | Bends increase stream length 3-4x<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Bends increase stream length 1.6-2x<br>☐ ☐ ☐ ☐ ☒<br>15 14 13 12 11 | Bends increase stream length 1-1.5x<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Channelized and straight length 1<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| BANK STABILITY | Banks stable, minimal erosion <5%<br>Left Bank ☐ ☐<br>10 9<br>Right Bank ☐ ☐<br>10 9 | Moderate stability, erosion 5-30%<br>☒ ☐ ☐<br>8 7 6<br>☒ ☐ ☐<br>8 7 6 | Minor stability, erosion 30-60%<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | Unstable, sluffing and erosion 60-100%<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| VEGETATIVE PROTECTION | >90% of streambank and riparian zone with undisturbed Native vegetation.<br>Left Bank ☐ ☐<br>10 9<br>Right Bank ☐ ☐<br>10 9 | 70-90% Native vegetation with one strata missing, minor disruption.<br>☐ ☒ ☐<br>8 7 6<br>☐ ☒ ☐<br>8 7 6 | 50-70% vegetation obvious disruption, patches of bare soil or short stubble.<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | >50% vegetation.<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| RIPARIAN VEGETATION ZONE WIDTH | >18 meters, no human impact.<br>Left Bank ☐ ☐<br>10 9<br>Right Bank ☐ ☐<br>10 9 | 12-18 meters, minimal impact.<br>☐ ☐ ☒<br>8 7 6<br>☐ ☐ ☒<br>8 7 6 | 6-12 meters, much human impact.<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | <6 meters<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| TOTAL SCORE: 144 | COMMENTS: | | | |

S 1

## Rapid Bio Assessment Stream Data

| | | | |
|---|---|---|---|
| Project ID: James | | Stream Class: Intermittent | |
| Stream ID: Stream 2 | | Location: McCracken County, KY | |
| Lat:37.07075° | Long:088.68125° | River Basin: Ohio | |
| Investigators: Tim Sandefur | | | |
| Date: 24OCT06<br>Time: 1130 | Reason for Survey:<br>404 Functional Assessment | Signature: Timothy D. Sandefur | |
| WEATHER CONDITIONS | Current<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Past 24-Hours<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Heavy Rain in Last 7-Days ☐NO ☒YES<br>Air Temp °F 40<br>Other |
| STREAM CHARACTERIZATION | Stream Subsystem<br>☐Perennial ☒Intermittent ☐Ephemeral<br>☐Headwater ☐Excavated Ditch ☐Other<br><br>Stream Origin<br>☒Upland Runoff<br>☒Spring-fed/Ground water<br>☐Wetland<br>☐Mixture of Origins<br>☐Other | Stream Type<br>☐Coldwater<br>☒Warmwater<br><br>Catchment Area<br>$ac^2$ | |
| WATERSHED FEATURES | Surrounding Land use & Percentage<br>☒Forest80%<br>☐Field/Pasture %<br>☐Agriculture %<br>☐Residential %<br>☒Commercial20%<br>☐Industrial %<br>☐Other % | Local Watershed NPS Pollution<br>☐No Evidence<br>☒Some Potential Sources<br>☐Obvious Sources<br>Source:<br><br>Local Watershed Erosion<br>☐None<br>☒Moderate<br>☐Heavy<br>Source: | |
| RIPARIAN VEGETATION (18 meter buffer) | Dominant Strata<br>☒Trees ☒Shrubs ☐Grasses ☐Herbs ☐None<br><br>Dominant Species: Hickory, hackberry, coralberry, oak | | |
| LARGE WOODY DEBRIS | Large Woody Debris $ft^2$ | Density of Large Woody Debris $ft^2$ /ac | |
| INSTREAM FEATURES | Estimated Stream Length 846ft<br><br>Estimated Stream Distance 640ft<br><br>Estimated Stream Width 2.6ft<br><br>Sampling Area 130$ft^2$<br><br>Stream Aerial Coverage.0505ac<br><br>Estimated Water Depth 0.1ft<br><br>Surface Velocity NAft/sec | Canopy Cover<br>☐Open ☐Partly Open<br>☒Shaded ☐Partly Shaded<br><br>Ordinary High Water Mark 2.2ft<br><br>Percentage of Stream Morphology<br>☒Riffle 10%☒Run 85%☒Pool 5%<br>☐Step Pool Series<br><br>Channelized ☐YES ☒NO<br>Dam Present ☐YES ☒NO | |

| | |
|---|---|
| AQUATIC VEGETATION | Dominant Strata<br>☐Rooted Emergent ☐Rooted Submergent ☐Rooted Floating ☒None<br>☐Free Floating ☐Attached Algae ☐Floating Algae<br>Species:<br><br>Portion of Reach with Aquatic Vegetation % |
| SEDIMENT / SUBSTRATE | Odors<br>☒Normal ☐Sewage ☐Petroleum ☐Chemical ☐Anaerobic ☐None<br>☐Other:<br>Deposits<br>☐Sludge ☐Sawdust ☐Paper Fiber ☐Sand ☒Silt ☐None<br>☐Other:<br>Oils<br>☐Slight ☐Moderate ☐Profuse ☒None<br>Partially Embedded Stones Black on Underside ☒YES ☐NO ☐No Stones |

| | | |
|---|---|---|
| WATER QUALITY<br><br>NA | Temperature °C<br>Conductivity µs/cm<br>Dissolved Oxygen mg/L<br>pH<br>Turbidity<br>☐Clear ☐Slightly Turbid ☐Turbid<br>☐Opaque ☐Stained ☐Other<br>TDS mg/L<br>Salinity ms/cm<br>ORP mv<br>Instrument: HACH 156 | Water Odors<br>☒Normal/None ☐Sewage ☐Petroleum<br>☐Chemical ☐Anaerobic<br>☐Other<br><br>Water Surface Oils<br>☐Slick ☐Sheen ☐Globs ☐Flecks<br>☒None<br>Other |

| INORGANIC SUBSTRATE COMPONENTS | | | ORGANIC SUBSTRATE COMPONENTS | | |
|---|---|---|---|---|---|
| Substrate Type | Diameter | % Composition in Sampling Reach | Substrate Type | Characteristic | % Composition in Sampling Reach |
| Bedrock | | | Detritus | Sticks, wood, coarse plant material | |
| Boulder | >10" | | | | |
| Cobble | 2.5-10" | | Muck-Mud | Black, very fine organic matter | |
| Gravel | 0.1-2.5" | 10 | | | |
| Sand | gritty | 20 | Marl | Grey, shell fragments | |
| Silt | gooey | 50 | | | |
| Clay | slick | 20 | | | |

| Habitat Parameter | HABITAT ASSESSMENT – LOW GRADIENT STREAMS | | | |
|---|---|---|---|---|
| | Optimal | SubOptimal | Marginal | Poor |
| EPIFAUNAL SUBSTRATE/ AVAILABLE COVER | Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at a stage to allow full colonization potential.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | 30-50% mix of stable habitat; well sited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.<br>☒ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

| | | | | |
|---|---|---|---|---|
| POOL SUBSTRATE CHARACTER | Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | All mud or clay or sand bottom; little or no root mat; no submerged vegetation.<br>☒ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Hard pan clay or bedrock; no root mat or vegetation.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| POOL VARIABILITY | Even mix of large-shallow, large-deep, small-shallow, small-deep pools.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Majority of pools large-deep, few shallow.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Shallow pools much more prevalent.<br>☐ ☐ ☐ ☐ ☒<br>10 9 8 7 6 | Majority of pools small or absent.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| SEDIMENT DEPOSITION | Little or no enlargement of islands or point bars and less than 20% of the bottom affected by deposition.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | 20-50% of bottom affected by increase in bar formation, mostly from gravel, sand or fine sediment.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 50-80% of bottom affected by bar formation and deposition. Buildup at obstructions.<br>☐ ☐ ☐ ☒ ☐<br>10 9 8 7 6 | 80% or more of bottom affected by sediment deposition.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL FLOW STATUS | Water reaches base of both banks, minimal substrate exposed.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Water fills 75% of channel.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Water fills 25-75% of channel, riffle substrate mostly exposed.<br>☐ ☐ ☒ ☐ ☐<br>10 9 8 7 6 | Very little water in channel, mostly present as standing pools.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL ALTERATION | Channelization or dredging absent or minimal, normal stream pattern.<br>☐ ☐ ☐ ☐ ☒<br>20 19 18 17 16 | Minor channelization in areas of abutment. Other channelization greater than 20-years<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 40-80% of channel disturbed by dredging on both banks.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Over 80% of channel disrupted Instream habitat greatly diminished / removed.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

| | | | | |
|---|---|---|---|---|
| CHANNEL SINUOSITY | Bends increase stream length 3-4x<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Bends increase stream length 1.6-2x<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Bends increase stream length 1-1.5x<br>☐ ☐ ☒ ☐ ☐<br>10 9 8 7 6 | Channelized and straight length 1<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| BANK STABILITY | Banks stable, minimal erosion <5%<br>Left Bank ☐ ☐<br>11 9<br>Right Bank ☐ ☐<br>10 9 | Moderate stability, erosion 5-30%<br>☐ ☐ ☒<br>8 7 6<br>☐ ☐ ☒<br>8 7 6 | Minor stability, erosion 30-60%<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | Unstable, sluffing and erosion 60-100%<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| VEGETATIVE PROTECTION | >90% of streambank and riparian zone with undisturbed Native vegetation.<br>Left Bank ☐ ☐<br>11 9<br>Right Bank ☐ ☐<br>10 9 | 70-90% Native vegetation with one strata missing, minor disruption.<br>☐ ☐ ☐<br>8 7 6<br>☐ ☐ ☐<br>8 7 6 | 50-70% vegetation obvious disruption, patches of bare soil or short stubble.<br>☒ ☐ ☐<br>5 4 3<br>☒ ☐ ☐<br>5 4 3 | >50% vegetation.<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| RIPARIAN VEGETATION ZONE WIDTH | >18 meters, no human impact.<br>Left Bank ☐ ☐<br>10 9<br>Right Bank ☐ ☐<br>10 9 | 12-18 meters, minimal impact.<br>☒ ☐ ☐<br>8 7 6<br>☒ ☐ ☐<br>8 7 6 | 6-12 meters, much human impact.<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | <6 meters<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |

| | |
|---|---|
| TOTAL SCORE: 103 | COMMENTS: |

S 2

## Physical Characterization/Water Quality Field Data Sheet

| | | | |
|---|---|---|---|
| Project ID: James | | Stream Class: Ephemeral | |
| Stream ID: Stream 3 | | Location: McCracken County, KY | |
| Lat:37.07116° | Long:088.68192° | River Basin: Ohio | |
| Investigators: Tim Sandefur | | | |
| Date: 24OCT06<br>Time: 1600 | Reason for Survey:<br>404 Functional Assessment | Signature: Timothy D. Sandefur | |
| WEATHER CONDITIONS | Current<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Past 24-Hours<br>☐Storm (Heavy Rain)<br>☐Rain (Steady)<br>☐Showers (Intermittent)<br>☐Cloud Cover %<br>☒Clear/Sunny | Heavy Rain in Last 7-Days ☐NO ☒YES<br>Air Temp °F 39<br>Other |
| STREAM CHARACTERIZATION | Stream Subsystem<br>☐Perennial ☐Intermittent ☒Ephemeral<br>☐Headwater ☐Excavated Ditch ☐Other<br><br>Stream Origin<br>☒Upland Runoff<br>☐Spring-fed/Ground water<br>☐Wetland<br>☐Mixture of Origins<br>☐Other | Stream Type<br>☐Coldwater<br>☒Warmwater<br><br>Catchment Area<br>$ac^2$ | |
| WATERSHED FEATURES | Surrounding Land use & Percentage<br>☒Forest100%<br>☐Field/Pasture %<br>☐Agriculture %<br>☐Residential %<br>☐Commercial %<br>☐Industrial %<br>☐Other % | Local Watershed NPS Pollution<br>☒No Evidence<br>☐Some Potential Sources<br>☐Obvious Sources<br>Source:<br><br>Local Watershed Erosion<br>☐None<br>☒Moderate<br>☐Heavy<br>Source: | |
| RIPARIAN VEGETATION (18 meter buffer) | Dominant Strata<br>☒Trees ☒Shrubs ☐Grasses ☐Herbs ☐None<br><br>Dominant Species: maple, box elder, hickory, coralberry | | |
| LARGE WOODY DEBRIS | Large Woody Debris $ft^2$ | Density of Large Woody Debris $ft^2$ /ac | |
| INSTREAM FEATURES | Estimated Stream Length 180ft<br><br>Estimated Stream Distance 174ft<br><br>Estimated Stream Width 1.9ft<br><br>Sampling Area $95ft^2$<br><br>Stream Aerial Coverage0.008ac<br><br>Estimated Water Depth 0.08ft<br><br>Surface Velocity NAft/sec | Canopy Cover<br>☐Open ☐Partly Open<br>☒Shaded ☐Partly Shaded<br><br>High Water Mark 1.7ft<br><br>Percentage of Stream Morphology<br>☒Riffle 15%☒Run 60%☒Pool 25%<br>☐Step Pool Series<br><br>Channelized ☐YES ☒NO<br>Dam Present ☐YES ☒NO | |

| | |
|---|---|
| AQUATIC VEGETATION | Dominant Strata<br>☐Rooted Emergent ☐Rooted Submergent ☐Rooted Floating ☒None<br>☐Free Floating ☐Attached Algae ☐Floating Algae<br>Species:<br><br>Portion of Reach with Aquatic Vegetation % |
| SEDIMENT / SUBSTRATE | Odors<br>☒Normal ☐Sewage ☐Petroleum ☐Chemical ☐Anaerobic ☐None<br>☐Other:<br>Deposits<br>☐Sludge ☐Sawdust ☐Paper Fiber ☐Sand ☒Silt ☐None<br>☐Other:<br>Oils<br>☐Slight ☐Moderate ☐Profuse ☒None<br>Partially Embedded Stones Black on Underside ☐YES ☐NO ☒No Stones |
| WATER QUALITY<br><br>NA | Temperature °C<br>Conductivity µs/cm<br>Dissolved Oxygen mg/L<br>pH<br>Turbidity<br>☐Clear ☐Slightly Turbid ☐Turbid<br>☐Opaque ☐Stained ☐Other<br>TDS mg/L<br>Salinity ms/cm<br>ORP mv<br>Instrument: HACH 156<br><br>Water Odors<br>☐Normal/None ☒Sewage ☐Petroleum<br>☐Chemical ☐Anaerobic<br>☐Other<br><br>Water Surface Oils<br>☐Slick ☐Sheen ☐Globs ☐Flecks<br>☒None<br>Other |

| INORGANIC SUBSTRATE COMPONENTS | | | ORGANIC SUBSTRATE COMPONENTS | | |
|---|---|---|---|---|---|
| Substrate Type | Diameter | % Composition in Sampling Reach | Substrate Type | Characteristic | % Composition in Sampling Reach |
| Bedrock | | | Detritus | Sticks, wood, coarse plant material | |
| Boulder | >10" | | | | |
| Cobble | 2.5-10" | | Muck-Mud | Black, very fine organic matter | |
| Gravel | 0.1-2.5" | 4 | | | |
| Sand | gritty | 20 | Marl | Grey, shell fragments | |
| Silt | gooey | 60 | | | |
| Clay | slick | 16 | | | |

| Habitat Parameter | HABITAT ASSESSMENT – LOW GRADIENT STREAMS | | | |
|---|---|---|---|---|
| | Optimal | SubOptimal | Marginal | Poor |
| EPIFAUNAL SUBSTRATE/ AVAILABLE COVER | Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at a stage to allow full colonization potential.<br><br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | 30-50% mix of stable habitat; well sited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization.<br><br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.<br><br>☐ ☐ ☐ ☐ ☒<br>10 9 8 7 6 | Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.<br><br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

| | | | | |
|---|---|---|---|---|
| POOL SUBSTRATE CHARACTER | Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | All mud or clay or sand bottom; little or no root mat; no submerged vegetation.<br>☐ ☐ ☐ ☐ ☒<br>10 9 8 7 6 | Hard pan clay or bedrock; no root mat or vegetation.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| POOL VARIABILITY | Even mix of large-shallow, large-deep, small-shallow, small-deep pools.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Majority of pools large-deep, few shallow.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Shallow pools much more prevalent.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Majority of pools small or absent.<br>☒ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| SEDIMENT DEPOSITION | Little or no enlargement of islands or point bars and less than 20% of the bottom affected by deposition.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | 20-50% of bottom affected by increase in bar formation, mostly from gravel, sand or fine sediment.<br>☐ ☐ ☐ ☐ ☒<br>15 14 13 12 11 | 50-80% of bottom affected by bar formation and deposition. Buildup at obstructions.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | 80% or more of bottom affected by sediment deposition.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL FLOW STATUS | Water reaches base of both banks, minimal substrate exposed.<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Water fills 75% of channel.<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Water fills 25-75% of channel, riffle substrate mostly exposed.<br>☐ ☐ ☐ ☐ ☒<br>10 9 8 7 6 | Very little water in channel, mostly present as standing pools.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |
| CHANNEL ALTERATION | Channelization or dredging absent or minimal, normal stream pattern.<br>☐ ☐ ☐ ☐ ☒<br>20 19 18 17 16 | Minor channelization in areas of abutment. Other channelization greater than 20-years<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | 40-80% of channel disturbed by dredging on both banks.<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Over 80% of channel disrupted Instream habitat greatly diminished / removed.<br>☐ ☐ ☐ ☐ ☐ ☐<br>5 4 3 2 1 0 |

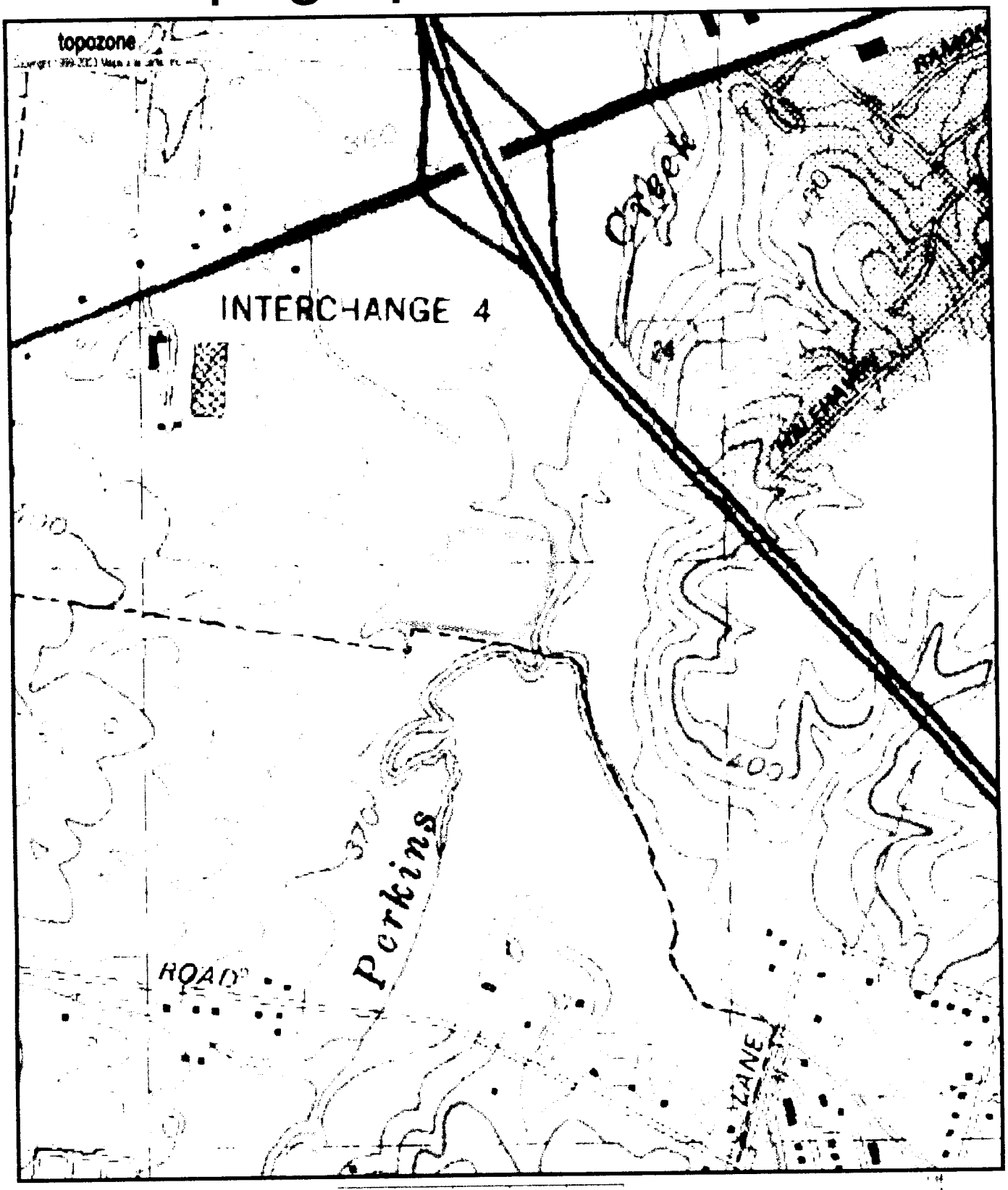
| | | | | |
|---|---|---|---|---|
| CHANNEL SINUOSITY | Bends increase stream length 3-4x<br>☐ ☐ ☐ ☐ ☐<br>20 19 18 17 16 | Bends increase stream length 1.6-2x<br>☐ ☐ ☐ ☐ ☐<br>15 14 13 12 11 | Bends increase stream length 1-1.5x<br>☐ ☐ ☐ ☐ ☐<br>10 9 8 7 6 | Channelized and straight length 1<br>☐ ☐ ☐ ☒ ☐ ☐<br>5 4 3 2 1 0 |
| BANK STABILITY | Banks stable, minimal erosion <5%<br>Left Bank ☐ ☐<br>12 9<br>Right Bank ☐ ☐<br>10 9 | Moderate stability, erosion 5-30%<br>☐ ☐ ☒<br>8 7 6<br>☐ ☐ ☒<br>8 7 6 | Minor stability, erosion 30-60%<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | Unstable, sluffing and erosion 60-100%<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| VEGETATIVE PROTECTION | >90% of streambank and riparian zone with undisturbed Native vegetation.<br>Left Bank ☐ ☐<br>12 9<br>Right Bank ☐ ☐<br>10 9 | 70-90% Native vegetation with one strata missing, minor disruption.<br>☐ ☐ ☐<br>8 7 6<br>☐ ☐ ☐<br>8 7 6 | 50-70% vegetation obvious disruption, patches of bare soil or short stubble.<br>☒ ☐ ☐<br>5 4 3<br>☒ ☐ ☐<br>5 4 3 | >50% vegetation.<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |
| RIPARIAN VEGETATION ZONE WIDTH | >18 meters, no human impact.<br>Left Bank ☐ ☐<br>10 9<br>Right Bank ☐ ☐<br>10 9 | 12-18 meters, minimal impact.<br>☐ ☒ ☐<br>8 7 6<br>☐ ☒ ☐<br>8 7 6 | 6-12 meters, much human impact.<br>☐ ☐ ☐<br>5 4 3<br>☐ ☐ ☐<br>5 4 3 | <6 meters<br>☐ ☐ ☐<br>2 1 0<br>☐ ☐ ☐<br>2 1 0 |

| | |
|---|---|
| TOTAL SCORE: 88 | COMMENTS: |

S 3

# Attachment 2

# JSGS Topographic Map - Impact Site




UTM 16 350624E 4103933N (NAD27)

**Crooked Creek, USGS Paducah West (KY,IL) Quadrangle**

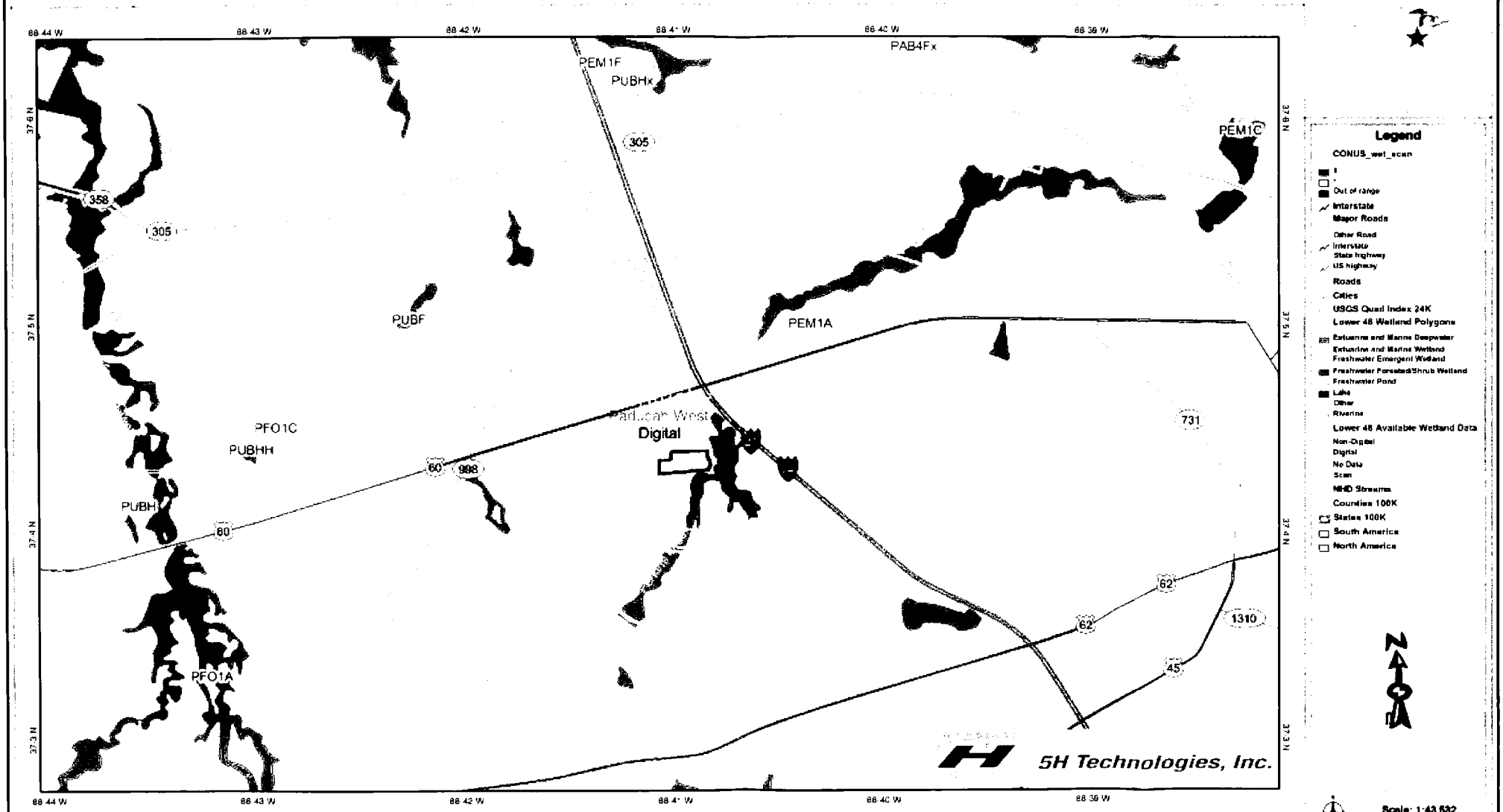
Projection is UTM Zone 16 NAD83 Datum

N

5H Technologies, Inc.

# Attachment 3

# National Wetlands Indicator Map - Impact Site




Map center: 37° 4' 34" N, 88° 41' 4" W

Scale: 1:43,532

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

# Attachment 4

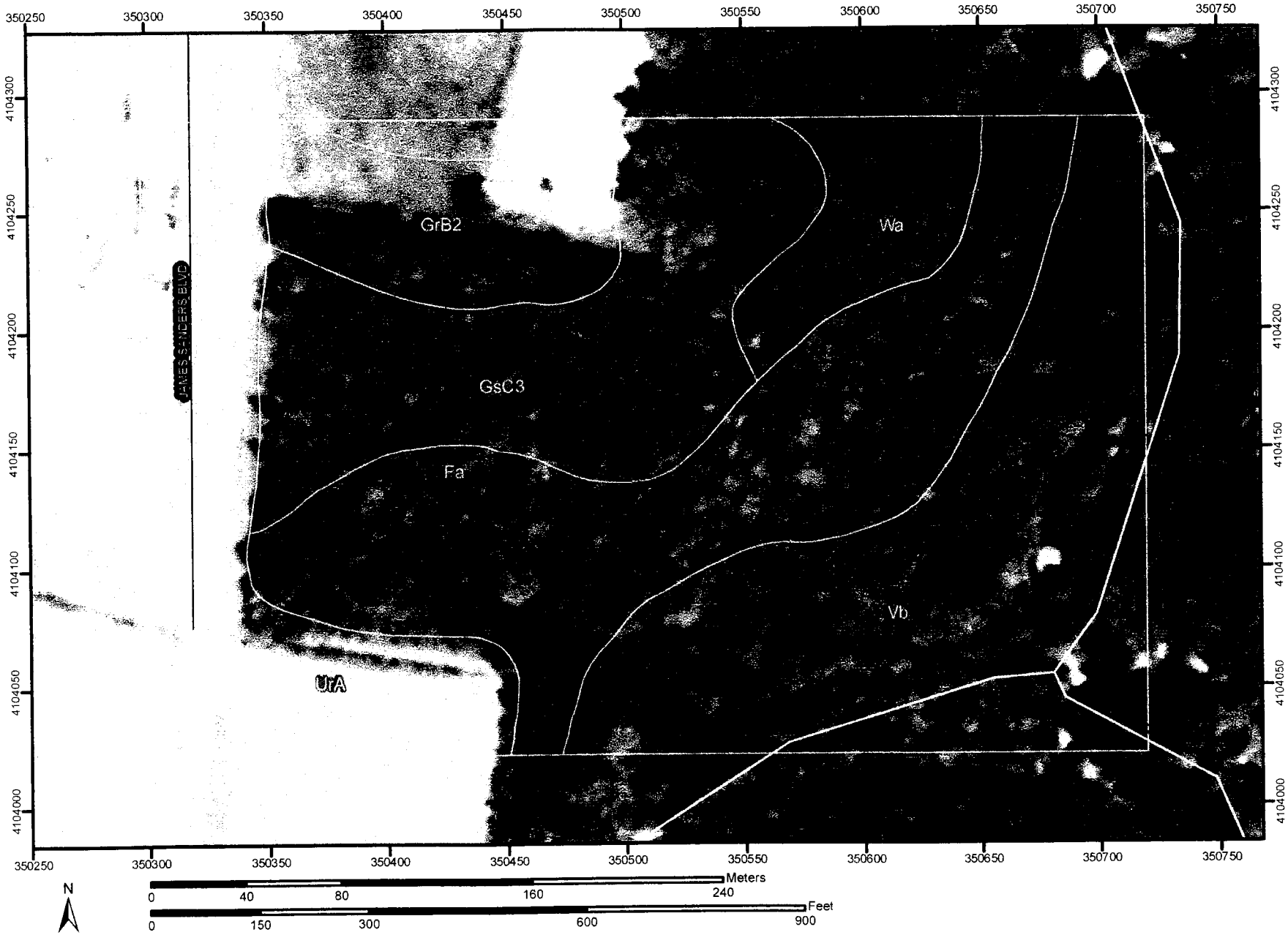
# Flood Plain Map - Impact Site

Schools
Hospitals
Geodesy (HARN)
Geodesy (Horz)
Geodesy (Vert)
Incorporated Cities
Populated Places (GNIS)
Major Roads
State Roads
Local Roads
County Boundaries
Time Zone Boundary
NHD (100k)
NHD (24k)
Ohio River
Lakes/Reservoirs
City Boundaries
Counties
Shaded Relief
LANDCOVER
SPOT 10 Meter
KRGs
Orthoimagery

N

5H Technologies, Inc.

# Attachment 5


350250
350300
350350
350400
350450
350500
350550
350600
350650
350700
350750
4104300
4104250
4104200
4104150
4104100
4104050
4104000
GrB2
Wa
JAMES SANDERS BLVD
GsC3
Fa
Vb
UrA
N
Meters
0
40
80
160
240
Feet
0
150
300
600
900

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Units

**Special Point Features**

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

**Special Line Features**

- Gully
- Short Steep Slope
- Other

**Political Features**

**Municipalities**

- Cities
- Urban Areas

**Water Features**

- Oceans
- Streams and Canals

**Transportation**

- Rails

**Roads**

- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

## MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ballard and McCracken Counties, Kentucky
Survey Area Data: Version 4, Dec 17, 2007

Date(s) aerial images were photographed: 1998

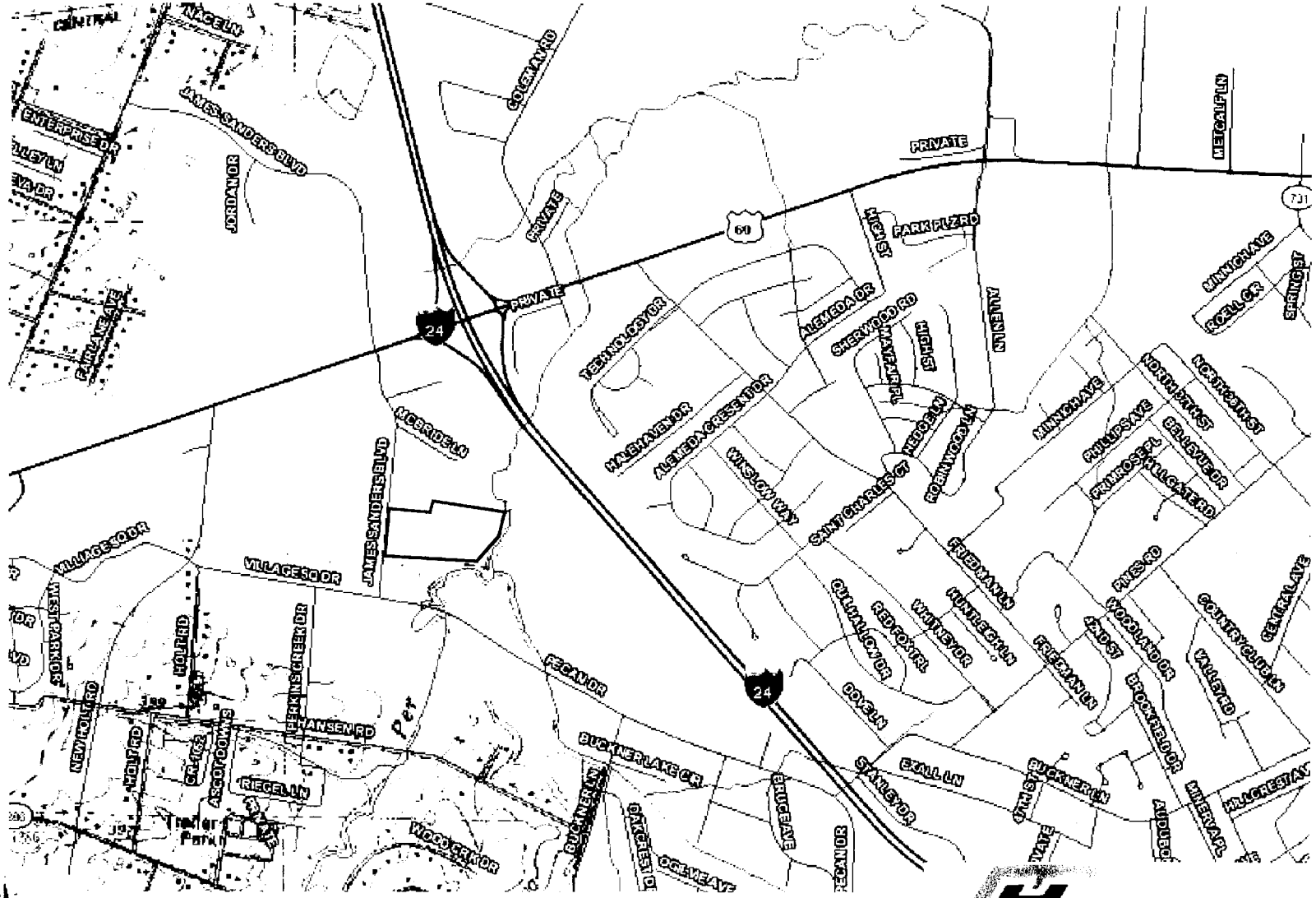
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Ballard and McCracken Counties, Kentucky (KY602) | | | |
|---|---|---|---|
| **Map Unit Symbol** | **Map Unit Name** | **Acres in AOI** | **Percent of AOI** |
| Fa | Falaya-Collins complex, 0 to 2 percent slopes, occasionally flooded | 6.5 | 23.4% |
| GrB2 | Grenada silt loam, 2 to 6 percent slopes, eroded | 2.1 | 7.6% |
| GsC3 | Grenada-Purchase complex, 6 to 12 percent slopes, severely eroded | 5.1 | 18.2% |
| UrA | Urban land-Udorthents complex, 0 to 4 percent slopes | 5.2 | 18.5% |
| Vb | Vicksburg silt loam, 0 to 2 percent slopes, occasionally flooded | 7.5 | 26.8% |
| Wa | Waverly silt loam, 0 to 2 percent slopes, occasionally flooded | 1.5 | 5.5% |
| Totals for Area of Interest (AOI) | | 27.9 | 100.0% |

# Attachment 6

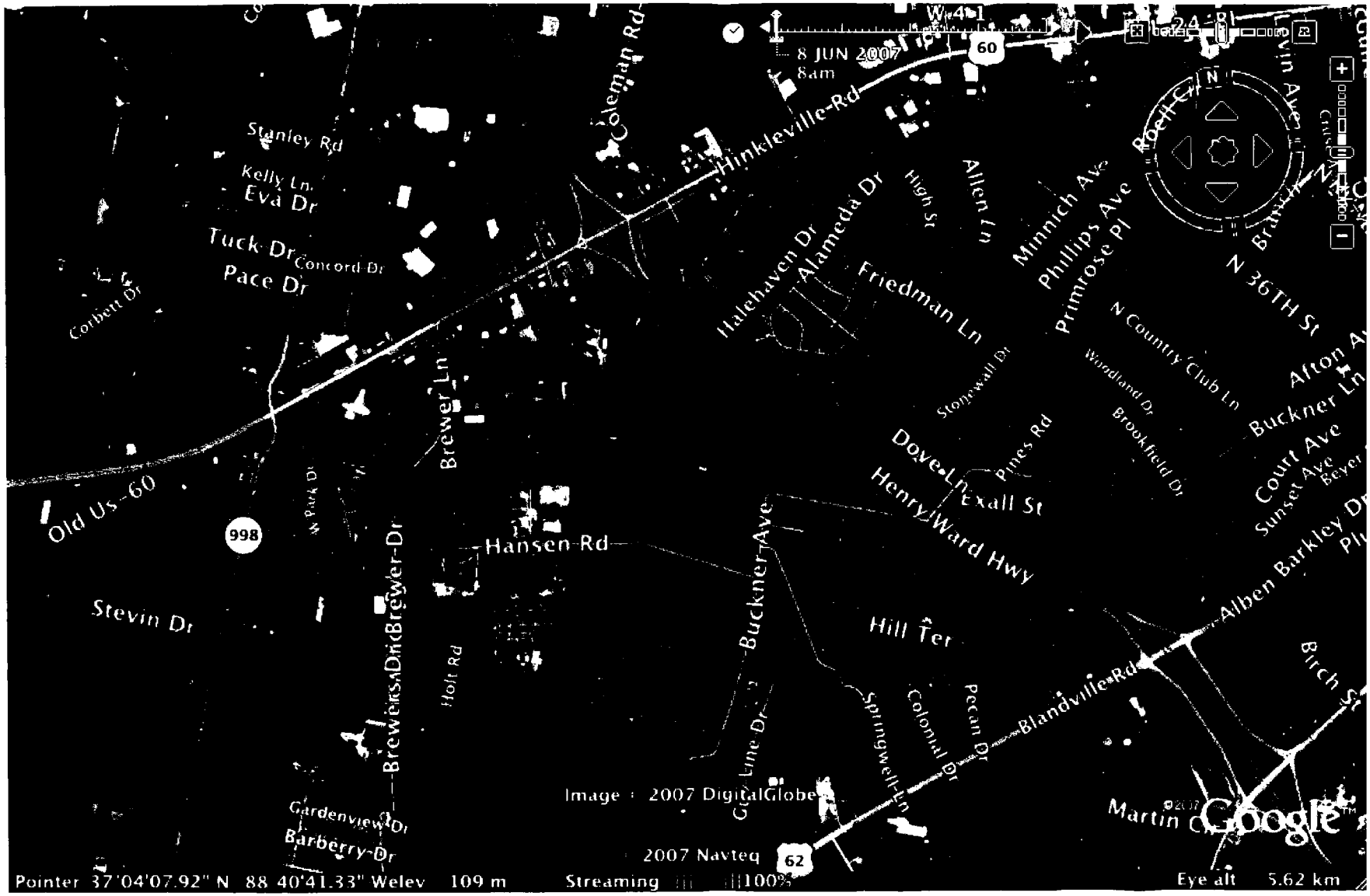
# Hydrology Map - Impact Site




5H Technologies, Inc.

# Attachment 7

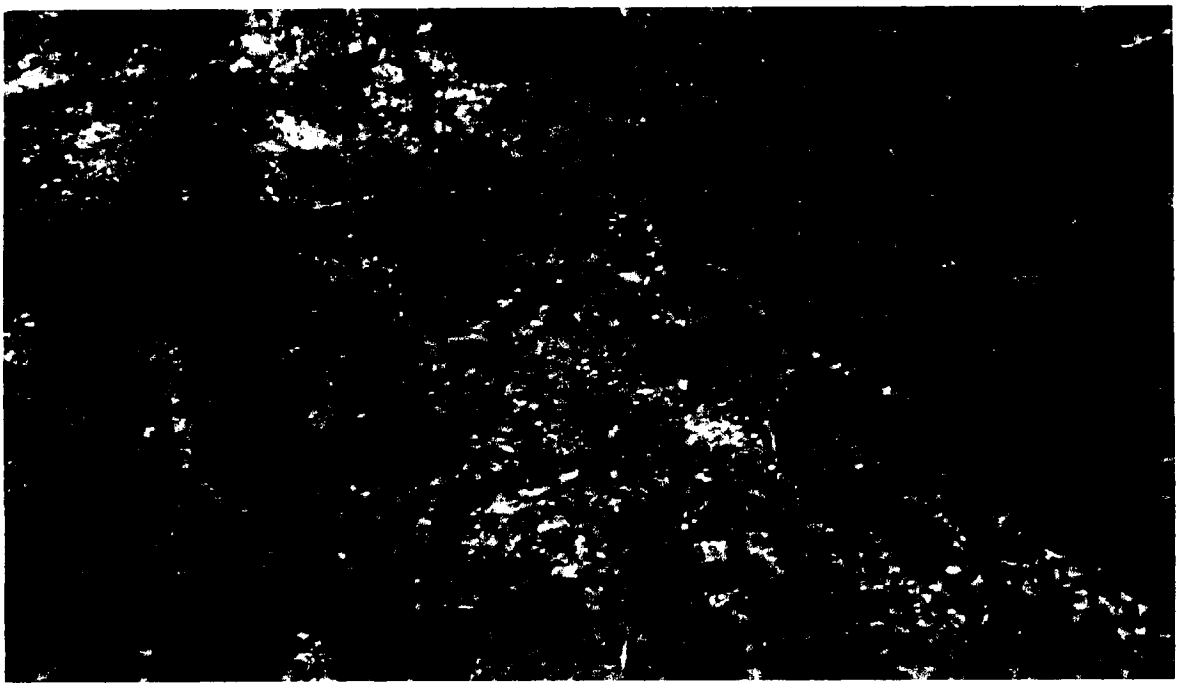
# Aerial Photograph - Impact Site

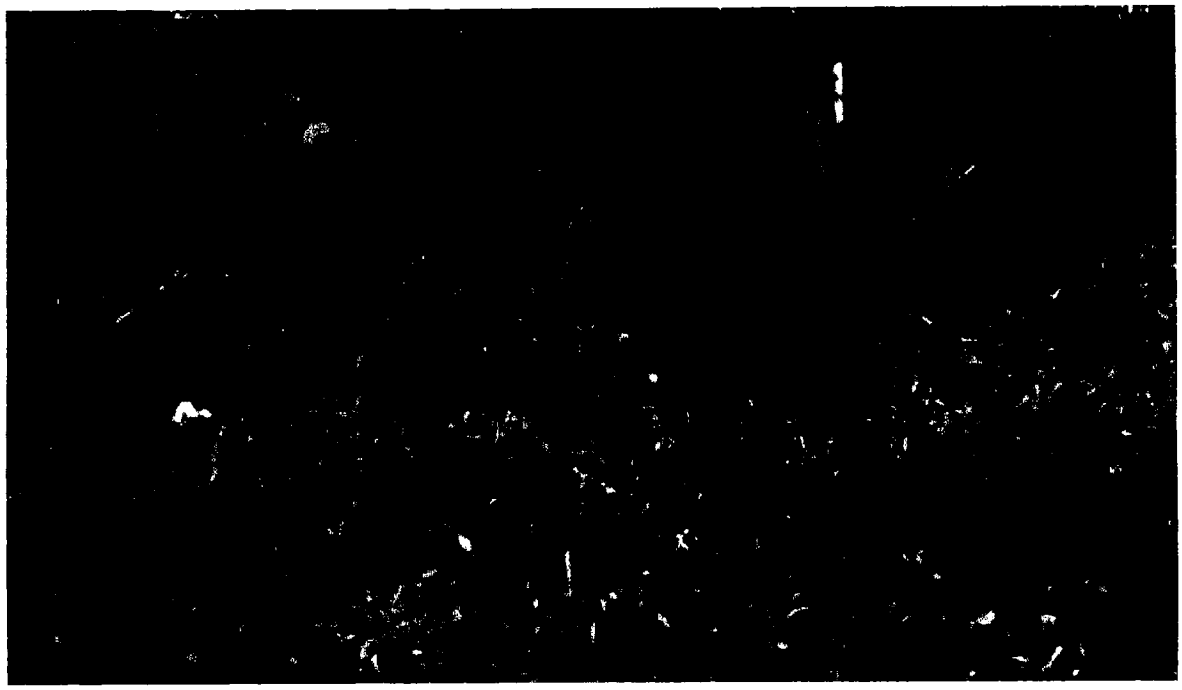



5H Technologies, Inc.

# Attachment 8

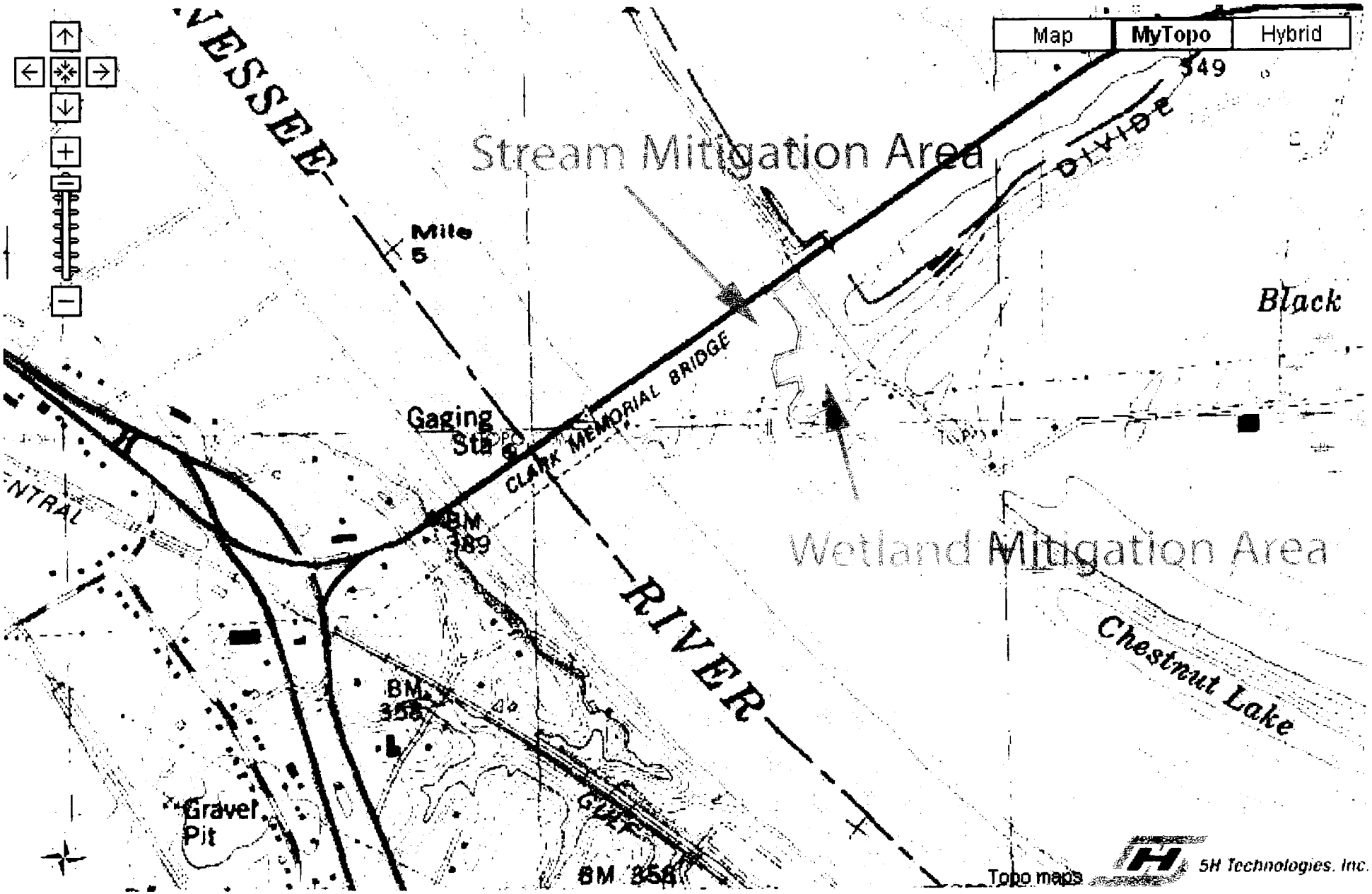
Impact Site Photos (James Sanders Boulevard)





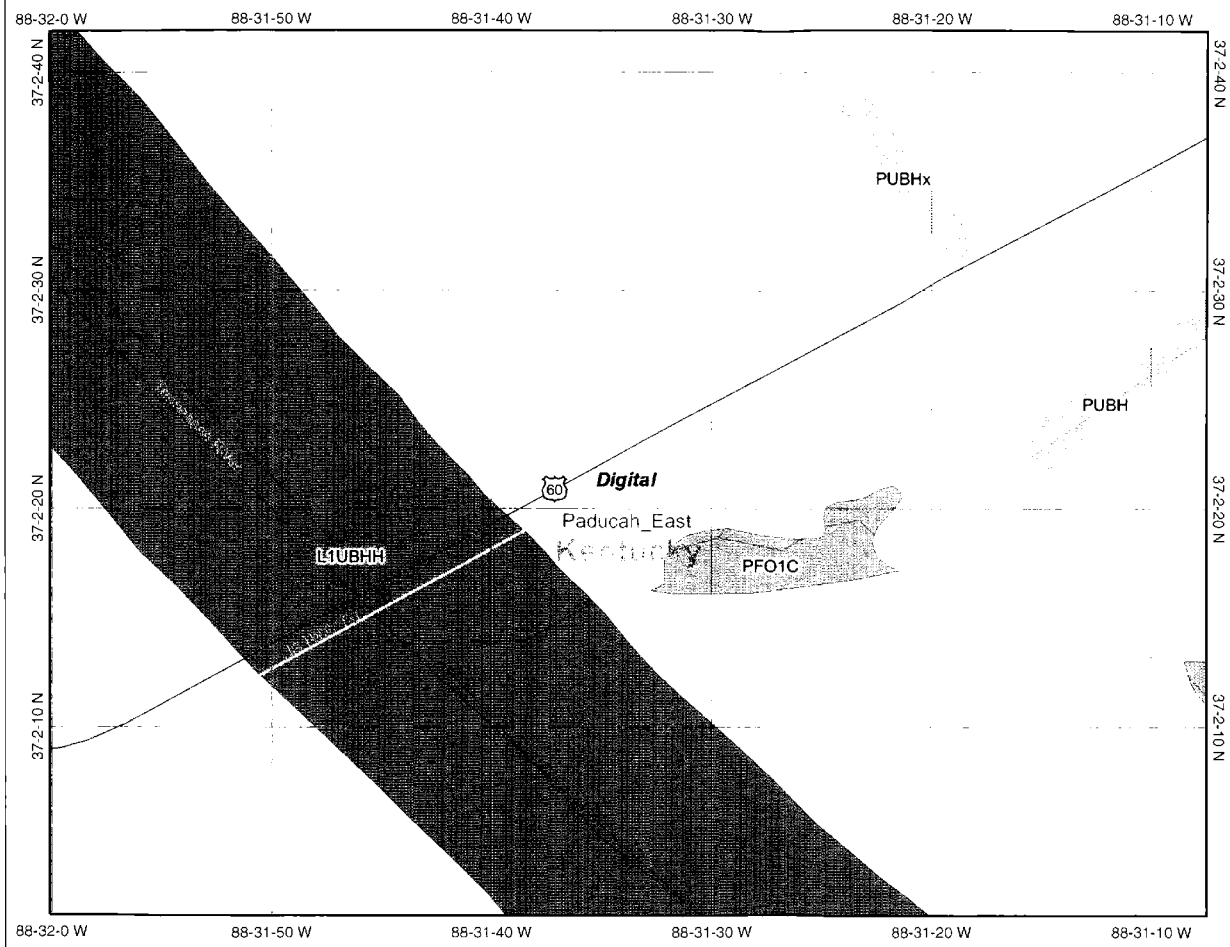
# Attachment 9

# USGS Quadrangle Ledbetter



# Attachment 10

# Weland Mitigation Area



## Legend

**Ohio_wet_scan**
- 0
- 1
- Out of range

**Interstate**

**Major Roads**

Other Road
- Interstate
- State highway
- US highway

**Roads**

- **Cities**

**USGS Quad Index 24K**

**Lower 48 Wetland Polygons**
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

**Lower 48 Available Wetland Data**
- Non-Digital
- Digital
- No Data
- Scan

**NHD Streams**

**Counties 100K**

- **States 100K**
- **South America**
- **North America**

N

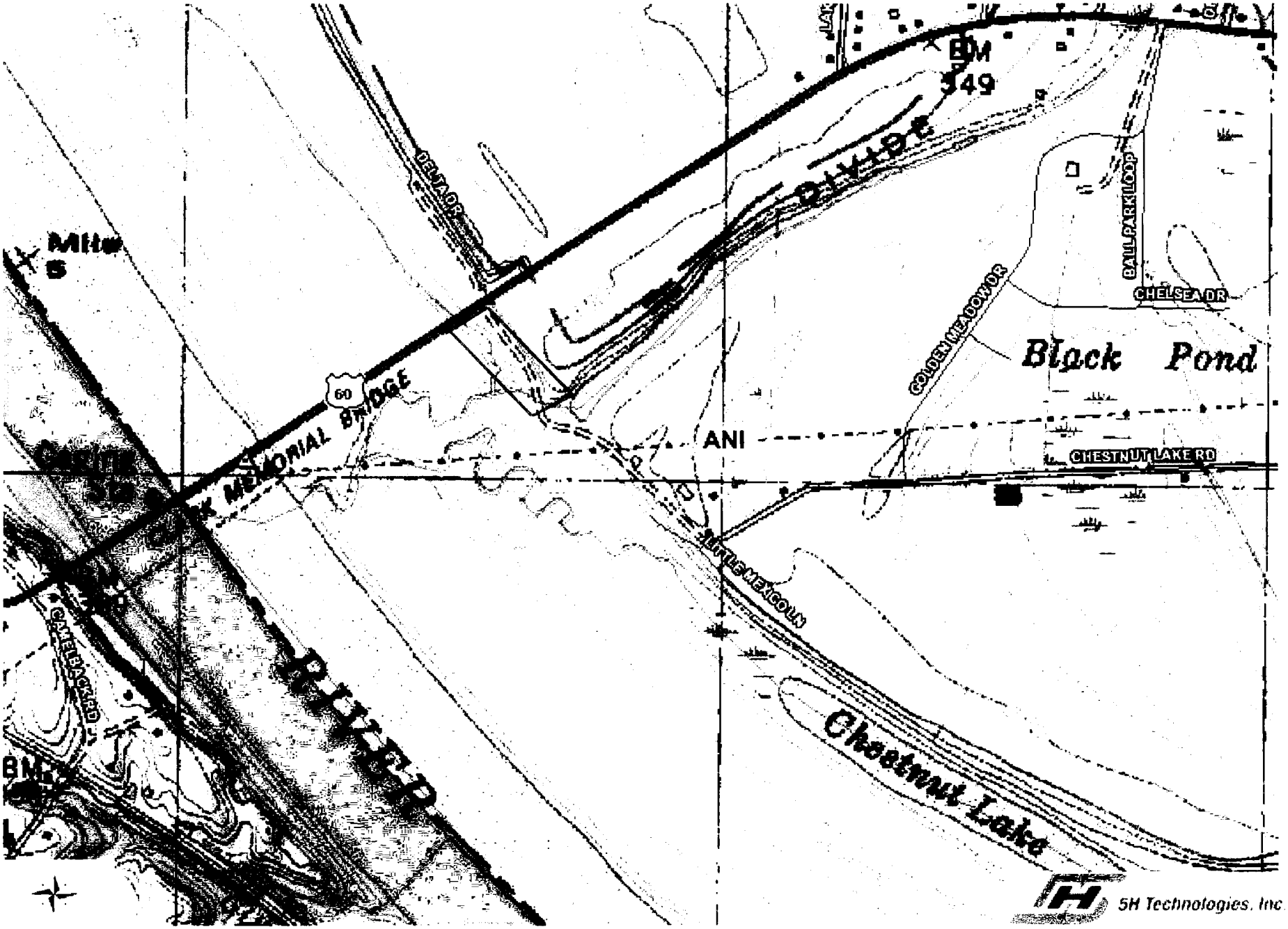
**Scale: 1:8,750**

**Map center: 37° 2' 22" N, 88° 31' 34" W**

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

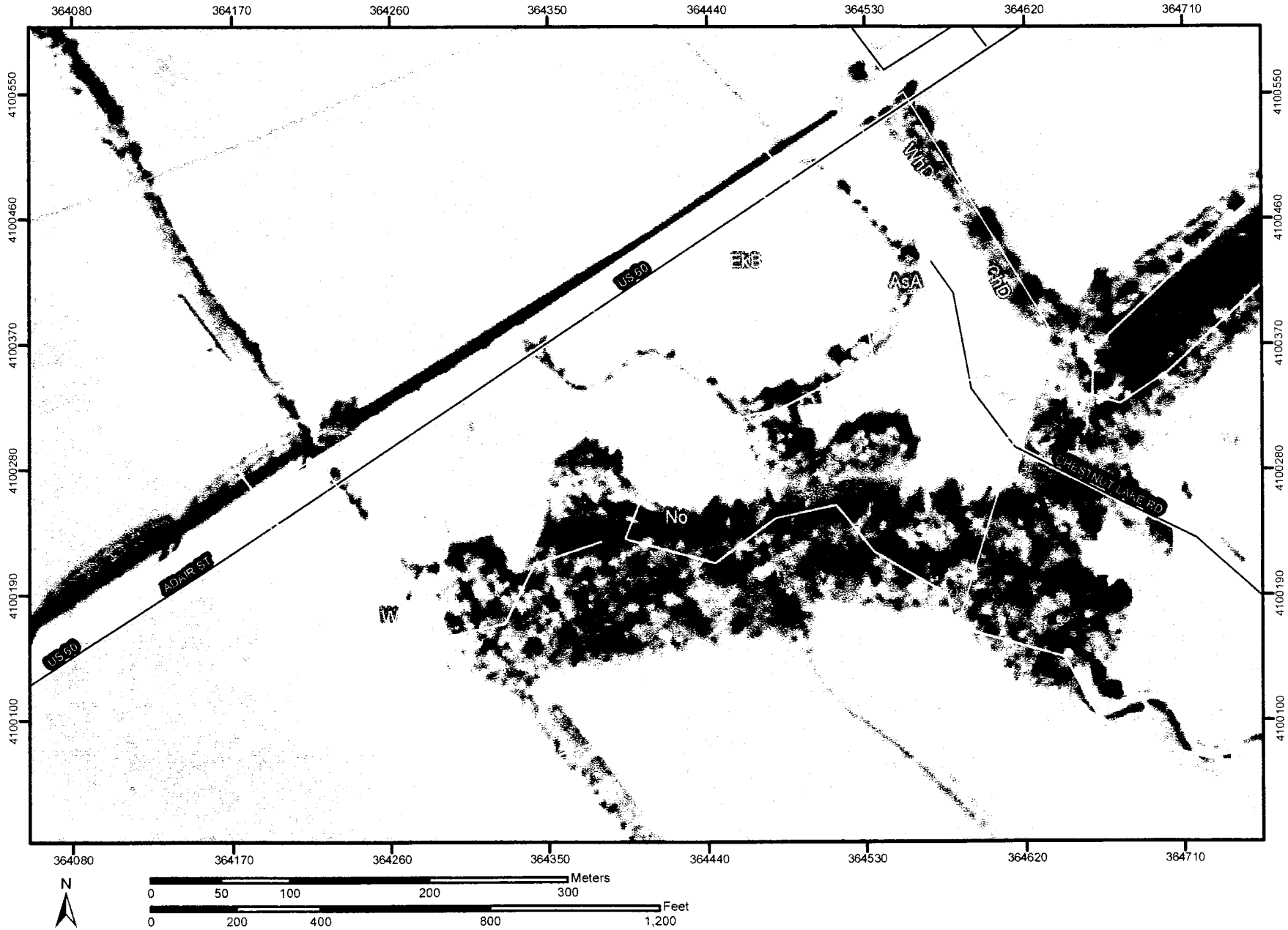
# Attachment 11

# Flood Hazard Wetland Mitigation Area



# Attachment 12

Soil Map–Livingston County, Kentucky
(Wetland Mitigation Area)



## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Units

**Special Point Features**

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

**Special Line Features**

Gully

Short Steep Slope

Other

**Political Features**

**Municipalities**

Cities

Urban Areas

**Water Features**

Oceans

Streams and Canals

**Transportation**

Rails

**Roads**

Interstate Highways

US Routes

State Highways

Local Roads

Other Roads

## MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Livingston County, Kentucky
Survey Area Data: Version 6, Jun 25, 2008

Date(s) aerial images were photographed: 1998

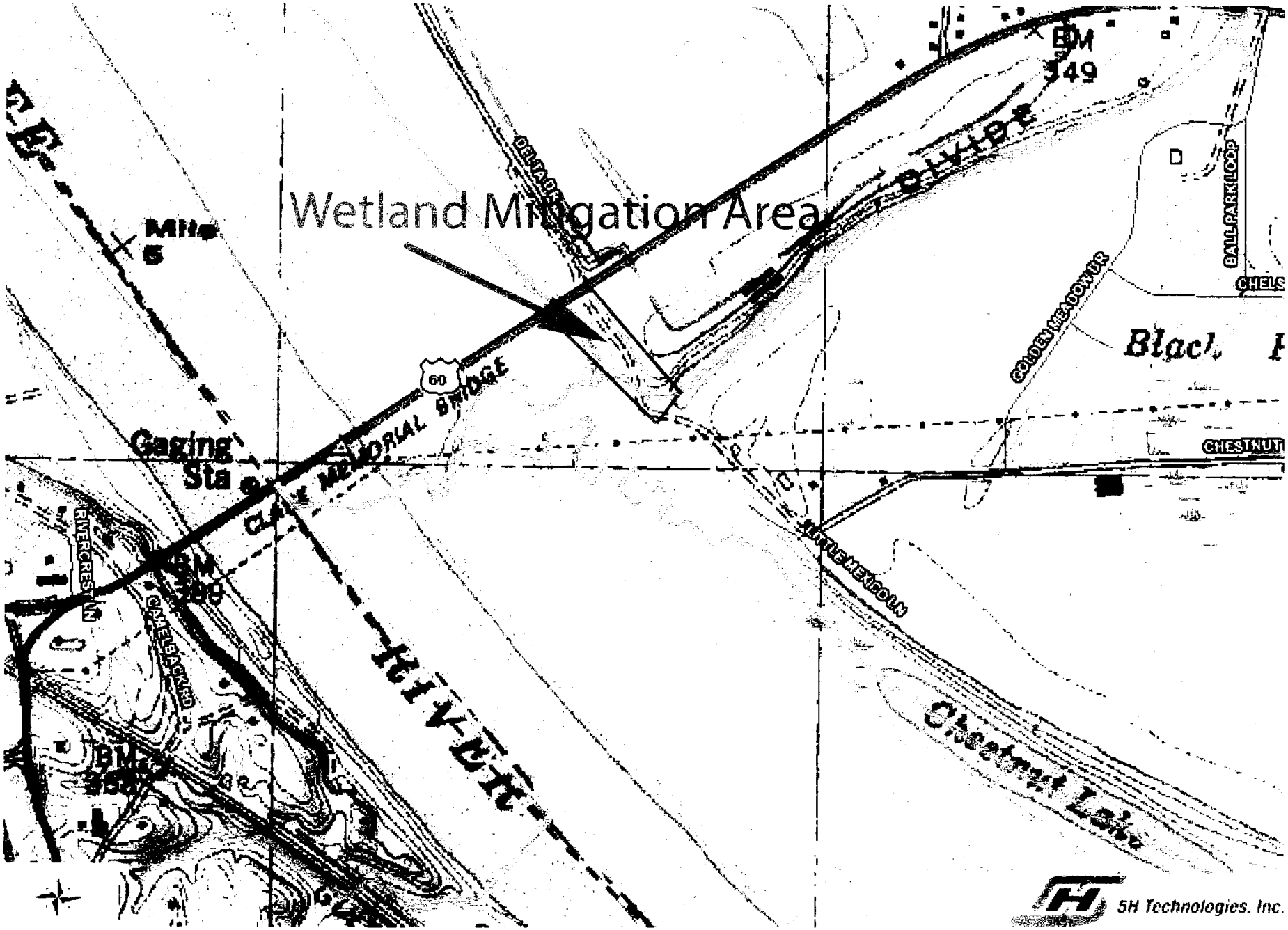
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Livingston County, Kentucky (KY139) | | | |
|---|---|---|---|
| **Map Unit Symbol** | **Map Unit Name** | **Acres in AOI** | **Percent of AOI** |
| AsA | Ashton silt loam, 0 to 4 percent slopes, occasionally flooded | 4.7 | 12.3% |
| ChD | Chavies fine sandy loam, 6 to 20 percent slopes | 0.8 | 2.1% |
| EkB | Elk silt loam, 2 to 6 percent slopes | 2.7 | 7.2% |
| No | Nolin silt loam, frequently flooded | 26.0 | 68.2% |
| W | Water | 3.1 | 8.2% |
| WhD | Wheeling silt loam, 12 to 20 percent slopes | 0.8 | 2.0% |
| Totals for Area of Interest (AOI) | | 38.1 | 100.0% |

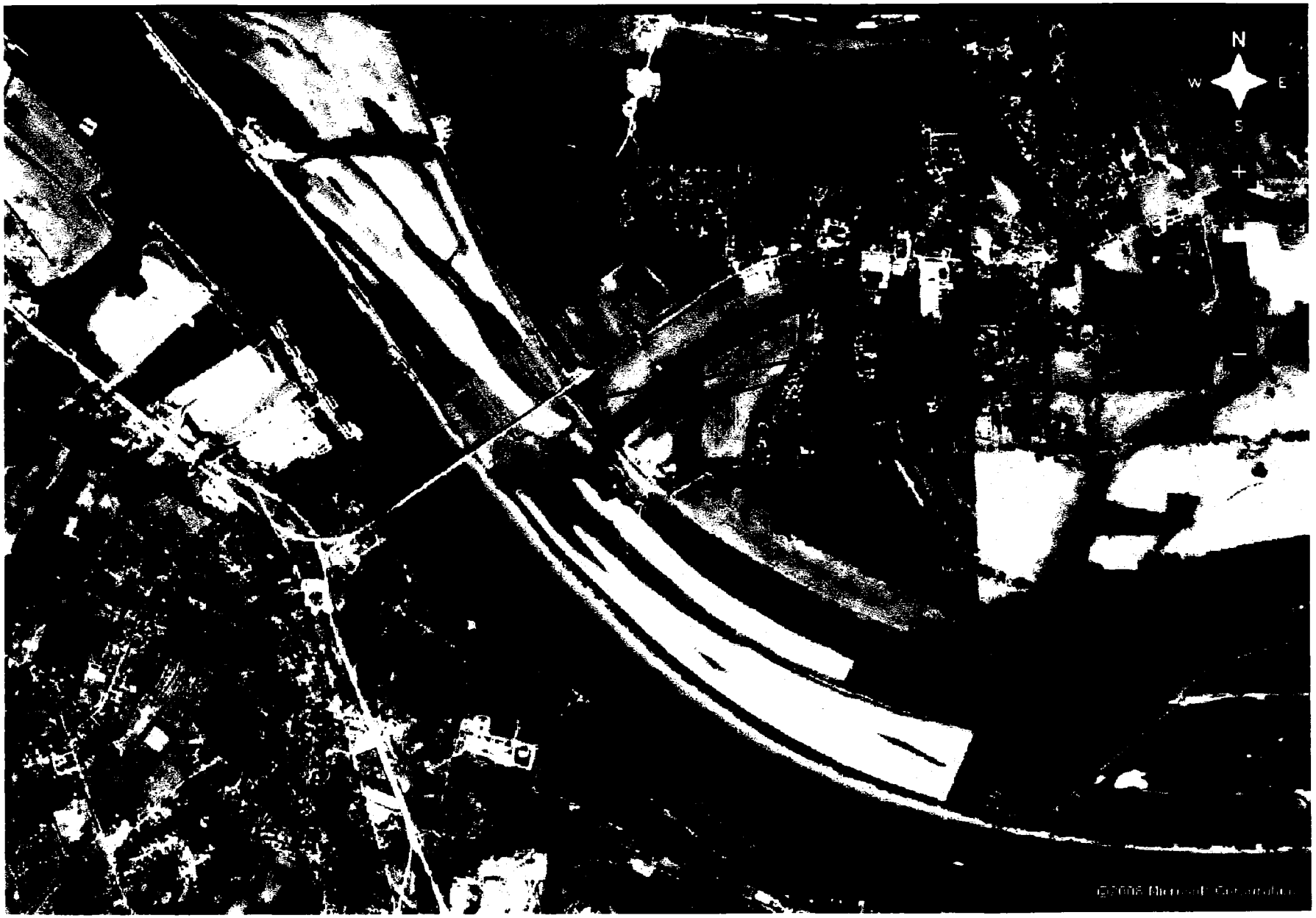
# Attachment 13

# Hydrology Map - Wetland Mitigation Area



# Attachment 14

# Wetland Mitigation Area - Livingston County




5H Technologies, Inc.

# Attachment 15

Wetland Mitigation Site Photos (Highway 60)

# Attachment 16

# Hydric Soils
# McCracken County
# Kentucky

Hydric Soil Map Units (are not drained and/or protected from flooding)

| Symbol unit | Name | Hydric part if not whole map |
|---|---|---|
| Ag | Alligator silty clay | 1/ |
| Hn | Henry silt loam | 1/ |
| Oc | Ocaw silt loam | 1/ |
| Ro | Rosebloom silt loam | 1/ |
| Sh | Sharkey silty clay | 1/ |
| Sw | Swamp | 1/, 3/ |
| Wa | Waverly silt loam | 1/ |

Other Hydric Soils 2/

All soil map units occurring at elevations below approximately 317 feet on the lower end and 321 feet on the upper end along the Ohio River and some tributaries are estimated to be hydric due to frequent flooding for long duration. Determinations may need to be adjusted locally. Principal soils that are not included in the list above are as follows:

| Symbol | Name |
|---|---|
| Av | Alluvial land, steep |
| Ay | Arkabutla silt loam |
| Bu | Bruno loamy fine sand |
| Cc | Cascilla silt loam |
| ChA | Chavies fine sandy loam, 0 to 4 percent slopes |
| DB | Dobbs silty clay loam, clayey subsoil variant |
| Du | Dundee silty clay loam, clayey subsoil variant |
| Fc | Falaya-Collins silt loams |
| MsB | Molena loamy fine sand, 0 to 6 percent slopes |
| Nd | Newark-Lindside silty clay loams |
| No | Nolin silty clay loam |
| Nr | Nolin-Robinsonville silt loams |
| Vb | Vicksburg silt loam |

1/ Hydric due to saturation
2/ Hydric due to seasonal flooding
3/ Hydric due to seasonal ponding

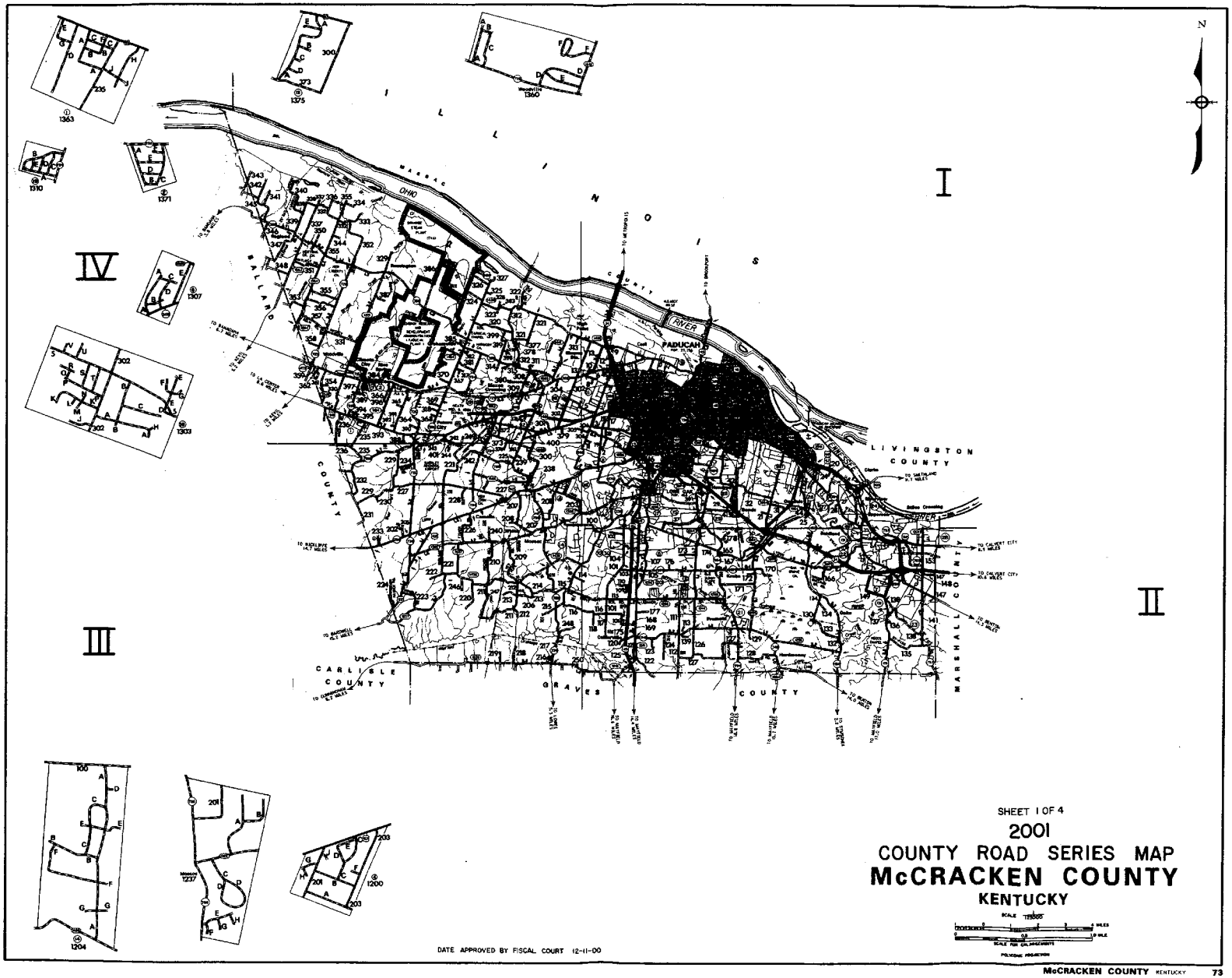
## Hydric Soils -- McCracken County, Kentucky (contd.)

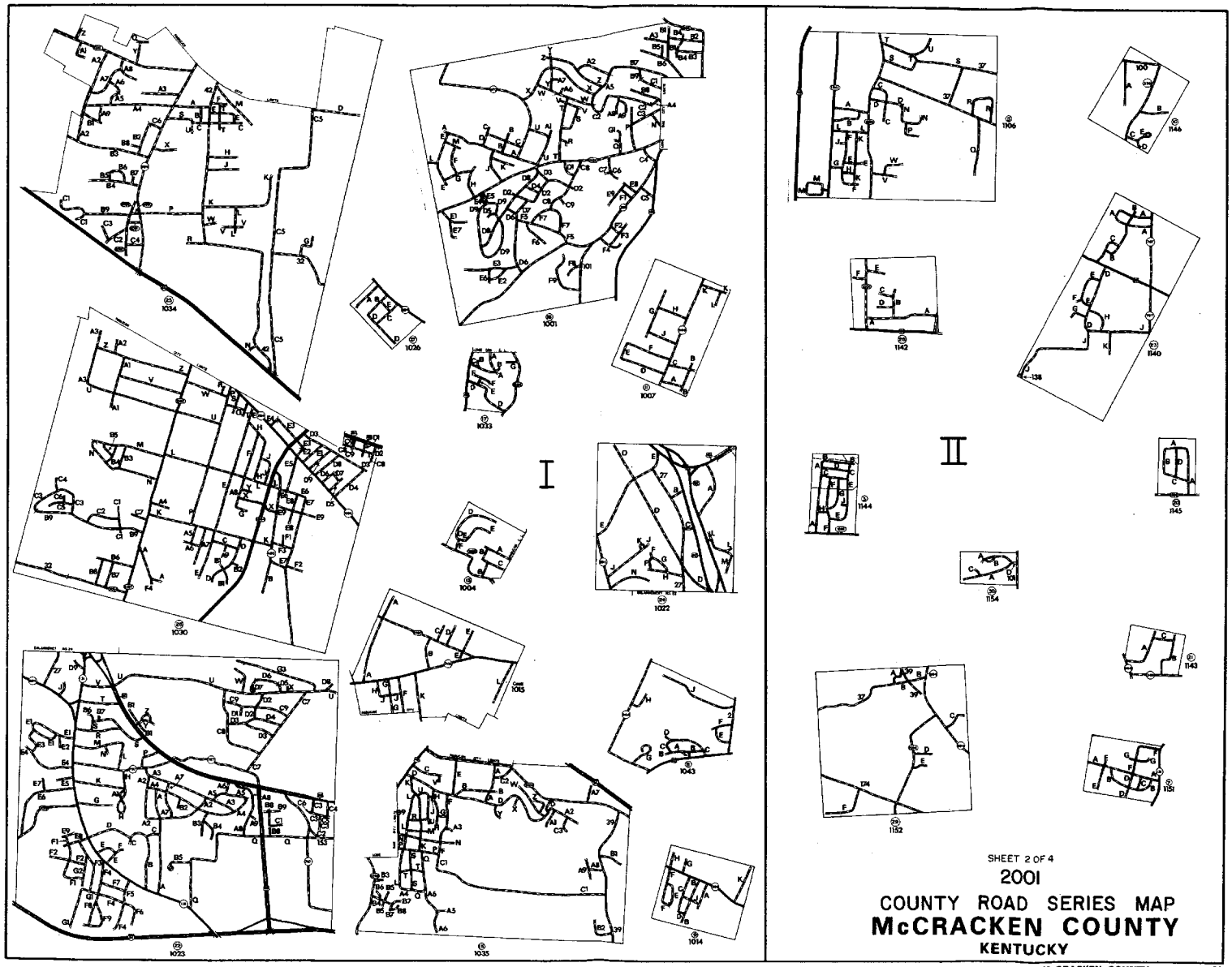
Soil Map Units That May Have Inclusions of Hydric Soils

| Symbol | Name | Probable landscape position of Hydric Inclusions |
|---|---|---|
| Ay | Arkabutla silt loam | Rosebloom soils in low spots |
| CaA | Calloway silt loam, 0 to 2 % slopes | Henry soils in low spots |
| CpA | Colp silt loam, 0 to 2 % slopes | Henry & Okaw soils in low spots |
| Du | Dundee silty clay loam, clayey subsoil variant | Rosebloom soils in low spots |
| Fc | Falaya-Collins silt loams | Waverly soils in low spots |
| Nd | Newark-Lindside silty clay loams | Rosebloom & Sharkey soils in low spots |

All hydric soils in this county support or would have supported woody vegetation under natural conditions except those identified as swamp or ponded phases.

# Attachment 17


I
II
III
IV
N
ILLINOIS
OHIO
RIVER
PADUCAH
BALLARD
COUNTY
LIVINGSTON
COUNTY
MARSHALL
COUNTY
CARLISLE
COUNTY
GRAVES
COUNTY
SHEET 1 OF 4
2001
COUNTY ROAD SERIES MAP
McCRACKEN COUNTY
KENTUCKY
DATE APPROVED BY FISCAL COURT 12-11-00




SHEET 2 OF 4

2001

COUNTY ROAD SERIES MAP

**McCRACKEN COUNTY**

**KENTUCKY**

## QUADRANT II

| CR. NO. | ROAD NAME | LNTH |
|---|---|---|
| 11 | NEACION LANE | 0.94 |
| J | MAGNETIC COURT | 0.09 |
| 1140 | ROADS IN ENLARGEMENT NO. 35 | |
| A | BURRINGAILE DRIVE | 0.56 |
| B | LACEY LANE DRIVE | 0.19 |
| C | LACEY LANE | 0.19 |
| D | SANDY HILL STREET | 0.31 |
| 1146 | ROADS IN ENLARGEMENT NO. 16 | |
| A | JEFFERY LANE | 0.34 |
| B | SHALLOW CREEK CIRCLE | 0.29 |
| D | SANDYRANT BOULEVARD | 0.10 |
| G | GREENWOOD TRAIL | 0.04 |
| H | TIMBER RIDGE DRIVE | 0.59 |
| 1147 | COUNTY LINE | 0.61 |
| 1148 | DELUX LANE | 1.62 |
| 1149 | CORNIS | 1.83 |
| 1150 | | 0.50 |
| 1151 | ROADS IN ENLARGEMENT NO. 7 | |
| A | GRESHAM HILL DRIVE | 0.60 |
| B | LAKLAND CIRCLE | 0.42 |
| C | PARAMOUNT DRIVE | 0.09 |
| D | SKY-HIGH PL | 0.15 |
| E | SUNNIER DRIVE | 0.31 |
| F | KITCHEN CREEK PLACE | 0.38 |
| G | STONEFORT DRIVE | 0.17 |
| 1152 | ROADS IN ENLARGEMENT NO. 39 | |
| A | HENDERSON WEST | 0.14 |
| B | MOUNT MORRIS | 0.52 |
| C | HERSHA LANE | 0.18 |
| D | BUNTO DRIVE | 0.18 |
| E | HELLA CIRCLE | 0.08 |
| F | NETT LANE | 0.38 |
| 1153 | OLD CHARRET CITY | 0.95 |
| 1154 | ROADS IN ENLARGEMENT NO. 30 | 0.60 |
| A | PEPPER HILL DRIVE | 0.62 |
| B | PEPPER HILL DRIVE | 0.14 |
| C | CAN-MORA ESTATES | 0.54 |
| D | PEPPER HILL (BUS CARR) &PLR | 0.06 |
| 1156 | | 1.00 |
| 1158 | | 0.50 |
| 1157 | | 0.04 |
| 1159 | | 0.50 |
| 1160 | | 0.04 |
| 1161 | | 0.06 |
| 1162 | | 0.06 |
| 1163 | | 0.06 |
| 1164 | | 0.06 |
| 1165 | | 0.06 |
| 1166 | | 0.06 |
| 1167 | | 0.06 |
| 1168 | | 0.06 |
| 1169 | LAMBERT DRIVE | 3.10 |
| 1170 | OLD SHERMAN BRIDGE | 0.68 |
| 1171 | CLARK LINE EAST | 1.00 |
| 1172 | ST. JOHN CHURCH | 0.50 |
| 1173 | WILLOWBROOK | 0.34 |
| 1175 | JONES | 0.90 |
| 1171 | YOUNG | 1.14 |
| 1173 | SALTON LANE | 0.26 |
| 1173 | TIMBERSTON | 0.56 |
| 1174 | CLARKSDALE WEST | 3.04 |
| 1175 | CLARKSDALE EAST | 1.13 |
| 1176 | CHADLEIGH-ST DRIVE | 0.75 |
| 1177 | POST LANE | 0.84 |
| 1178 | WATERKING | 0.31 |

## QUADRANT III

| CR. NO. | ROAD NAME | LNTH |
|---|---|---|
| 1200 | ROADS IN ENLARGEMENT NO. 4 | |
| A | APRIL DRIVE | 0.28 |
| B | BARNES LANE | 0.50 |
| D | KIMBRELL DRIVE | 0.19 |
| G | MAYFAIR DRIVE | 0.14 |
| H | MAYFAIR WAY DRIVE | 0.14 |
| I | BLANKED RIDER COURT | 0.08 |
| J | APPIA LANE | 0.10 |
| K | PA PA LANE | 0.07 |
| L | PORRINGLEN COURT | 0.02 |
| 1201 | MARBLE CHURCH | 1.93 |
| 1202 | ASBURY DRIVE | 0.45 |
| 1203 | OLD SPRINGS NORTH | 1.00 |
| 1204 | ROADS IN ENLARGEMENT NO. 14 | |
| A | JERYELL LANE | 0.30 |
| B | MAYFAIR DRIVE | 0.14 |
| C | MEINE DRIVE | 0.40 |
| D | SANDALE DRIVE | 0.71 |
| E | LARKE DRIVE | 0.29 |
| F | MARKET DRIVE | 0.02 |
| G | SANDRIDGE DRIVE | 0.13 |
| 1205 | FAY-WAY DRIVE | 0.54 |
| 1206 | HYDNEY LANE | 0.17 |
| 1207 | HART | 1.00 |
| 1208 | REEVES | 0.68 |
| 1209 | NEW HOPE CHURCH | 1.00 |
| 1210 | HEIN LANE | 1.00 |
| 1211 | COLTSWN CUT | 2.71 |
| 1212 | CROSS HILL | 1.22 |
| 1213 | MARSHALL SOUTH | 1.30 |
| 1214 | LONGLEACH HILL FLOREDGE STATION WEST | 1.00 |
| 1216 | WEBRIN | 0.50 |
| 1219 | RAINEY | 0.34 |
| 1217 | JEFFERY LANE | 0.28 |
| 1218 | HUNDY WUNDY | 0.06 |
| 1219 | HUNDRIDGY VIEW | 1.00 |
| 1220 | HOLLY | 1.38 |
| 1221 | JAI-LUBON | 2.50 |
| 1222 | ABI WEBB | 0.17 |
| 1223 | NEWBILL | 0.92 |
| 1224 | HAYDEN SOUTH | 1.21 |
| 1225 | DERRAD LANE | 0.12 |
| 1226 | FISHER | 1.31 |
| 1227 | CHALDRENA | 0.62 |
| 1228 | HILBER | 0.47 |
| 1229 | BRINES | 1.17 |
| 1230 | HAUNDOLOOD LANE | 0.77 |
| 1231 | PHILLIPS | 1.55 |
| 1232 | HOLLY | 0.75 |
| 1233 | ADAMSON | 2.13 |
| 1234 | NEW HARRIS | 2.68 |
| 1235 | JERSON HARRIS | 1.50 |
| 1236 | HARRIS | 1.46 |
| 1237 | ROADS IN ENLARGEMENT NO. 1 | |
| A | CRESTAN WAY | 0.42 |
| B | MEADOW DRIVE | 0.29 |
| C | REDEMPTION TRAIL | 0.17 |
| D | WINTERS PLACE | 0.51 |
| E | OLD TOWNE LANE | 0.25 |
| F | CRESTAN PLACE | 0.20 |
| G | MOUNTAIN PLACE | 0.18 |
| H | CYPRESS COVE | 0.06 |
| 1238 | BOLTHROUGH | 0.16 |
| 1239 | DEWBERRY LANE | 0.14 |
| 1240 | HILL CHAPEL | 0.83 |
| 1241 | OLD HINKLEVILLE SOUTH | 0.78 |
| 1242 | WEST AIRPORT DRIVE | 1.21 |
| 1243 | OLD HINKLEVILLE WEST | 0.83 |
| 1244 | JOHNSON LANE | 0.28 |
| 1245 | | 0.28 |
| 1246 | CLIFTON ELLIOTT | 0.97 |
| 1247 | PENDERGRASS LANE | 0.38 |
| 1248 | ALDON | 0.42 |
| 1249 | TWYLINE DRIVE | 0.38 |
| 1250 | EDITH HANDLER LANE | 0.19 |

## QUADRANT IV

| CR. NO. | ROAD NAME | LNTH |
|---|---|---|
| 1251 | MAYFIELD (NO PROPOSED SOUTH) | 1.01 |
| 1252 | LEDFORD HILL DRILL | 0.30 |
| 1253 | BRADY | 1.41 |
| 1254 | ROADS IN ENLARGEMENT NO. 18 | |
| A | BRENNA DRIVE | 0.44 |
| B | REMBUGH LANE | 0.50 |
| C | OLD CHARRET | 0.24 |
| D | DUTCH BARRE | 0.31 |
| E | CORBETT DRIVE | 0.31 |
| F | KATHERINE PATT | 0.11 |
| G | GARDEN WAY | 0.08 |
| H | DAISY COURT | 0.13 |
| J | HEATON LANE | 0.16 |
| K | SPRING BROOK DRIVE | 0.34 |
| L | CLEAR CREEK DRIVE | 0.04 |
| M | SOUTH BROOKVIEW DRIVE | 0.53 |
| N | NORTH BROOKVIEW DRIVE | 0.75 |
| P | BRIAR RIDGE DRIVE | 0.27 |
| Q | BRIAR RIDGE AVENUE | 0.27 |
| R | HARD CIRCLE | 0.16 |
| S | JOHNSON DRIVE | 0.17 |
| T | OSCAR AVENUE | 0.16 |
| U | NORTH BRIAR AVENUE | 0.10 |
| V | JORETTA AVENUE | 0.67 |
| 1255 | DAYLE LANE | 0.20 |
| 1256 | STEVEN DRIVE | 0.44 |
| 1257 | STEVEN DRIVE | 0.67 |
| 1257 | ROADS IN ENLARGEMENT NO. 9 | |
| A | CHRISTY DRIVE | 0.33 |
| B | CHRISTY CIRCLE | 0.17 |
| C | NATHAN DRIVE | 0.11 |
| D | CHRIS DRIVE | 0.30 |
| E | WEST PADUCAH SCHOOL | 0.31 |
| 1258 | WILLIAMSON | 1.08 |
| 1259 | HARDIE LANE | 0.16 |
| 1260 | ROADS IN ENLARGEMENT NO. 19 | |
| A | TIMBERLAND DRIVE | 0.25 |
| B | BAYER DRIVE | 0.14 |
| C | BAYER DRIVE | 0.14 |
| D | BLUE RIDGE DRIVE | 0.10 |
| E | SAN JACINTO | 0.08 |
| 1261 | MAHORE | 0.34 |
| 1262 | MAYFIELD (NO PROPOSED NORTH) | 0.47 |
| 1263 | JEF-HIGH | 0.29 |
| 1264 | PLUMBY | 0.41 |
| 1265 | ROLERSON LANE | 0.12 |
| 1266 | | 0.08 |
| 1267 | OLD HALL | 0.29 |
| 1268 | FITHIAN LANE | 0.21 |
| 1269 | FITHIAN LANE | 1.38 |
| 1270 | OLD PATTERSON SCHOOL | 1.00 |
| 1271 | MOBO EAST | 1.48 |
| 1272 | METROPOLIS FERRY LANDING | 0.92 |
| 1273 | HEALY | 0.19 |
| 1274 | ANDERSON | 0.37 |
| 1275 | SUNNIER STREET | 1.02 |
| 1276 | GIPSON | 0.18 |
| 1277 | SUNFORD | 0.13 |
| 1278 | TUDOR | 0.30 |
| 1279 | BETHEL CHURCH NORTH | 0.75 |
| 1280 | BETHEL CHURCH SOUTH | 1.12 |
| 1281 | MASON | 1.50 |
| 1282 | GREY | 1.16 |
| 1283 | SIMMS | 0.56 |
| 1284 | BRAKE SLOUGH | 1.05 |
| 1285 | JOPPA LANDING NORTH | 1.00 |
| 1286 | METCALFE | 0.25 |
| 1287 | OAKLEDGE | 1.17 |
| 1288 | BROADWAY | 0.57 |
| 1289 | CRAWFORD LANE | 1.32 |
| 1290 | OLD JOPPA LANDING | 1.00 |
| 1291 | BARTON | 0.87 |
| 1292 | DORNAY | 0.80 |
| 1293 | ELLIOTT | 0.34 |
| 1294 | BREEZE LANE | 0.46 |
| 1295 | OLD DIXIEN LANDING | 1.34 |
| 1296 | DIXSON | 0.32 |
| 1297 | VAUGHN | 1.00 |
| 1298 | P. HARRIS | 0.50 |
| 1299 | | 0.40 |
| 1300 | HARFORD | 0.50 |
| 1301 | BARLOW | 0.40 |
| 1302 | NEW LIBERTY CHURCH | 1.00 |
| 1303 | HOUSE | 0.66 |
| 1304 | ROBB LANE | 0.19 |
| 1305 | BURNLEY SCHOOL | 1.00 |
| 1306 | WALLACE | 1.00 |
| 1307 | HILL | 1.00 |
| 1308 | JENKINS | 0.34 |
| 1309 | WOODVILLE SCHOOL | 0.11 |
| 1310 | ROADS IN ENLARGEMENT | |
| A | SCHERON DRIVE | 0.27 |

## QUADRANT IV

| CR. NO. | ROAD NAME | LNTH |
|---|---|---|
| B | CHANDA DRIVE | 0.05 |
| C | PARK LANE | 0.20 |
| D | LUNSAY LANE | 0.41 |
| E | ROBERTS DRIVE | 0.29 |
| F | MARBLEX VILLAGE | 0.66 |
| 1311 | WOODLAND HILL DRIVE | 0.54 |
| 1312 | ROADS IN ENLARGEMENT NO. 1 | 0.34 |
| 1313 | ROADS IN ENLARGEMENT NO. 1 | |
| A | QUEENSWAY DRIVE | 0.41 |
| B | BOWMAN STREET EAST | 0.19 |
| C | MAIN STREET | 0.26 |
| D | KINGSWAY DRIVE | 0.61 |
| E | LINDA HILL DRIVE | 0.14 |
| F | JOHNSON BOULEVARD WEST | 0.07 |
| G | BOWMAN STREET WEST | 0.14 |
| H | LAKE DRIVE | 0.30 |
| J | RACHEL DRIVE | 0.17 |
| 1314 | MARBLE LANE | 0.20 |
| 1315 | MOUNTAIN ESTATE | 0.20 |
| 1316 | LOW HILL WAY | 0.07 |
| 1317 | PLANT WORK WAY | 0.14 |
| 1318 | MAGE AVENUE | 0.33 |
| 1319 | HOGELL LANE | 0.58 |
| 1320 | LINTUSER LANE | 0.27 |
| 1321 | ROADS IN ENLARGEMENT NO. 2 | |
| A | MOSSTRE | 0.26 |
| B | COLLINS AVENUE | 0.06 |
| C | MARSHALL NORTH | 0.05 |
| D | DUNBAR AVENUE | 0.16 |
| E | DUNBAR AVENUE | 0.16 |
| F | BALLARD AVENUE | 0.10 |
| 1322 | RICHARD | 0.14 |
| 1323 | LIGHTNOW | 0.33 |
| 1324 | JAMES ELLIOTT | 0.44 |
| 1325 | ROADS IN ENLARGEMENT NO. 12 | |
| A | HARTFORD ROAD | 0.46 |
| B | JENNY LANE | 0.10 |
| C | IVY DELRIA | 0.06 |
| D | LANDER CIRCLE | 0.13 |
| E | LANDER CIRCLE | 0.13 |
| 1326 | HENLTY CIRCLE | 0.31 |
| 1327 | NEW HIGHOS | 0.26 |
| 1328 | MITCHELL | 0.06 |
| 1329 | MORGAN LANE | 0.27 |
| 1330 | LOWELL LANE | 0.26 |
| 1331 | HALL EAST | 0.85 |
| 1332 | COLONY CIRCLE | 0.75 |
| 1333 | TUCKER SPUR | 0.64 |
| 1334 | OLD HINKLEVILLE | 0.17 |
| 1335 | MEADALE DRIVE | 0.40 |
| 1336 | BOLERY SCHOOL | 1.31 |
| 1337 | BOND WEST | 0.47 |
| 1338 | BOND WEST | 0.47 |
| 1339 | LAKE LAND DRIVE | 0.21 |
| 1340 | SALOU DRIVE | 0.65 |
| 1341 | LAKE AVENUE | 1.13 |
| 1342 | ABILAND AVENUE | 0.13 |
| 1343 | JOHNSON BOULEVARD | 0.13 |
| 1344 | POSTER DRIVE | 0.31 |
| 1345 | ROBERTS | 0.14 |
| 1346 | BARNA COVE | 0.34 |
| 1347 | LAKE DRIVE | 0.34 |
| 1348 | LAWSON DRIVE | 0.13 |
| 1349 | MONRY DRIVE | 0.36 |
| 1350 | OLD HINKLEVILLE EAST | 0.73 |
| 1351 | JUSTUS LANE | 0.42 |

SHEET 4 OF 4

2001

COUNTY ROAD SERIES MAP

# McCRACKEN COUNTY

KENTUCKY

## QUADRANT II

| CR. NO. | ROAD NAME | LGTH. |
|---|---|---|
| H | MEADOW LANE | 0.06 |
| J | MAJESTIC COURT | 0.06 |
| 1145 | ROADS IN ENLARGEMENT NO. 20 | |
| A | MARKINGDALE DRIVE | 0.56 |
| B | COPELAND DRIVE | 0.17 |
| C | LACEY LANE | 0.16 |
| D | SANDY HILLS DRIVE | 0.21 |
| 1146 | ROADS IN ENLARGEMENT NO. 10 | |
| A | JEFFERY LANE | 0.34 |
| B | SHALLOW CREEK CIRCLE | 0.22 |
| C | GROVEWAY BOULEVARD | 0.10 |
| D | CREEKWOOD TRAIL | 0.24 |
| E | TIMBER RIDGE DRIVE | 0.03 |
| 1147 | COUNTY LINE | 0.53 |
| 1148 | DELLA LANE | 0.44 |
| 1149 | DOWNS | 1.35 |
| 1150 | | 3.00 |
| 1151 | ROADS IN ENLARGEMENT NO. 7 | |
| A | GREENFIELD DRIVE | 0.83 |
| B | OAKLAND CIRCLE | 0.42 |
| C | PARKWOOD DRIVE | 0.08 |
| D | [illegible] | 0.15 |
| E | ELEANOR DRIVE | 0.21 |
| F | STONECREEK PLACE | 0.31 |
| G | STONEPOINT COURT | 0.17 |
| 1152 | ROADS IN ENLARGEMENT NO. 38 | |
| A | HENDRON WEST | 0.16 |
| B | ROGART-SCHEDDT | 0.22 |
| C | HERZOG LANE | 0.14 |
| D | SUMAC DRIVE | 0.18 |
| E | ABELIA CIRCLE | 0.28 |
| F | MISTY LANE | 0.36 |
| 1153 | OLD CALVERT CITY | 0.98 |
| 1154 | ROADS IN ENLARGEMENT NO. 30 | |
| A | PEPPERS MILL DRIVE | 0.58 |
| B | PEPPERS MILL COVE | 0.06 |
| C | OAK RIDGE COVE | 0.04 |
| D | PEPPERS MILL DRIVE DRIVE SPUR | 0.06 |
| 1155 | | 0.90 |
| 1156 | | 3.00 |
| 1157 | | 3.00 |
| 1158 | | 3.00 |
| 1159 | | 0.00 |
| 1160 | | 3.00 |
| 1161 | | 3.00 |
| 1162 | | 0.00 |
| 1163 | | 0.00 |
| 1164 | | 3.00 |
| 1165 | LAMBERT DRIVE | 3.10 |
| 1166 | OLD SHEEHAN BRIDGE | 7.40 |
| 1167 | CLARK LINE EAST | 1.60 |
| 1168 | ST. JOHN CHURCH | 0.29 |
| 1169 | WILLOWCREEK | 0.31 |
| 1170 | JONES | 3.95 |
| 1171 | RIBE | 1.13 |
| 1172 | DALTON LANE | 0.26 |
| 1173 | THROGMORTON | 0.86 |
| 1174 | CLARK LINE WEST | 2.54 |
| 1175 | LINDCREST DRIVE | 0.15 |
| 1176 | CANDLELIGHT DRIVE | 0.16 |
| 1177 | POAT LANE | 0.46 |
| 1178 | WAYNEWOOD | 0.30 |

## QUADRANT III

| CR. NO. | ROAD NAME | LGTH. |
|---|---|---|
| 1200 | ROADS IN ENLARGEMENT NO. 4 | |
| A | APRIL DRIVE | 0.28 |
| B | SHAWN LANE | 0.30 |
| C | KIMBRELL DRIVE | 0.33 |
| D | CAMILLA DRIVE | 0.14 |
| E | WAYNE WAY DRIVE | 0.14 |
| F | BLANDCHESTER COURT | 0.06 |
| G | ANNIE LANE | 0.18 |
| H | PA PA LANE | 0.07 |
| J | FOXBOROUGH COURT | 0.05 |
| 1201 | MASSAC CHURCH | 1.65 |
| 1202 | ASHLEY DRIVE | 0.05 |
| 1203 | GUM SPRINGS NORTH | 1.66 |
| 1204 | ROADS IN ENLARGEMENT NO. 14 | |
| A | JEWELL LANE | 1.36 |
| B | LEBALEE DRIVE | 0.38 |
| C | MARK DRIVE | 0.46 |
| D | RANDALE DRIVE | 0.08 |
| E | LARUE DRIVE | 0.29 |
| F | SANUTT DRIVE | 0.02 |
| G | SHANFORD DRIVE | 0.33 |
| 1205 | PATHWAY DRIVE | 0.06 |
| 1206 | PENNEY LANE | 0.17 |
| 1207 | HAKE | 1.48 |
| 1208 | REEVES | 0.58 |
| 1209 | NEW HOPE CHURCH | 1.90 |
| 1210 | HOOKER | 1.66 |
| 1211 | COLEMAN CUT | 2.71 |
| 1212 | CROSS HILL | 1.32 |
| 1213 | MARSHALL SOUTH | 1.30 |
| 1214 | LOVELACEVILLE FLORENCE STATION WEST | 1.88 |
| 1215 | WERTH | 0.60 |
| 1216 | SMOKEY | 0.24 |
| 1217 | SPERRY LANE | 0.36 |
| 1218 | HENRY WORTH | 0.44 |
| 1219 | HIGGENBOTTOM | 0.56 |
| 1220 | TRICE | 1.09 |
| 1221 | SHOLBOK | 4.56 |
| 1222 | MEYERS | 0.47 |
| 1223 | WOMBLE | 0.55 |
| 1224 | HAYDEN SOUTH | 1.05 |
| 1225 | OXFORD LANE | 0.12 |
| 1226 | FISHER | 1.30 |
| 1227 | CHILDRESS | 0.16 |
| 1228 | WILSON | 0.47 |
| 1229 | BIRKS | 1.57 |
| 1230 | YOUNGBLOOD LANE | 0.17 |
| 1231 | PHELPS | 0.38 |
| 1232 | MOSS | 1.00 |
| 1233 | BOHANNON | 2.25 |
| 1234 | BOB HARRIS | 0.58 |
| 1235 | LESTER HARRIS | 1.86 |
| 1236 | WREN | 1.48 |
| 1237 | ROADS IN MASSAC | |
| A | CORDOBA WAY | 0.82 |
| B | GRADOR COVE | 0.28 |
| C | ROSEMONT DRIVE | 0.17 |
| D | WAVERLY PLACE | 0.61 |
| E | COTTONWOOD LANE | 0.22 |
| F | CRABAPPLE COVE | 0.09 |
| G | MULBERRY PLACE | 0.06 |
| H | CYPRESS COVE | 0.06 |
| 1238 | BUCHANON | 2.15 |
| 1239 | DEWBERRY LANE | 0.14 |
| 1240 | HILL CHAPEL | 0.85 |
| 1241 | OLD HINKLEVILLE SOUTH | 3.76 |
| 1242 | WEST AIRPORT DRIVE | 2.37 |
| 1243 | OLD HINKLEVILLE WEST | 3.83 |
| 1244 | JOHNNA LANE | 0.22 |
| 1245 | | 3.00 |
| 1246 | CLETUS ELLIOTT | 0.29 |
| 1247 | PENDERGRASS LANE | 2.30 |
| 1248 | JILSON | 0.42 |
| 1249 | SKYLINE DRIVE | 2.36 |
| 1250 | EDITH WHEELER LANE | 0.10 |

## QUADRANT IV

| CR. NO. | ROAD NAME | LGTH. |
|---|---|---|
| 1300 | MAYFIELD-METROPOLIS SOUTH | 1.01 |
| 1301 | LEONARD PURYELL | 0.35 |
| 1302 | MACEY | 1.90 |
| 1303 | ROADS IN ENLARGEMENT NO. 18 | |
| A | BRENNA DRIVE | 0.44 |
| B | REBECCA LANE | 0.32 |
| C | KATHY DRIVE | 0.28 |
| D | OLD J HARRIS | 0.11 |
| E | CORBETT DRIVE | 0.21 |
| F | KATHERINE WAY | 0.11 |
| G | CAMDEN WAY | 0.08 |
| H | CINDY COURT | 0.33 |
| J | KEATON LANE | 0.38 |
| K | SPRING BROOK DRIVE | 0.34 |
| L | CLEAR CREEK DRIVE | 0.08 |
| M | SOUTH BROOKVIEW DRIVE | 0.05 |
| N | NORTH BROOKVIEW DRIVE | 0.09 |
| P | CONNIE SUE AVENUE | 0.23 |
| Q | BRIAN AVENUE | 0.07 |
| R | WARD CIRCLE | 0.15 |
| S | JOHNANN DRIVE | 0.27 |
| T | OSCAR AVENUE | 0.15 |
| U | NORTH BRIAN AVENUE | 0.22 |
| V | JORETTA AVENUE | 0.07 |
| 1304 | GAYLE LANE | 0.22 |
| 1305 | STEVEN DRIVE | 0.44 |
| 1306 | STEVEN SPUR | 0.07 |
| 1307 | ROADS IN ENLARGEMENT NO. 8 | |
| A | CRAVEN DRIVE | 0.35 |
| B | CHILDS DRIVE | 0.12 |
| C | NATHAN DRIVE | 0.11 |
| D | EMILY DRIVE | 0.25 |
| E | WEST PADUCAH SCHOOL | 0.31 |
| 1308 | WILMINGTON | 1.08 |
| 1309 | VANCE LANE | 0.14 |
| 1310 | ROADS IN ENLARGEMENT NO. 19 | |
| A | TIMBERLAND DRIVE | 0.28 |
| B | BLUEBIRD ROCK | 0.30 |
| C | SIERRA DRIVE | 0.16 |
| D | BLUE RIDGE DRIVE | 0.13 |
| E | SHILOH DRIVE | 0.08 |
| 1311 | MAJORS | 3.38 |
| 1312 | MAYFIELD-METROPOLIS NORTH | 9.87 |
| 1313 | JOHNSON | 3.29 |
| 1314 | RUSSELL | 0.41 |
| 1315 | SOLDIERS LANE | 0.17 |
| 1316 | | 0.00 |
| 1317 | OLD HALL | 0.29 |
| 1318 | FATHER LANE | 0.21 |
| 1319 | CUNNINGHAM | 1.28 |
| 1320 | PALESTINE SCHOOL | 1.43 |
| 1321 | BOBO EAST | 1.45 |
| 1322 | METROPOLIS FERRY LANDING | 9.82 |
| 1323 | HEATH | 0.19 |
| 1324 | ANDERSON | 0.57 |
| 1325 | SHAWNEE DRIVE | 0.22 |
| 1326 | GIPSON | 0.59 |
| 1327 | STAFFORD | 0.13 |
| 1328 | TUCKER | 0.70 |
| 1329 | BETHEL CHURCH NORTH | 0.76 |
| 1330 | BETHEL CHURCH SOUTH | 1.55 |
| 1331 | MASSEY | 3.14 |
| 1332 | GREER | 1.56 |
| 1333 | GIBBS | 3.84 |
| 1334 | SNAKE SLOUGH | 0.25 |
| 1335 | JOPPA LANDING NORTH | 1.36 |
| 1336 | METCALFE | 0.78 |
| 1337 | INGLESIDE | 5.47 |
| 1338 | BROCKMAN | 0.57 |
| 1339 | CRAWFORD LANE | 1.12 |
| 1340 | CARROLL LANDING | 1.57 |
| 1341 | SHELTON | 0.60 |
| 1342 | CONWAY | 0.86 |
| 1343 | ELLIOTT | 0.74 |
| 1344 | BREEZE LANE | 0.35 |
| 1345 | OLD OGDEN LANDING | 1.34 |
| 1346 | GIBSON | 0.32 |
| 1347 | VAUGHN | 1.36 |
| 1348 | P. HARRIS | 0.42 |
| 1349 | | 3.00 |
| 1350 | WARFORD | 0.42 |
| 1351 | MATLOCK | 0.86 |
| 1352 | NEW LIBERTY CHURCH | 1.88 |
| 1353 | HOUSE | 0.40 |
| 1354 | ROSE LANE | 0.19 |
| 1355 | BURNLEY SCHOOL | 1.36 |
| 1356 | WALLACE | 1.08 |
| 1357 | HELM | 1.38 |
| 1358 | JENKINS | 0.34 |
| 1359 | WOODVILLE SCHOOL | 0.11 |
| 1360 | ROADS IN WOODVILLE | |
| A | GORDON DRIVE | 0.27 |

## QUADRANT IV

| CR. NO. | ROAD NAME | LGTH. |
|---|---|---|
| B | CANADA DRIVE | 0.55 |
| C | PARK LANE | 0.28 |
| D | LOGAN LANE | 0.41 |
| E | ROBINETTE DRIVE | 0.29 |
| F | MAGRUDER VILLAGE | 0.45 |
| 1361 | WOODLAND HILL DRIVE | 0.84 |
| 1362 | ROSSITER DRIVE | 0.35 |
| 1363 | ROADS IN ENLARGEMENT NO. 1 | |
| A | QUEENSWAY DRIVE | 0.41 |
| B | BONHAM STREET EAST | 0.33 |
| C | MAIN STREET | 0.30 |
| D | KINGSWAY DRIVE | 0.51 |
| E | LINDA MEL DRIVE | 0.14 |
| F | JOHNSON BOULEVARD WEST | 0.07 |
| G | BONHAM STREET WEST | 0.59 |
| H | LANE DRIVE | 0.32 |
| J | RACHEL DRIVE | 0.17 |
| 1364 | RAGSDUCER | 1.70 |
| 1365 | MICHELLE COURT | 0.31 |
| 1366 | OLD HOBBS | 0.87 |
| 1367 | PLANTATION WAY | 0.16 |
| 1368 | NACE AVENUE | 0.35 |
| 1369 | WOOD LANE | 0.48 |
| 1370 | CRITTER LANE | 0.37 |
| 1371 | ROADS IN ENLARGEMENT NO. 2 | |
| A | ROGERS | 0.28 |
| B | COLLINS AVENUE | 0.08 |
| C | MARSHALL NORTH | 0.80 |
| D | DUNBAR AVENUE | 0.72 |
| E | BROWN AVENUE | 0.11 |
| F | BALLARD AVENUE | 0.03 |
| 1372 | BOWMAN | 0.74 |
| 1373 | LIGHTFOOT | 1.13 |
| 1374 | JAMES ELLIOTT | 0.91 |
| 1375 | ROADS IN ENLARGEMENT NO. 12 | |
| A | HARDING RIDGE | 0.06 |
| B | ERIN LANE | 0.15 |
| C | IVA COURT | 0.04 |
| D | CASSIE CIRCLE | 0.06 |
| E | JANCLYN DRIVE | 0.12 |
| 1376 | WESLEY CIRCLE | 0.17 |
| 1377 | RUDY WOODS | 0.28 |
| 1378 | MITCHELL | 0.06 |
| 1379 | MORGAN LANE | 0.21 |
| 1380 | LOWELL LANE | 0.06 |
| 1381 | HALL EAST | 0.88 |
| 1382 | GOLDBERRY CIRCLE | 0.13 |
| 1383 | TUCKER SPUR | 0.04 |
| 1384 | OLD WOODVILLE | 0.17 |
| 1385 | MELODIE DRIVE | 0.40 |
| 1386 | BOLDRY SCHOOL | 1.44 |
| 1387 | BOBO WEST | 1.27 |
| 1388 | JARCH DRIVE | 0.27 |
| 1389 | LONE LAKE DRIVE | 1.21 |
| 1390 | SHELBY DRIVE | 0.26 |
| 1391 | OAK AVENUE | 1.10 |
| 1392 | ASHLAND AVENUE | 0.10 |
| 1393 | JOHNSON BOULEVARD | 0.11 |
| 1394 | FOSTER DRIVE | 0.31 |
| 1395 | ROBERTS | 0.14 |
| 1396 | SARAH COVE | 3.04 |
| 1397 | LAKE COURT | 0.06 |
| 1398 | LAWRENCE DRIVE | 0.11 |
| 1399 | KERRY DRIVE | 0.35 |
| 1400 | OLD HINKLEVILLE EAST | 0.73 |
| 1401 | JUSTUS LANE | 0.18 |

SHEET 4 OF 4

2001

COUNTY ROAD SERIES MAP

# McCRACKEN COUNTY

KENTUCKY

# Attachment 18

# Hydric Soils
# Livingston County
# Kentucky

Hydric Soil Map Units (Where not drained and/or protected from flooding)

| Symbol | Name | Hydric part if not whole map unit |
|---|---|---|
| Du (279) | Dunning silty clay, frequently flooded 1/ | |
| Pe (352) | Peoga silt loam 1/ | |
| Ka (215) | Karnak silty clay, frequently flooded 1/ | |
| Me (117, 168) | Melvin silt loam 1/ | |

Other Hydric Soils 2/

All soil map units occurring at elevations below about 321 feet on the lower end (near McCracken County line) and below about 333 feet (near Crittenden County line) along the Ohio River and some tributaries are estimated to be hydric due to frequent flooding for long duration. Determinations may need to be adjusted locally. Principal soils that are not included in the list above are as follows:

| Symbol | Name |
|---|---|
| AsA (103) | Ashton silt loam, 0 to 4 percent slopes, occasionally flooded |
| ChD (343C, 343D) | Chavies fine sandy loam, 6 to 20 percent slopes |
| EkA (39A) | Elk silt loam, 0 to 2 percent slopes |
| EkB (39B) | Elk silt loam, 2 to 6 percent slopes |
| EkC (39C) | Elk silt loam, 6 to 12 percent slopes |
| Hu (10) | Huntington silt loam, frequently flooded |
| LcB (415B) | Licking silt loam, 2 to 6 percent slopes |
| LkC3 (415C) | Licking silt clay loam, 6 to 12 percent slopes, severely eroded |
| Ln (105, 164) | Lindside silt loam, frequently flooded |
| Mc (414) | McGary silt loam, rarely flooded |
| Na (16) | Nelse loam, frequently flooded |
| Nb (052) | Nelse – Huntington complex, frequently flooded |
| NcE (054) | Nelse – Huntington – Wheelington complex, 2 to 55 percent slopes, frequently flooded |
| Ne (112, 166) | Newark silt loam, frequently flooded |
| No (102, 283) | Nolin silt loam, frequently flooded |
| OtB (348B) | Otwell silt loam, 2 to 6 percent slopes |
| OtC3 (348C) | Otwell silt loam, 6 to 12 percent slopes, severely eroded |
| WhA (345A) | Wheelington silt loam, 0 to 2 percent slopes |
| WhB (345B) | Wheelington silt loam, 2 to 6 percent slopes |
| WhC (345C) | Wheelington silt loam, 6 to 12 percent slopes |

## Hydric Soils -- Livingston County, Kentucky (contd.)

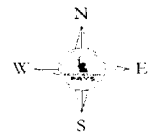
1/ Hydric due to saturation
2/ Hydric due to seasonal flooding
3/ Hydric due to seasonal ponding (None Identified)

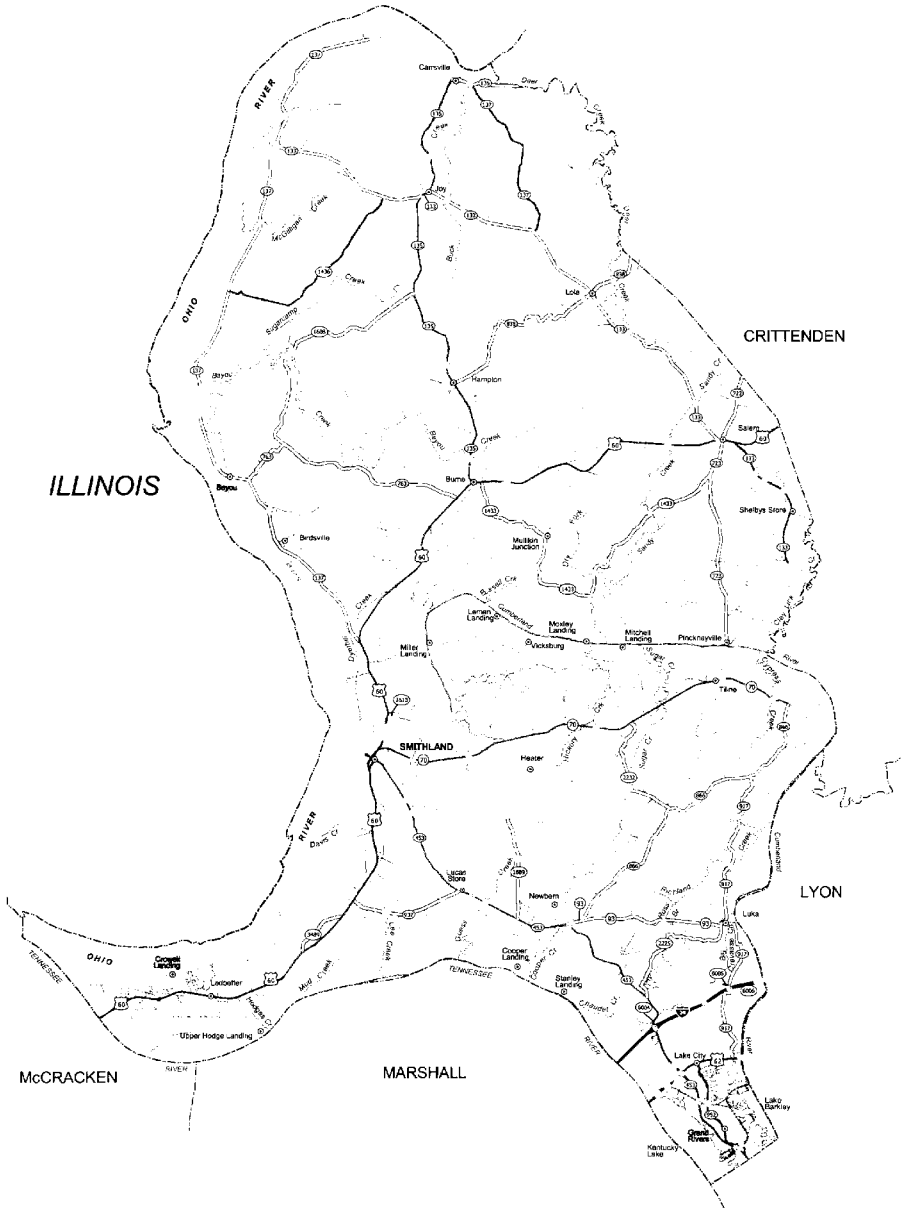
Map Units That May Have Inclusions of Hydric Soils

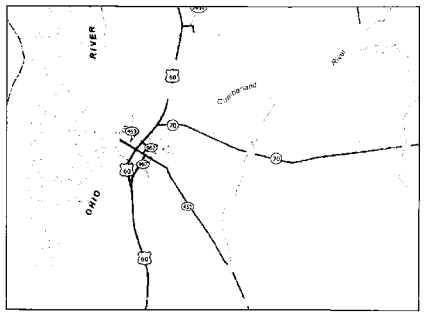
| Symbol | Name | Probable landscape position of Hydric Inclusions |
|---|---|---|
| Ne (112, 166) | Newark silt loam, frequently flooded | Melvin soils in low spots |
| Hn (350) | Henshaw silt loam, Rarely flooded | Peoga soils in low spots |

All hydric soils in this county support or would have supported woody vegetation under natural conditions except those identified as swamp or ponded phases.

# Attachment 19




SMITHLAND

**State Primary Road System**

- Interstate
- Parkway
- Other State Primary
- State Secondary
- Rural Secondary
- Supplemental Road

**Local Road System**

- Unimproved
- Crushed Stone or Gravel
- Paved

**Other Features**

- Stream
- Railroad
- Bridge
- City/Town
- Incorporated Area Boundary
- Lake

# LIVINGSTON COUNTY KENTUCKY

## STATE PRIMARY ROAD SYSTEM

**Last Map Revision: 07/16/02**
**Last Official Order Change: 06/20/02**

**Kentucky Transportation Cabinet**
**Department of Highways**
**Division of Planning**

2 0 2 4 6 8 Miles

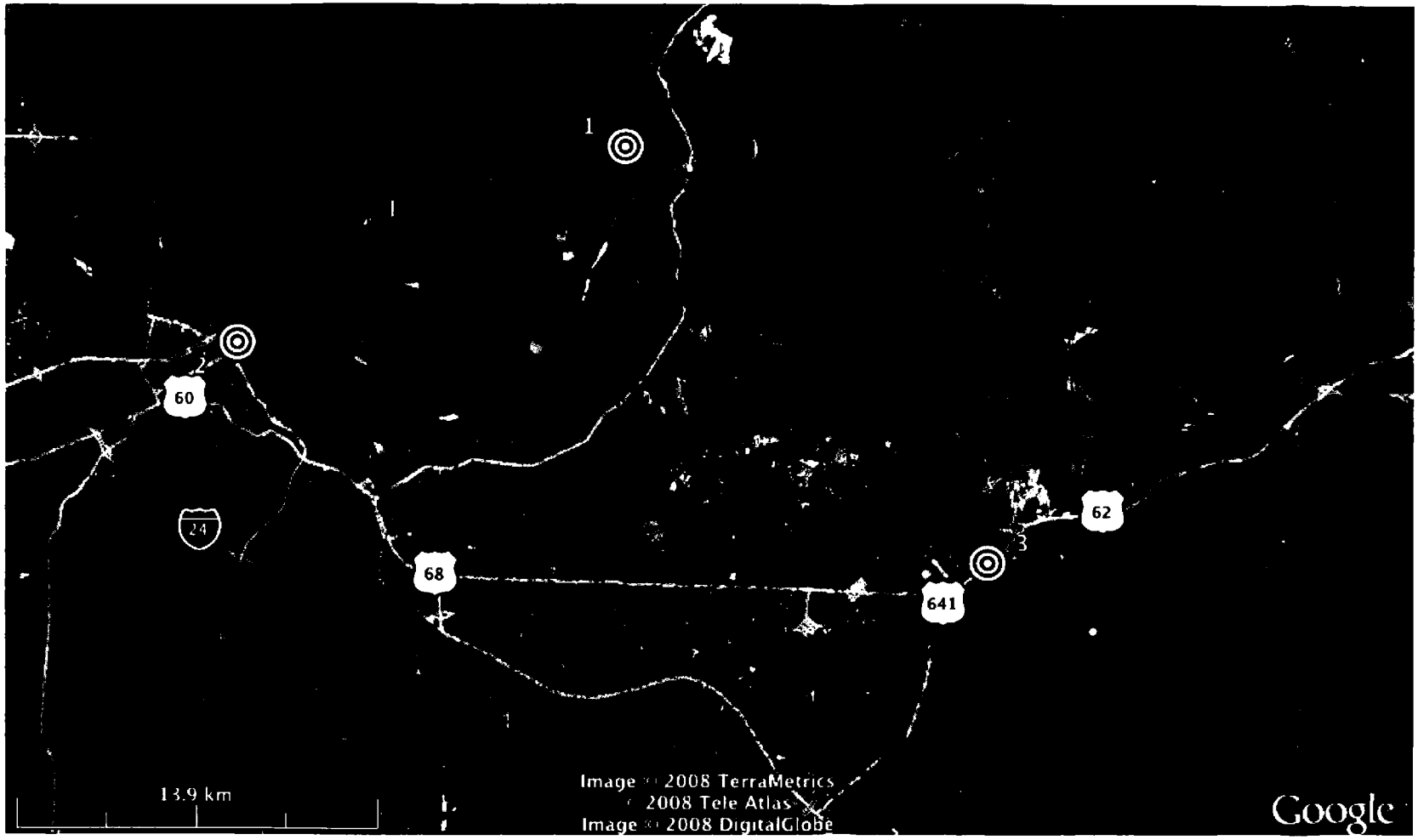
3 0 3 6 9 12 Kilometers

**Kentucky State Plane Coordinate Sus tem (NAD-83)**
**Road centerlines collected using GPS technology**

**State Primary Road System, Livingston County**

# Attachment 20

Aerial Photograph Showing Locations of Gage Stations




KEY

1 USGS Gage Station 03384500-Ohio River at Golconda, IL

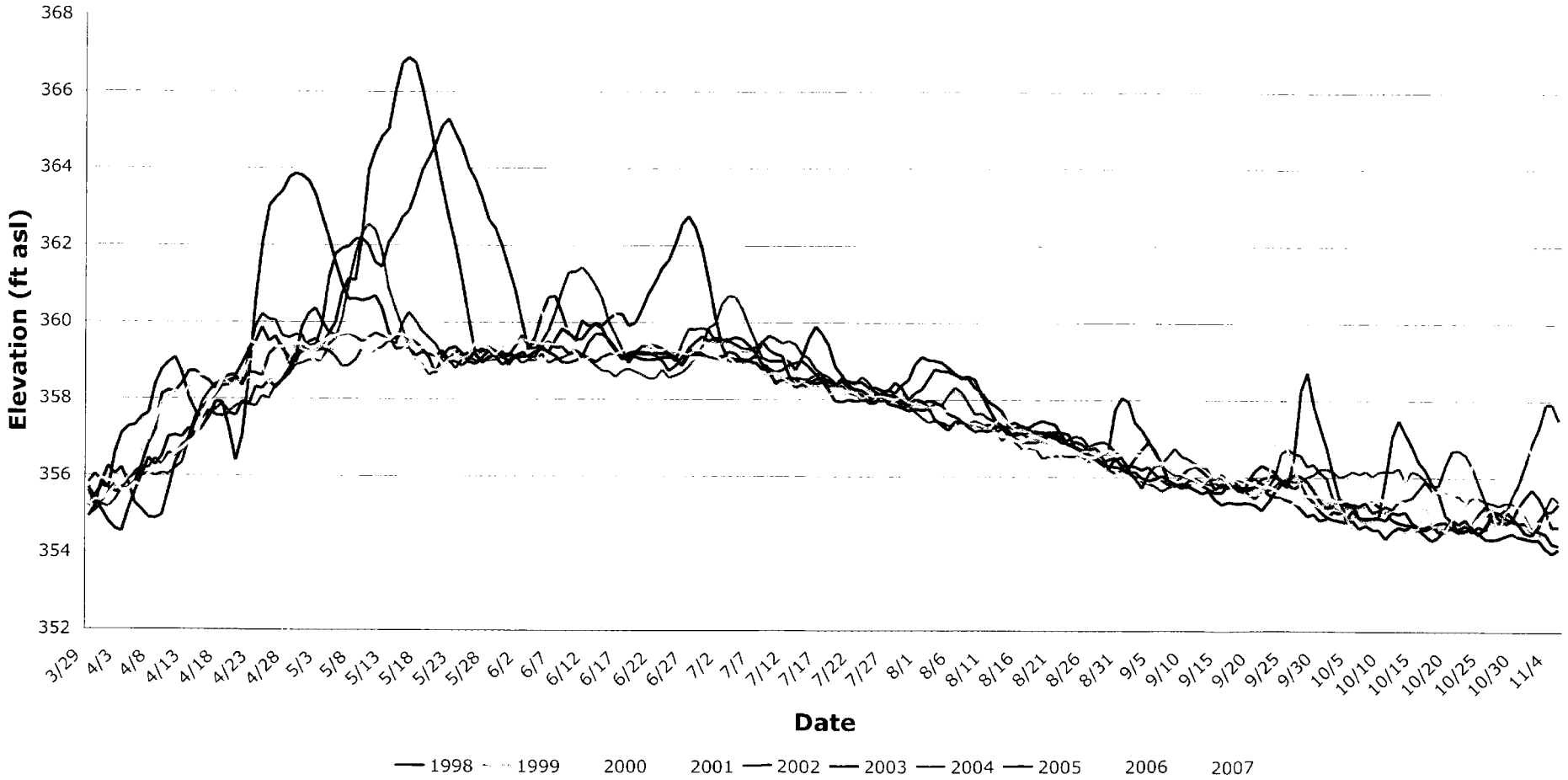
2 USGS Gage Station 03611000-Ohio River at Paducah, KY

3 Kentucky Lake Long Term Monitoring Program-Tennessee River at Kentucky Dam

5H Technologies, Inc.

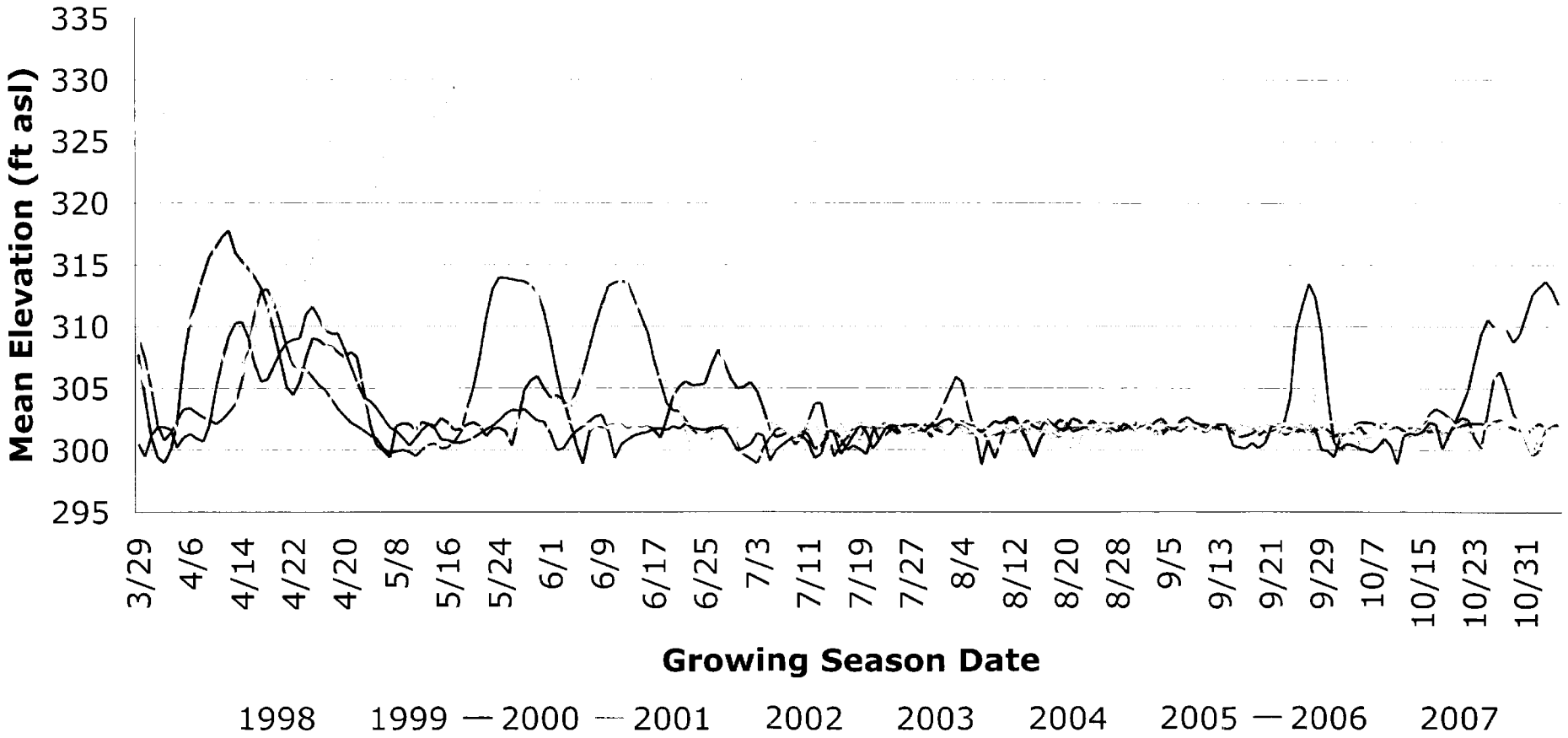
# Attachment 21

## Kentucky Lake Long Term Monitoring Program Data During the Growing Season-
## Tennessee River at Kentucky Dam



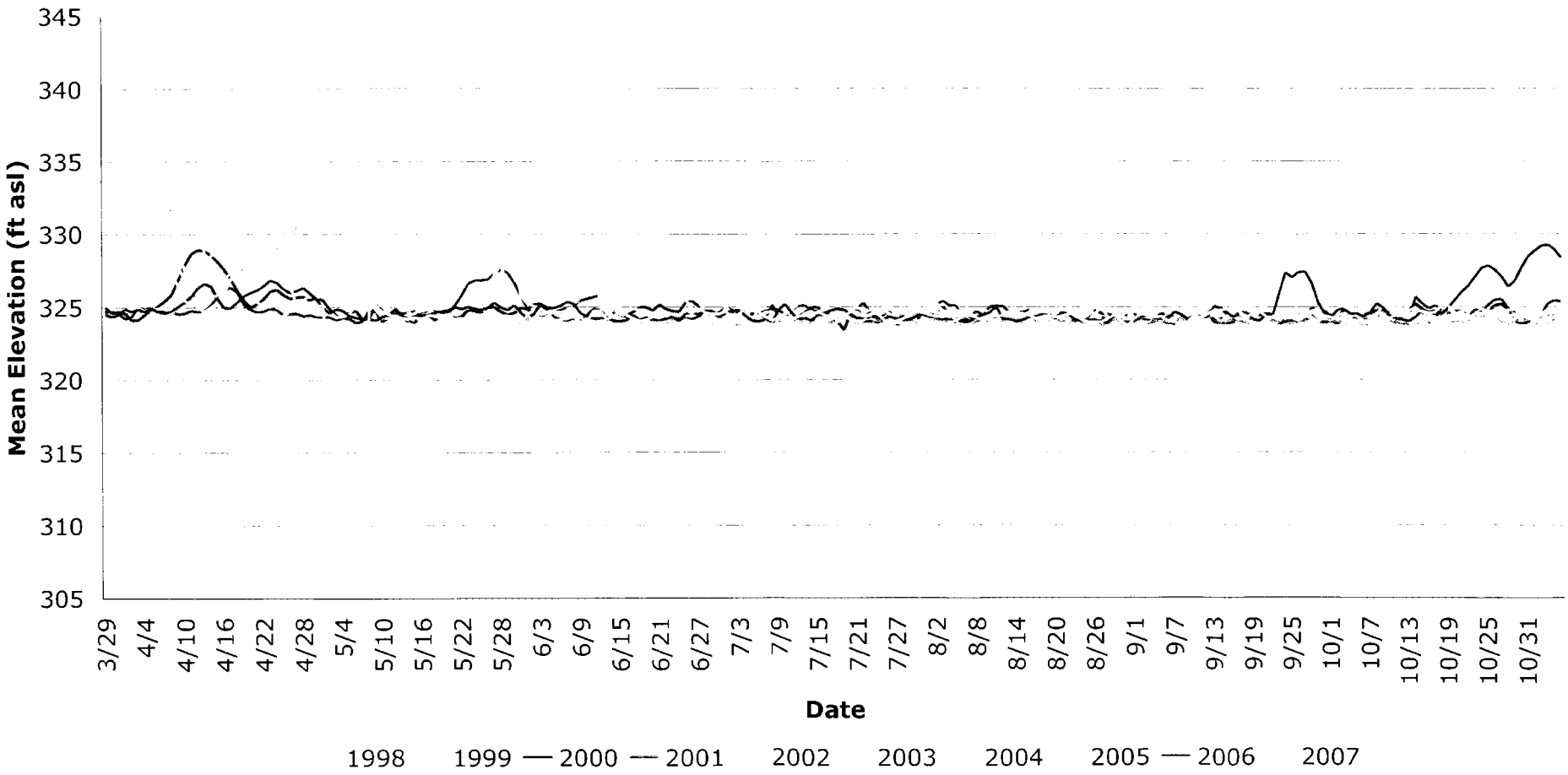

5H Technologies, Inc.

# USGS Gage Data During the Growing Season-Ohio River at Paducah (03611000)




5H Technologies, Inc.

# USGS Gage Data During the Growing Season-Ohio River at Golconda (03384500)




5H Technologies, Inc.