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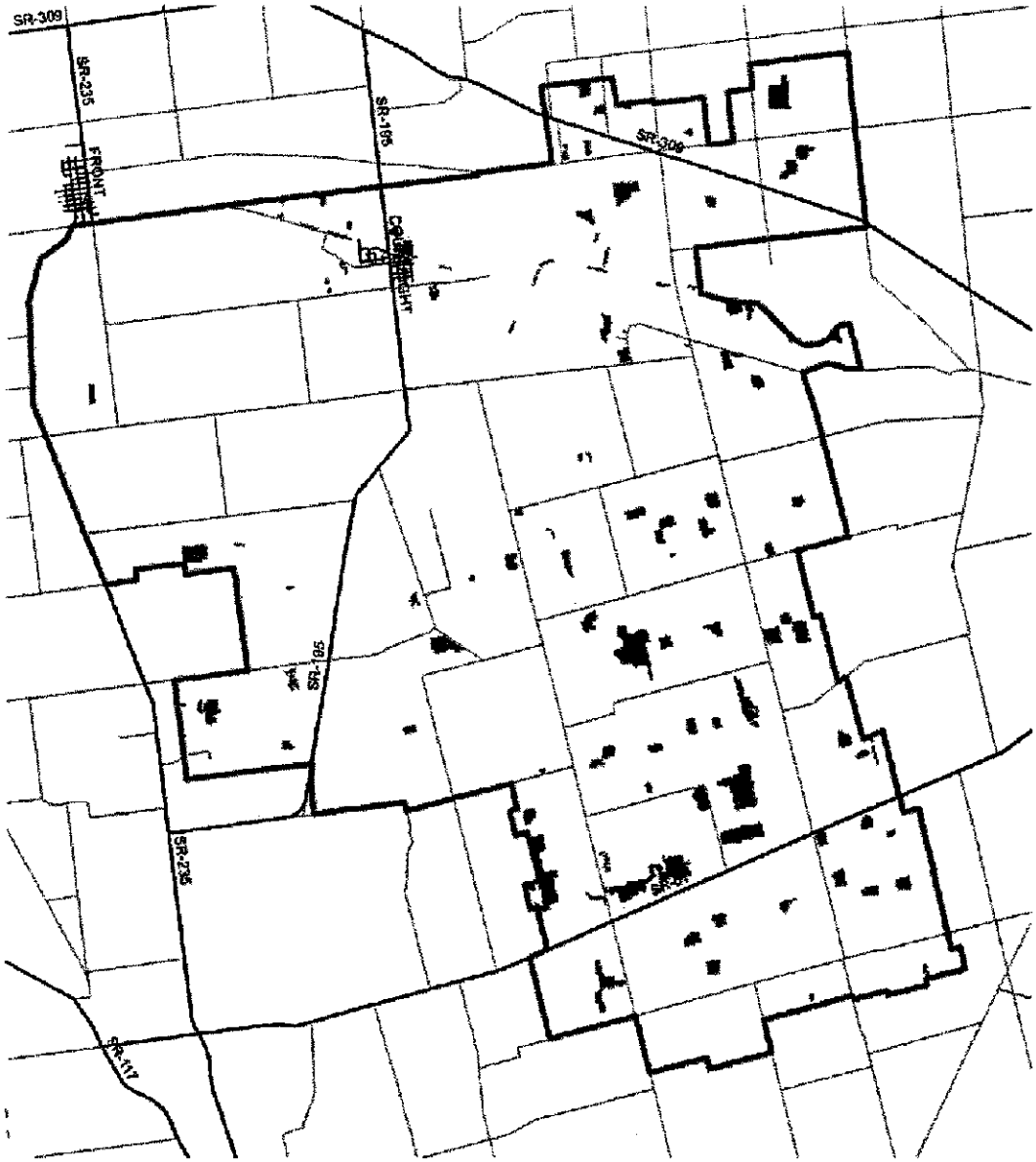

Invenergy Hardin County project

Forest cover

0 0.5 1 2 Miles

Rhett Good

From: Lott, Keith [Keith.Lott@dnr.state.oh.us]
Sent: Friday, June 26, 2009 12:01 PM
To: rgood@west-inc.com
Cc: Nazre Adum
Subject: RE: Revised Protocol for Invenergy Hardin County

All,

The survey recommendations within the "Wildlife Baseline Protocol for the Proposed Hardin County Wind Farm" concur with the level of effort suggested by the Ohio Department of Natural Resources Division of Wildlife. Please contact me if you have any questions or are in need of bat bands.

Keith

-----Original Message-----
From: Rhett Good [mailto:rgood@west-inc.com]
Sent: Thursday, June 25, 2009 3:22 PM
To: Lott, Keith
Cc: Nazre Adum
Subject: Revised Protocol for Invenergy Hardin County

Hello Keith,

Please find attached the revised protocol for Hardin for your review, based on the revised effort letter and new boundary for the project and the latest version of the ODNR wildlife monitoring protocols. The methods described are identical to the previous version, with the following exceptions:

1 – The number of mistnet sites has been increased to nine, per the revised effort letter
2 – Anabat detectors have been added to the two new met towers, per the revised effort letter

Would you mind reviewing, and letting us know if the protocol is acceptable to the ODNR? Please feel free to call with any questions.

Best regards,

Rhett

Rhett E. Good
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Wetland Reconnaissance

of the

Hardin Wind Farm

Prepared For

Hardin Wind Energy LLC

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 INTRODUCTION

Hardin Wind Energy LLC is investigating the potential occurrence of jurisdictional wetlands and waters of the U.S. and waters of the state in its Project (Project) located in Hardin County, Ohio (Figure 1). The wind farm being developed occurs in mostly private, unincorporated, agricultural land used for growing crops (e.g., corn, soy, alfalfa and wheat). The Project includes 200 wind generating turbines, buried electric utility corridor, access roads and a substation that would also be used for construction staging and laydown.

Tetra Tech conducted a ground reconnaissance-level survey of jurisdictional wetlands and waters of the U.S. and waters of the state to verify the presence and approximate extent of those features in the Project. For this purpose, survey corridors larger than the area which will be disturbed during construction of the wind farm were established as listed in Table 1. The larger survey corridor was intentionally used to give Hardin Wind the opportunity to adjust its access road and underground cable locations to avoid identified features. The results of this reconnaissance are presented in this summary report in both tabular and spatial format, and include maps (Attachment A) that depict the locations of verified mapped wetlands and waters as well as newly identified features that are not found in other mapped information sources. Photographs of wetlands and waterbodies in the survey corridor are presented as Attachment B.

Table 1. Project Survey Corridor Description

Facility	Dimensions of Surveyed Corridor	Acres Surveyed
Turbines	250-ft circular plot for each of 200 turbines	901.5
Access Roads	30 miles of 150-ft wide corridor	545.5
Underground Cable	98 miles of 100-ft wide corridor	1187.9
Construction Staging Area / Operations and Maintenance / Substation	One location accommodates all three facilities	15.0
Total		2,650

2.0 METHODS

Tetra Tech conducted a field-based reconnaissance of wetlands and waterbodies in the Project Project from August 31 to September 4, 2009. The layout was provided to Tetra Tech on May 25th 2009 and was modified on September 2, 2009. This modification was fully evaluated by the reconnaissance team during the field effort.

The desktop review identified 39 streams, 26 NWI wetland and 56 OWI wetlands. Information about wetlands and waters in the survey corridor was extracted from the U.S. Fish and Wildlife National Wetland Inventory (NWI), Ohio Wetlands Inventory (OWI), National Land Cover Database (NLCD), and U.S. Geologic Survey topographic data and was supplemented by recent aerial photography. These areas were prioritized for field review to determine wetland presence and extent of wetland limits within the survey corridor. All portions of the survey corridor were

field reviewed to confirm the determinations of the desktop study, or identify additional unmapped wetland or surface waterbody features.

The field reconnaissance focused on observations of two wetland parameters: dominant hydrophytic vegetation and observable characteristics of hydrology (e.g., saturated or inundated soils, shallow/buttressed root systems, or stunted crops and cracked soils in farmed wetlands). The reconnaissance was conducted using the 1987 Corps Manual and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (2008) as a guide. Although soil investigations were not conducted as part of this effort, evidence of hydric soils throughout most of the project was confirmed though review of Ohio Department of Natural Resources mapping and was inferred by the presence of mapped wetland or waterbody resources. This method was discussed with staff of the Ohio Power Siting Board and the Ohio Environmental Protection Agency with the understanding that formal delineation would be performed on any water feature which would be affected by the wind farm.

Only features that intersected with the survey corridor were investigated during this reconnaissance. Tetra Tech personnel used GPS capable of sub-meter accuracy to document approximate wetland boundaries. Wetland and waterbody boundary information was collected for all features that did not reasonably conform to desktop feature boundaries (NWI and OWI mapped features) or for newly identified features. Wetlands and waterbodies that reasonably conformed to mapped information were identified as being present by a single waypoint collected in the field. In some cases, as in farmed wetlands, mapped features were observed to be under active cultivation. Tetra Tech considered a farmed wetland as a "potential" wetland because it is unknown whether or not the feature was a farmed wetland prior to the enactment of the Food Security Act of 1985. A provision in this bill, known as the Swampbuster, discourages the conversion of wetlands to agricultural use. To determine if the feature is indeed a jurisdictional wetland, additional information would be required, including soils investigation and a written request for information about the wetland from the landowner to determine if it is a prior converted wetland or a converted/non-wetland. With few exceptions (e.g., sites with difficult access, as in corn crops), photographs were collected at each wetland or waterbody. Notes were collected on any mapped land use that did not conform to mapped NLCD information.

Verified wetlands and surface water bodies were depicted on maps using color shading. Green shaded wetlands and surface water bodies indicate features verified as present. Red shaded wetlands and surface water bodies indicated features verified as absent. Yellow shading indicates potential presence of a feature which could not be conclusively determined during the field reconnaissance. For wetlands, color shading was applied to the entire mapped feature, however, determination applies only to the portion within the study area.

Wetland quality was assessed visually and ranked for each wetland encountered in the field using terms and descriptions consistent with the Ohio Rapid Assessment Method (ORAM). A wetland was ranked a "1" (i.e., low quality) if it was hydrologically isolated from the surrounding area; if it was under active agricultural production; or if the dominant vegetation consisted of nuisance or non-native species. A wetland was ranked a "2" (i.e., fair to good quality) if it was forested; if the potential for restoring lost wetland functions existed; or if it appeared to exhibited moderate diversity or wildlife habitat. A high-quality wetland was ranked a "3" if it exhibited superior

functions, diversity or wildlife habitat. Tetra Tech did not use the ORAM scoring sheets, rather, wetlands were visually assessed in the field using the quality ranks of 1, 2 or 3.

3.0 REGULATORY INFORMATION

The Project is located in two regulatory districts of the Army Corps of Engineers (ACOE), including the Buffalo District in the northern portion and the Huntington District in the southern portion of the site. Tetra Tech anticipates that the ACOE district in which most of the environmental impacts occur would take the regulatory lead; however, this would be decided during a meeting made at the request of the permit applicant with each of the affected ACOE districts.

Based on the September 4th 2009 layout, Tetra Tech anticipates that Hardin Wind would be required to obtain a Section 404 administered by the ACOE; a Section 401 Water Quality Certification permit administered by the Ohio Environmental Protection Agency (OEPA), and an Isolated Wetland Permit administered by the OEPA. Tetra Tech does not anticipate that need for a Section 10 permit as navigable waters listed by the ACOE are not present in the survey corridor. A National Pollutant Discharge Elimination System (NPDES) general permit would also be required to construct the Project.

3.1 SECTION 404 CLEAN WATER ACT (CWA)

If jurisdictional wetlands or waters of the U.S. are not avoided by construction or operation impacts associated with the Project, Section 404 permitting would be required to introduce fill into wetlands or waters of the U.S. Per the December 2, 2008 regulatory guidance letter jointly issued by the ACOE and the EPA, CWA jurisdiction includes traditional navigable waters, wetlands adjacent to traditional navigable waters, non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have seasonal flow, and wetlands that abut such tributaries. In the survey corridor, navigable waters and wetlands adjacent to those waters are lacking; however, non-navigable tributaries of traditional navigable waters that are relatively permanent and abutting wetlands are present. The CWA jurisdiction may also extend to non-navigable waters that are not relatively permanent, wetlands adjacent to such waters, and wetlands that do not directly abut those waters.

The December 2008 guidance clearly indicates that the federal agencies will not assert jurisdiction over swales or erosional features, or ditches excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water. Many linear features crossed by the survey corridor are grassy swales, or are present as re-directed waterbodies that aid in the drainage of agricultural fields. Some of these re-directed waterbodies are likely to be non-jurisdictional. Other areas exhibit a natural sinuousity and may provide hydrologic functions in connecting wetlands within the overall watershed. Those features are likely to be considered jurisdictional under the Section 404 permit. A routine, on-site wetland assessment would be necessary to make this anticipated determination.

3.2 SECTION 401 WATER QUALITY CERTIFICATION, NATIONWIDE PERMIT 12 – UTILITY LINE ACTIVITIES

Construction and operational activities associated with the Project would be authorized by the NWP 12 assuming that permanent impacts to wetlands would be less than 0.5 acre (or less than

500 linear feet in jurisdictional waters) for a single and complete project inclusive of temporary and permanent access roads, buried and overhead utility lines, and construction of the substation.

Pre-construction notification would be required if any of the following conditions are met:

- the activity involves mechanized land clearing in a forested wetland for the utility line right-of-way;
- the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet;
- the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to a stream bed that is within that jurisdictional area;
- discharges that result in the loss of greater than 0.10 acre of waters of the United States;
- permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or
- permanent access roads are constructed in waters of the United States with impervious materials.

Note that access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, accordance with the requirements for temporary fills.

In Ohio, the ACOE also imposes Specific Regional Permit Conditions on the NWP 12. The potential triggers for the Project are listed below.

- Pre-Construction Notification: The permittee must notify the District Engineer in accordance with the "Pre-Construction Notification" Nationwide Permit General Condition for the following activities:
    - All work in waters of the U.S., including special aquatic sites[1] , associated with utility line substations;
    - All stream work (perennial, intermittent, and ephemeral) associated with foundations for overhead utility line towers, poles, and anchors;
    - Impacts greater than 0.10 acre in waters of the US, including wetlands, associated with access roads;
    - All work associated with temporary construction, access, and dewatering activities in Section 10 waters, perennial streams, and wetlands. The PCN must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
- All impacts to forested wetlands; and
- All impacts to shrub/scrub wetlands.

[1] Special aquatic sites that potentially occur in the Project include wetlands and riffle/pool complexes; however, riffle/pool complexes were not observed during this field reconnaissance and given the topographic relief observed, are unlikely to occur.

- Where certain functions and values of waters of the US are permanently adversely affected, such as the conversion of a forested wetland or shrub/scrub wetland to a herbaceous wetland in the permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

The Ohio State 401 Certification General Limitations and Conditions apply to this nationwide permit; permitting triggers that apply to the Project are listed below:

- The Certification does not authorize the physical disturbance of more than 500 linear feet of forested wetland soils (containing woody vegetation 6 meters or taller).
- Buried utility line stream crossings does not exceed a total of three per stream mile per stream.
- The total width of any excavation, grading, or mechanized clearing of vegetation and soil shall not exceed 25 feet on either side of a utility line, or a total width of 50 feet on both sides of a utility line.
- New buried utility lines crossing more than 1,500 feet (cumulative for the entire project) of surface waters (wetlands, and ephemeral, intermittent, and perennial streams) or with impacts located in three or more Ohio EPA 8-digit hydrologic units as defined in Ohio Administrative Code 3745-1-54(F) are not authorized.

3.3 SECTION 401 WATER QUALITY CERTIFICATION – NATIONWIDE PERMIT 14 – LINEAR TRANSPORTATION PROJECTS

Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States are authorized by the NWP 14. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 0.5 acre of waters of the United States. The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the loss of waters of the United States exceeds 0.10 acre; or if there is a discharge in a special aquatic site, including wetlands. The specific regional conditions that would be triggers for the Project are listed below.

- Pre-Construction Notification in accordance with the "Pre-Construction Notification" Nationwide Permit General Condition is required if the cumulative stream impacts for the project are greater than 500 linear feet. In addition, Pre-Construction Notification is required if the cumulative perennial and intermittent stream impacts are greater than 200 linear feet.
- Pre-Construction Notification in accordance with the "Pre-Construction Notification" Nationwide Permit General Condition is required for temporary construction, access, and dewatering activities in Section 10 waters, perennial streams, and wetlands. The PCN must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
- Interior roadways for recreational facilities and residential, commercial, and institutional developments are not authorized by this nationwide permit.

Ohio State Certification Special Limitations and Conditions that apply to this nationwide permit preclude more than 3 stream crossings per stream mile per stream.

3.4 SECTION 401 WATER QUALITY CERTIFICATION – OHIO ISOLATED WETLANDS PERMIT

OEPA would require the Isolated Wetland Permit for dredging and filling activities in Category 1, 2 or 3 isolated wetlands; for re-routing or channelizing streams, or installing dams. It could also require the Isolated Wetlands Permit for certain activities of concern, which include (but are not limited to) lack of surface water avoidance; excessive construction limits; the removal of trees and shrubs from riparian habitats; and activities that reduce stream length and sinuosity. The Section 401 Water Quality Certifications permit and the Isolated Wetlands Permit are reviewed together. The Ohio Revised Code 6111.02 contains information about the filling of up to 0.5 acre of ORAM Category 1 and 2 wetlands. If any ORAM Category 1 or 2 wetlands would be filled, the level 1 review would require the submission of a pre-activity notice that includes an application, an acceptable wetland delineation, a wetland categorization, a description of the project, a description of the acreage of the isolated wetland that will be subject to filling, site photographs, and a mitigation proposal for the impact to the isolated wetland.

4.0 RESULTS

The wetland reconnaissance observed fifty-three (53) new and/or mapped NWI or OWI wetlands in the survey corridor. Of these wetlands, 10 features were confirmed as not present within the Project; either because wetland boundary differed from mapped conditions, (e.g., wetland was present but beyond the survey limits), or the feature was not present. Table 2 summarizes the wetlands identified during the field reconnaissance. Observed wetlands are depicted on maps presented in Attachment A.

Observed wetlands in the survey corridor consisted of freshwater emergent (PEM), deciduous forested (PFO1), and farmed wetland types. Emergent wetlands depicted in NWI or OWI datasets were usually not observable in the field because they were obscured by crops. These wetlands were rated as ORAM category 1 wetlands because they did not provide normal wetland functions or demonstrated appropriate diversity. In some instances, crops were stunted and soils were cracked; in other instances, no difference in vegetative vigor was observable.

Many wetlands in the survey corridor were observed in the forest fragments on the edges of fields. Wooded wetlands consisted of ash, cottonwood, maple and oak; wetland portions of these woodlands were noted by a slight fall in elevation and a change in species composition where ash species were more dominant and often were accompanied by cottonwoods. Upland portions were noted by a rise in elevation, more hickory and maple, and a visual change in the herbaceous groundcover.

In three forested wetlands, potential vernal pools were observed. Wetlands AWAR016, AWAR021 and AWAR023 appeared at the forested edge of woodlots adjacent to active croplands. Watermarks were evident on the bases of trees as were black-stained leaves. Limited herbaceous vegetation occurred in the potential vernal pool basins. These wetlands were identified as ORAM category 2 wetlands because of the lack of continuous upland vernal pool buffer and none appeared to exhibit superior wetland function and diversity.

A total of fifty-nine (59) streams were observed intersecting the survey corridor during the wetlands reconnaissance. Many of these waterbodies are tributaries of the Scioto River and occur as perennial, intermittent and ephemeral features. Several perennial and intermittent waters are indicated in USGS topographic maps as "spoil piles", presumably where historic ditches were placed to drain lands for agriculture. These include Cooney Ditch and Cottonwood Ditch, as well as other unnamed features that generally parallel township roads. A few waterbodies are small tributaries of the North Forth Great Miami River; these occur in the southern portion of the Project. Waterbodies inventoried during the reconnaissance are listed in Table 3 and depicted on maps provided in Attachment A.

Most waterbodies in the survey corridor were designated as warmwater habitats in the Aquatic Life Habitat Use water quality classification. Several waters, including Payden Run, Cooney Ditch and Cottonwood Ditch are designated as modified warmwater habitat. Most of the waters in the Project are suitable for use in agriculture or industry as well as primary contact recreation. Smaller unnamed tribuaries and ephemeral streams were not assigned aquatic life habitat use categories.

Swales and agricultural ditches are prevalent throughout the Project. Some of these features were clearly non-juridictional waters of the U.S. and are stated as such in Table 3. However, other swales or agricultural ditches appeared as intermittent streams in USGS topographic maps.

5.0 RECOMMENDATION AND LAYOUT REVISIONS

Following the field work Tetra Tech provided Hardin Wind Energy with the field identified features as geospatial data along with avoidance recommendations. Hardin Wind Energy revised their September 3 2009 layout and issued a September 16 2009 layout which is evaluated in this report and included along with the mapped wetland features as Attachment C.

Based on the September 3 2009 wind farm layout , the Project would have triggered each of the permits listed in Section 3 of this report. Jurisdictional determinations as to whether features fall under regulatory requirements of the ACOE would have been required for some wetlands and for many of the waterbodies crossed by the Project.

Note that the NWPs 12 and 14 authorizes up to 0.10 acre of permanent fill or discharge to wetlands and waters of the U.S. for each single and complete project (individual wetland or stream crossing). The introduction of fill into ACOE non-jurisdictional wetlands that are currently used in active croplands are likely to fall under the jurisdiction of the OEPA (isolated wetlands). Tetra Tech has provided recommendations that would avoid or minimize impacts to wetlands or waters of the U.S or of the state in tables 2 and 3. These recommendations are largely based on moving the access road or buried utility corridor, limiting workspace around the sensitive resource, or avoiding the sensitive resource through other means (i.e., directional drilling underneath the feature).

Tetra Tech staff and Hardin Wind Energy staff have worked together to implement the above referenced recommendations. Through the adjustment of roads, planned use of directional drilling and relocation of buried utility routes, impacts to all but 7 stream crossings have been avoided based on the September 16 2009 wind farm layout. These culverted crossings of access roads could trigger permitting requirements. In particular, the NWP 14 Specific Regional Permit

conditions state that Pre-Construction Notification would be required if the cumulative stream impacts for the wind farm are greater than 500 linear feet. In addition, Pre-Construction Notification is required if the cumulative perennial and intermittent stream impacts are greater than 200 linear feet. For perennial waters and wetlands, the Pre-Construction Notification must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions. However, based on Tetra Tech's limited review of Hardin Wind Energy's September 16 2009 (included as Attachment C) access road layout, Hardin Wind has limited the access road width at these 7 stream crossings to 20 feet wide and thus the impact is expected to be below the cumulative 200 linear foot of impact trigger for the Pre-Construction Notification.

Table 2. Wetlands in the Surveyed Corridor and Recommended Avoidance or Minimization Method

Name	Acres In Surveyed Area	Cover Type a/	Hydrology	ORAM Class	Map Sheet	Recommendations for Avoidance/Minimization
CWBU002	0.51	Ag	Isolated	Cat1-Limited Quality	1	Limit or shift workspace to avoid this wetland. Install siltfencing around wetland perimeter.
CWTB002001	0.43	Ag	Isolated	Cat1-Limited Quality	1	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
CWTB003003	0.26	Ag	Isolated	Cat1-Limited Quality	1	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWAR055	0.02	PFO1	Isolated	Cat2-Fair to Good	6	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWBU008	0.00	Ag	Isolated	Cat1-Limited Quality	8	OWI field verified, wetland is absent.
BWBU0081	0.12	Ag	Connected	Cat1-Limited Quality	8	Shift buried utility corridor west to avoid wetland, or limit workspace to avoid wetland. Install siltfencing along wetland boundary.
CWAR011	0.21	PFO1	Connected	Cat2-Fair to Good	8	Limit access road workspace to avoid wetland. Install siltfencing along wetland boundary.
BWBU0821	1.50	PFO1	Isolated	Cat2-Fair to Good	9	Limit buried utility workspace to avoid wetland. Install siltfence around wetland perimeter.
CWBU035	0.03	POW	Isolated	Cat1-Limited Quality	10	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BTB089	0.54	PFO1	Connected	Cat2-Fair to Good	11	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWAR020	0.01	PFO1	Connected	Cat2-Fair to Good	11	Relocate workspace to the South to avoid wetland. Install siltfencing along wetland boundary.
CWAR016	0.00	Ag	Isolated	Cat1-Limited Quality	11	OWI Wetland verified, wetland does not occur at edge but farther in the woodlot.
CWAR017	0.00	PFO1	Connected	Cat2-Fair to Good	11	OWI Wetland verified, wetland not present.
AWAR004	0.06	PFO1	Isolated	Cat2-Fair to Good	13	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
CWAR007	0.00	Ag	Isolated	Cat1-Limited Quality	6, 7	OWI Wetland verified, wetland not present.
CWAR019	0.02	Hedge Row	Isolated	Cat1-Limited Quality	13	Limit access road workspace to avoid wetland.

Table 2. Wetlands in the Surveyed Corridor and Recommended Avoidance or Minimization Method

Name	Acres In Surveyed Area	Cover Type a/	Hydrology	ORAM Class	Map Sheet	Recommendations for Avoidance/Minimization
						Install siltfencing along wetland boundary.
CWAR020	0.00	Ag	Isolated	Cat1-Limited Quality	13	Limit access road workspace to avoid wetland. Install siltfencing along wetland boundary.
AWBU002	0.15	Ag	Isolated	Cat1-Limited Quality	15	Limit workspace to minimize wetland impact. Install siltfencing along wetland boundary.
BWAR102	0.00	Ag	Connected	Cat1-Limited Quality	20	OWI field verified, wetland is absent.
AWBU036	0.25	Ag	Isolated	Cat1-Limited Quality	21	Directional drill to avoid impacts to wetland; or, relocate buried utility north of woodlot.
CWTB120036	0.18	Ag	Isolated	Cat1-Limited Quality	21	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWAR001	0.58	PFO1	Isolated	Cat2-Fair to Good	22	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
CWBU024	0.10	POW	Isolated	Cat1-Limited Quality	24	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWBU003	0.09	PFO1	Isolated	Cat2-Fair to Good	26	Limit buried utility workspace to avoid wetland. Install siltfence around wetland perimeter.
BWBU002	0.10	PFO1	Isolated	Cat2-Fair to Good	27	Relocate workspace to the North to avoid wetland impacts. Install siltfencing along wetland boundary.
CWAR029	0.20	Ag	Isolated	Cat1-Limited Quality	27	Limit or shift workspace to avoid this wetland. Install siltfencing around wetland perimeter.
AWAR028	0.12	PFO1	Connected	Cat2-Fair to Good	30	Limit workspace to minimize wetland impact. Install siltfencing along wetland boundary.
ASAR027	0.14	PFO1	Connected	Cat2-Fair to Good	30	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWTB190029	0.45	PFO1	Connected	Cat2-Fair to Good	30	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
CWBU030	0.08	Ag	Isolated	Cat1-Limited Quality	30	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.

Table 2. Wetlands in the Surveyed Corridor and Recommended Avoidance or Minimization Method

Name	Acres In Surveyed Area	Cover Type a/	Hydrology	ORAM Class	Map Sheet	Recommendations for Avoidance/Minimization
AWAR023	0.10	PFO1	Isolated	Cat2-Fair to Good	31	Limit workspace to minimize wetland impact. Install siltfencing along wetland boundary.
AWAR020	0.02	PFO1	Connected	Cat2-Fair to Good	33	Limit workspace to minimize wetland impact. Install siltfencing along wetland boundary.
AWAR021	0.60	PFO1	Connected	Cat2-Fair to Good	33	Shift access road construction limits to the east to avoid forested wetland and potential vernal pool.
AWAR038	0.00	Ag	Isolated	Cat1-Limited Quality	33	OWI field verified, wetland is absent.
AWAR039	0.00	Upland forest	Connected	Cat2-Fair to Good	33	OWI field verified, wetland is absent.
AWAR040	0.00	Upland forest	Isolated	Cat2-Fair to Good	33	OWI field verified, wetland is absent.
AWTB167019	0.75	PFO1	Connected	Cat2-Fair to Good	33	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWTB167019	0.00	PFO1	Connected	Cat2-Fair to Good	33	(OWI wetland, NWI boundary was accurate)
CWAR031	0.06	PFO1	Connected	Cat2-Fair to Good	33	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWTB164014	0.09	PFO1	Isolated	Cat2-Fair to Good	34	Limit buried utility workspace to avoid wetland. Install siltfence around wetland perimeter.
CWAR025	0.00	PFO1	Isolated	Cat2-Fair to Good	34	(wetland present but not within the access road)
CWBU028	0.00	Ag	Isolated	Cat1-Limited Quality	34	OWI field verified, wetland is absent.
AWAR016	0.07	PFO1	Isolated	Cat2-Fair to Good	35	Shift access road construction limits to the east to avoid forested wetland and potential vernal pool.
CWTB155037	0.17	Ag	Isolated	Cat1-Limited Quality	35	Relocate access road to east to avoid wetland impacts. Limit turbine laydown to avoid wetland. Install siltfencing around wetland boundary.
BWTB137017	0.02	PFO1	Connected	Cat2-Fair to Good	36	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
BWAR020	0.01	PFO1	Connected	Cat2-Fair to Good	37	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWTB147009	0.28	PFO1	Connected	Cat2-Fair to Good	38	Limit workspace to minimize wetland impact.

Table 2. Wetlands in the Surveyed Corridor and Recommended Avoidance or Minimization Method

Name	Acres in Surveyed Area	Cover Type a/	Hydrology	ORAM Class	Map Sheet	Recommendations for Avoidance/Minimization
						Install siltfencing along wetland boundary.
CWBU034	0.00	Ag	Isolated	Cat1-Limited Quality	38	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWAR010	0.02	PFO1	Connected	Cat2-Fair to Good	39	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWAR012	0.29	PEM	Connected	Cat2-Fair to Good	39	Limit workspace to avoid wetland. Install siltfencing along wetland boundary.
AWTB150013	0.09	PFO1	Connected	Cat2-Fair to Good	39	Limit turbine laydown to minimize wetland impact. Relocate access road to West of woodlot to avoid wetland impacts.
AWTB150013	1.15	Ag	Isolated	Cat1-Limited Quality	39	(wetland present but not within the access road)
AWTB151011	0.01	Wet Meadow	Connected	Cat1-Limited Quality	39	Limit turbine laydown to minimize wetland impact. Relocate access road to West of woodlot to avoid wetland impacts.

a/ Covertype based on Cowardin et al. 1979, except "Ag" which indicates PEM or other wetland covertypes that were actively farmed.

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
WATERBODIES THAT ARE ANTICIPATED TO BE AVOIDED BY THE PROJECT								
BSBU023	Cottonwood Ditch	MWH	P	15	100	1	1	Directional drill to avoid impacts to streambed and banks.
ASBU008	ag ditch / (T) Cottonwood Ditch	WWH	I	10	999	1	1	Relocate access road to the north and avoid trib to Cottonwood Ditch
ASBU006	Cottonwood Ditch	MWH	P	50	200	2, 4, 5	2	Sheet 2: Directional drill to avoid impacts to streambed and banks. Sheet 4: Relocate buried utility corridor to north of TR 100 to avoid Cottonwood Ditch. Sheet 5: Directional drill perpendicular to TR 100 to avoid impacts to ditch bed and banks
BSUT016	ag ditch / (T) Scioto River	-	I	5	100	1	3	Directional drill to avoid impacts to streambed and banks.
ASBU005	ag ditch / (T) Cottonwood Ditch	WWH	E	25	100	1	4	Relocate buried utility to the east of ag ditch
BSBU082	ag ditch	-	I	5	294	1	8	Shift buried utility corridor west to avoid ag ditch, or limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
CSAR012	Cooney Ditch / (T) Scioto River	WWH	Unk.	5	1768	2	8	Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
CSBU009	ag ditch / (T) Cooney Ditch	-	Unk.	5	119	1	8	Directional drill to avoid impacts to streambed and banks.
CSBU010	ag ditch / (T) Cooney Ditch	-	Unk.	0	102	1	8	non-jurisdictional swale

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
CSTB079010	ag ditch / (T) Cooney Ditch	-	E	0	238	1	8	non-jurisdictional swale
CSTB079010	ag ditch / (T) Cooney Ditch	-	E	0	473	1	8	non-jurisdictional swale
BS082-1	ag ditch	-	I	5	100	1	9	Directional drill to avoid impacts to streambed and banks.
CSTB080012	Cooney Ditch / (T) Scioto River	WWH	Unk.	5	519	1	9	Directional drill to avoid impacts to streambed and banks.
CSBU015	(T) Scioto River	WWH	I	5	119	1	10	Directional drill to avoid impacts to streambed and banks.
BSAR1	Swale	-	E	0	80	1	11	Limit workspace to avoid wooded area west of access road. Swale is non-jurisdictional.
DRAINAGE SWALE	Unknown	-	Unk.	0	89	1	11	non-jurisdictional swale
BSTB089021	Swale	-	E	5	107	1	11	Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
BWAR018	Unknown	-	Unk.	0	331	1	11	non-jurisdictional swale
ASBU034	(T) Scioto River	WWH	I	20	101	1	12	Directional drill to avoid impacts to streambed and banks.
ASBU035	Scioto River	WWH	P	65	203	2	12	Directional drill to avoid impacts to streambed and banks.
ASBU003	McCoy Run	WWH	P	30	138	1	14	Directional drill to avoid impacts to streambed and banks.
ASBU001	ag ditch / (T) Scioto River	-	I	20	100	1	15	Directional drill to avoid impacts to streambed and banks.

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
ASBU030	ag ditch / (T) Scioto River	-	I	30	356	2	16	Directional drill to avoid impacts to streambed and banks, or eliminate crossings of this feature by using turbine 68 and 69 access roads.
ASBU033	ag ditch / (T) Scioto River	-	I	15	100	1	16	Directional drill to avoid impacts to streambed and banks.
ASBU031	Flat Branch	MWH	P	35	101	1	17	Directional drill to avoid impacts to streambed and banks, or eliminate crossings of this feature by using turbine 68 and 69 access roads.
ASBU032	Scioto River and Trib	WWH	P	50	600	1	17	Relocate buried utility 75 feet or more to South of CR 110 and eliminate all adjacency and crossing of perennial ditch that drains to Scioto River. Directional drill Scioto River to avoid impacts to streambed and banks.
BSUT046-51	Scioto River	WWH	P	15	403	4	19	Directional drill to avoid impacts to streambed and banks.
CSBU021	ag ditch	-	Unk.	0	111	1	20	non-jurisdictional swale
BSAR107	(T) Scioto River	WWH	I	0	113	1	20	No work planned for area south of CR 150; no impacts
CSBU022aa	ag ditch	-	Unk.	0	156	1	20	non-jurisdictional swale
BSBU010	Flat Branch	MWH	I	5.5	114	1	23	Directional drill to avoid impacts to streambed and banks.
BSBU011	(T) Flat Branch	MWH	I	5	274	2	23	Relocate buried utility slightly East to reduce amount of adjacent stream crossing. Cross trib using directional drill to avoid impacts.

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
BSBU009	Flat Branch	MWH	I	5.5	275	1	23	Directional drill to avoid impacts to streambed and banks.
ASBU037	Flat Branch	MWH	I	8	318	2	23	Directional drill to avoid impacts to streambed and banks.
BSBU005	McCoy Run	WWH	I	5	100	1	25	Directional drill to avoid impacts to streambed and banks.
BSAR006	McCoy Run	WWH	I	5	195	2	25	Directional drill to avoid impacts to streambed and banks.
BSBU004	(T) McCoy Run	WWH	I	6	297	2	26	Directional drill to avoid impacts to streambed and banks.
BSBU013-3	(T) Flat Branch	WWH	I	5	96	1	28	Water has been redirected through buried culvert. Surface stream no longer present.
BSBU013-1	(T) Flat Branch	WWH	I	5	100	1	28	Directional drill to avoid impacts to streambed and banks.
ASBU026	ag ditch / (T) McCoy Run	-	E	0	114	1	30	non-jurisdictional swale
ASBU025	Payden Run	WWH	P	5	113	1	31	Directional drill to avoid impacts to streambed and banks, or eliminate crossings of this feature by using turbine 68 and 69 access roads.
ASAR024	ag ditch / (T) Payden Run	-	E	5	484	4	31	Limit access road workspace to avoid streambed and banks. Install siltfencing along stream boundary. Culvert will be necessary within access road. Directional drill within buried utility corridor.
CSBU023	McCoy Run	WWH	I	5	100	1	32	Directional drill to avoid impacts to streambed and banks.

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
ASTB168021	(T) McCoy Run	WWH	E	5	334	1	33	Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
ASTB169022	ag ditch / (T) McCoy Run	-	I	5	1046	5	33	Directional drill to avoid impacts to streambed and banks.
CSAR027	unnamed (T) Scioto River	-	I	5	556	1	34	Relocate access road to east to avoid crossing stream.
ASTB156016	(T) Flat Branch	MWH	I	30	195	1	35	Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
BSBU016	Flat Branch	MWH	I	5	105	1	36	Directional drill to avoid impacts to streambed and banks.
CSBU032	unnamed (T) Scioto River	-	I	0	100	1	36	non-jurisdictional swale
BSTB140019	(T) Scioto River	WWH	I	5	215	1	37	Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary.
WATERBODIES THAT MAY REQUIRE A CULVERTED CROSSING								
BSAR018	(T) Scioto River	WWH	I	5	165	1	11; 36	Sheet 11: Limit workspace to avoid streambed and banks. Install siltfencing along stream boundary. Sheet 36: Bridge already present, may require upgrade to accommodate heavy equipment. Culvert installation likely required.
BSBU012, BSAR012	Flat Branch	MWH	I	5	250	2	18	Perennial waterway (BSAR012); access road will require bridge/culvert crossing. Buried utility (BSBU012) should be installed via directional drilling and be relocated within the access road to minimize impacts.

Table 3. Streams Identified in the Surveyed Corridor and Recommended Measures to avoid Stream Impacts

Field ID	Stream Name	Aquatic Life Habitat Type	Flow	Stream Width (ft)	Length (ft)	Number of Crossings	Map Sheet	Recommendations for Avoidance/Minimization
BSBU007	(T) McCoy Run	WWH	I	5	170	1	26	Intermittent waterway; access road will require bridge/culvert crossing.
BSAR015	McCoy Run	WWH	I	5	202	1	29	Intermittent waterway; access road will require bridge/culvert crossing. Relocate buried utility within access road and install via directional drilling.
ASAR027	(T) McCoy Run	WWH	I	5	208	1	30	Intermittent waterway; access road will require bridge/culvert crossing. Shift access road away from PFO wetland.
ASAR018	(T) McCoy Run	WWH	I	15	274	2	33	Intermittent waterway; access road will require bridge/culvert crossing.
ASAR014, ASBU014	(T) N. Fork Great Miami River	WWH	P	20	251	2	39	Perennial waterway; access road will require bridge/culvert crossing. Buried utility should be installed via directional drilling and be relocated within the access road to minimize impacts.

Notes: (T) = tributary; WWH = warmwater habitat; MWH = modified warmwater habitat; P = perennial; I = intermittent; E = ephemeral; Unk. = unknown; ag, = agriculture.

6.0 REFERENCES

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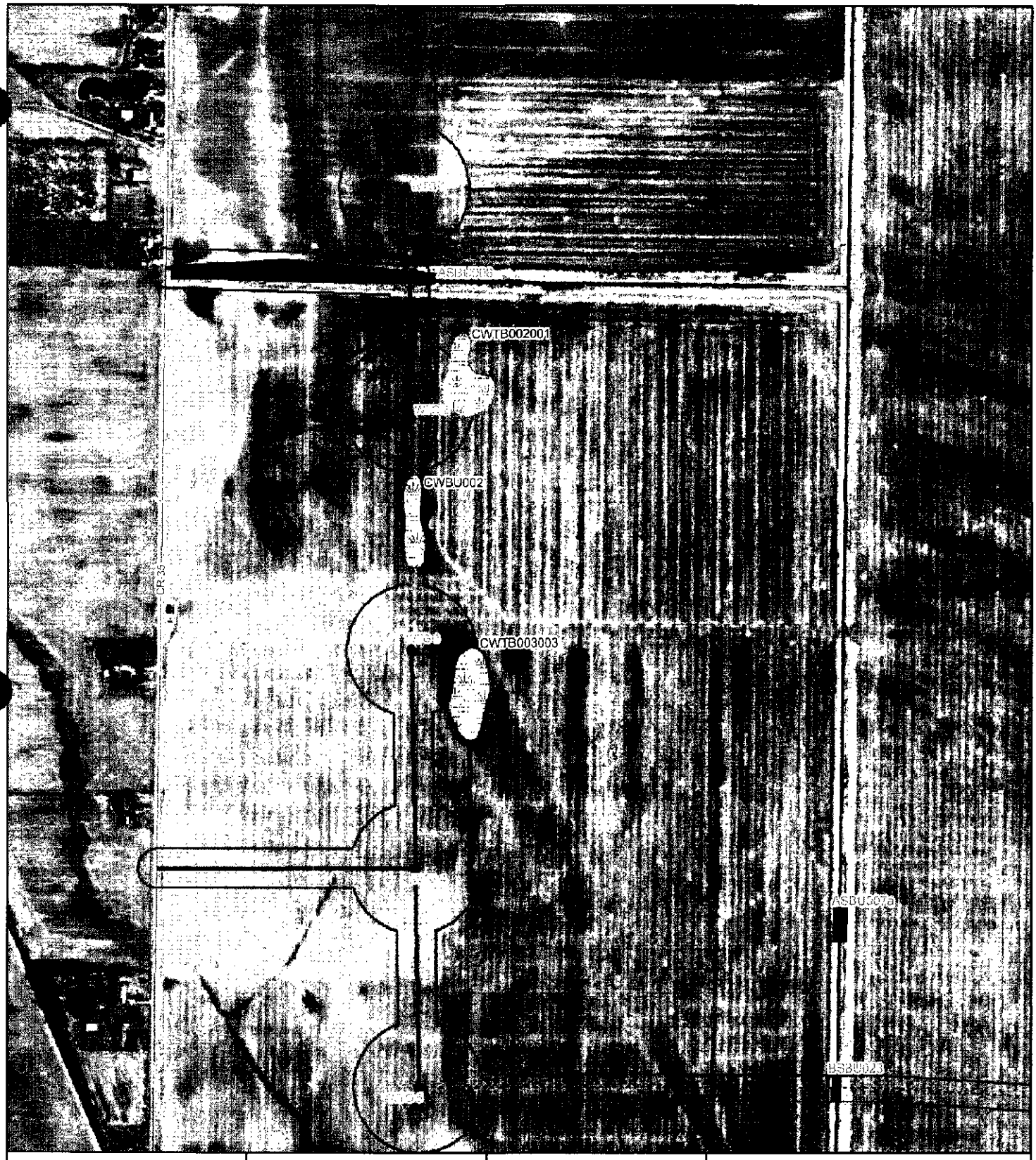
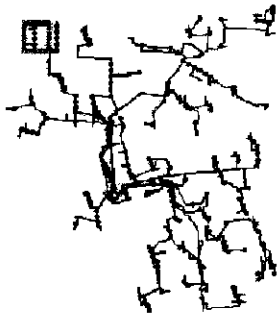
ATTACHMENT A

Hardin Wind Farm Wetland Reconnaissance

Map Figures 1 through 39





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

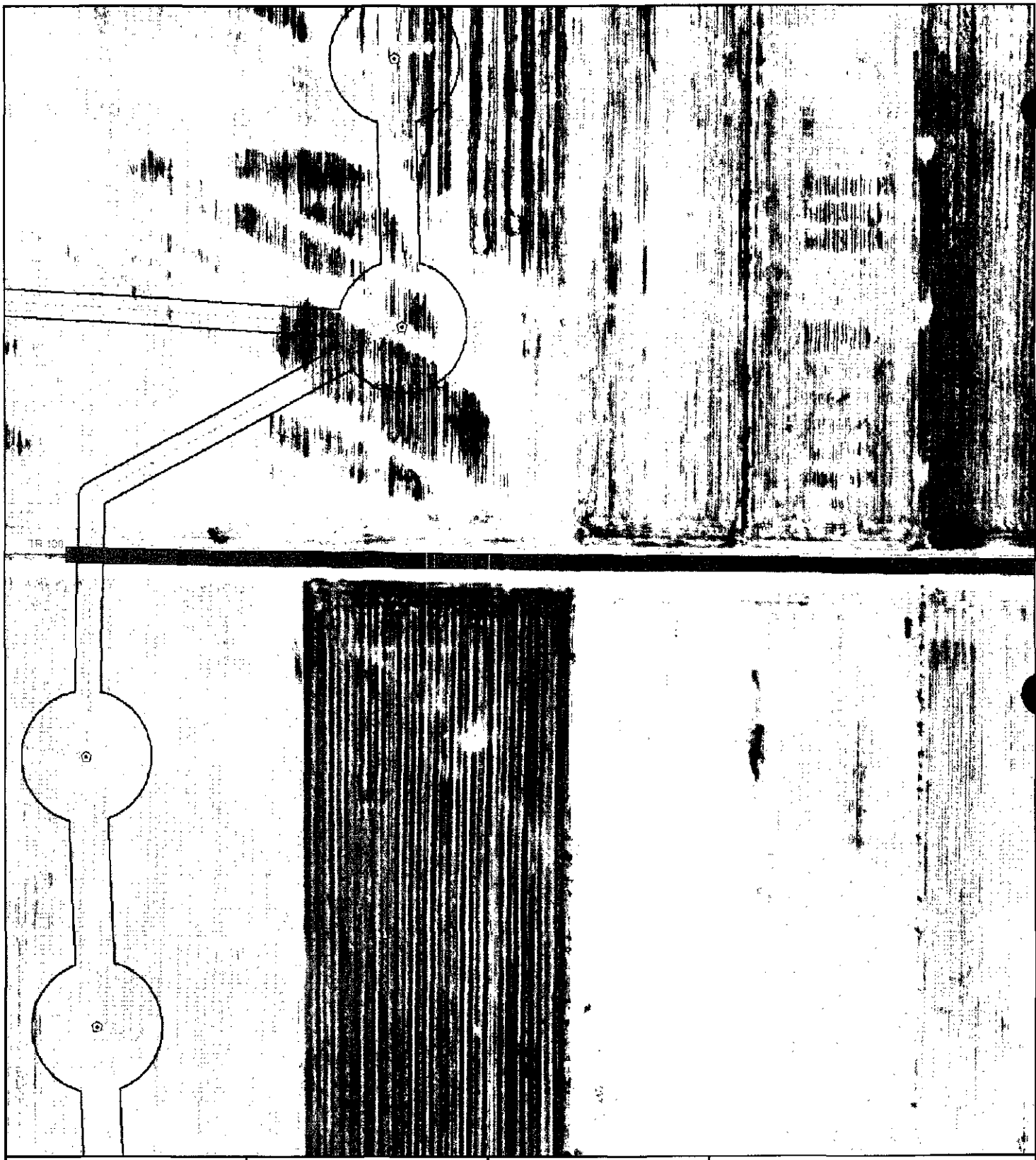
TETRA TECH

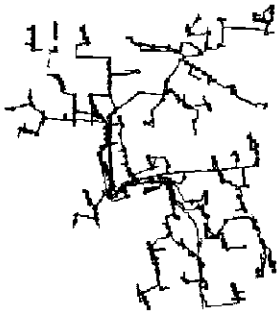
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 01 of 39

September 2009





Legend

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- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

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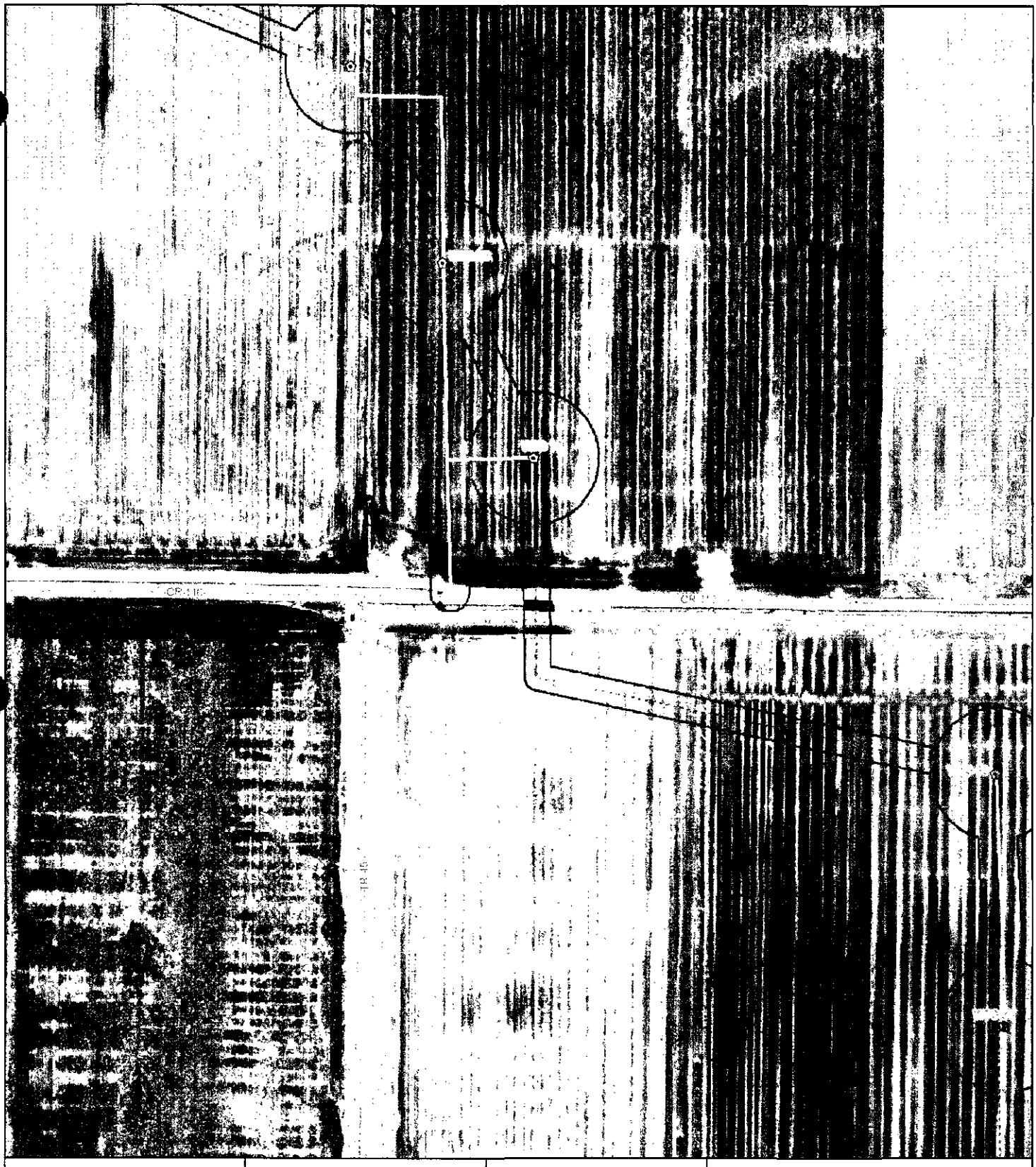
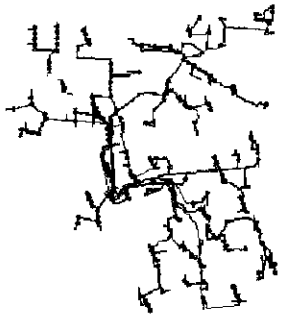
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 02 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
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- Field Verified Wet and Indeterminant
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- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

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Feet

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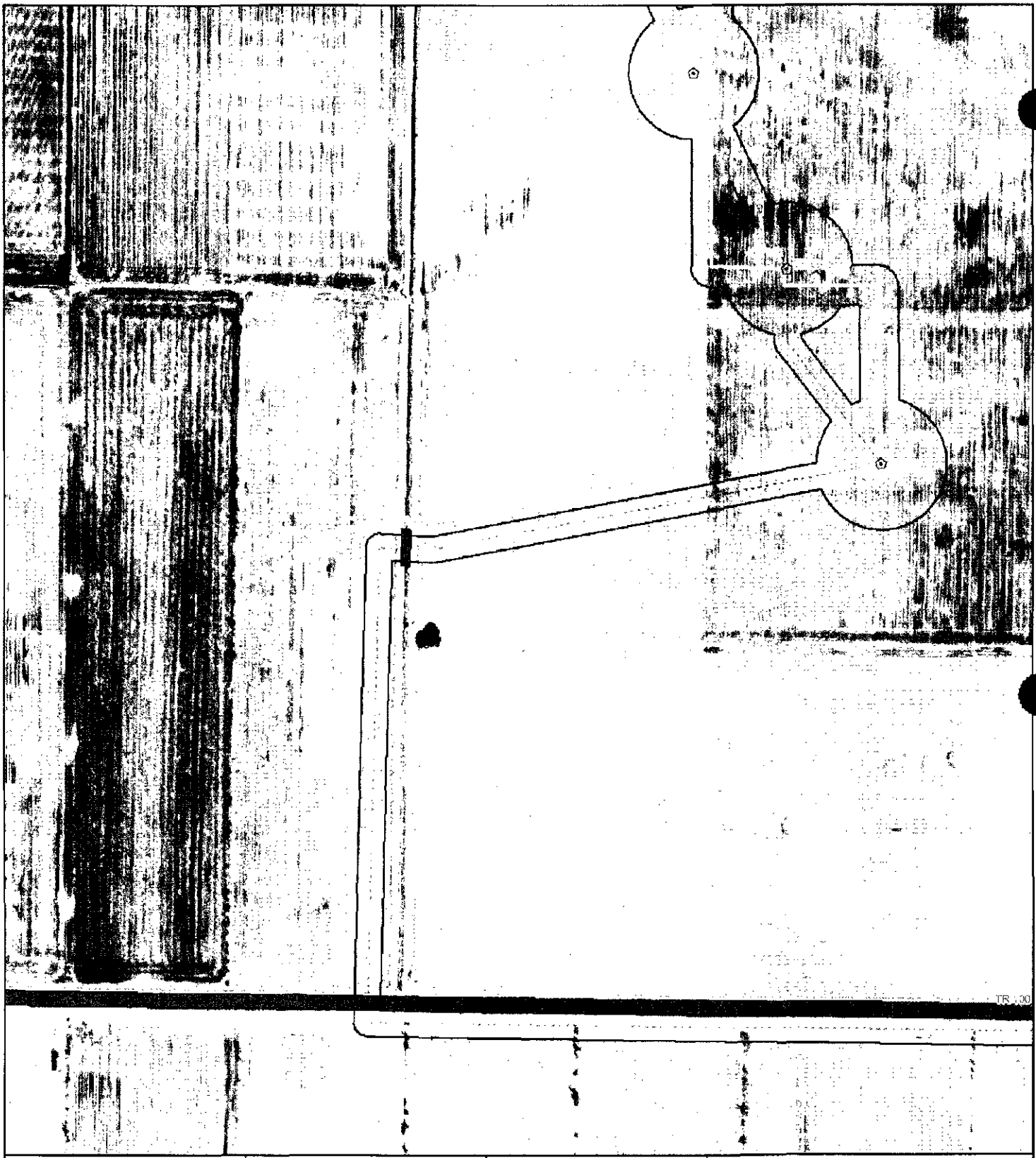
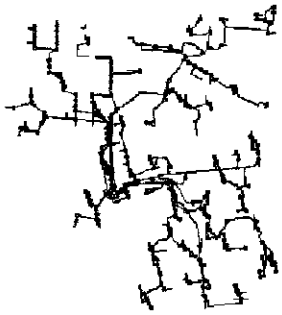
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 03 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
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- Field Verified Wetland Indeterminant
- Field Verifind Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

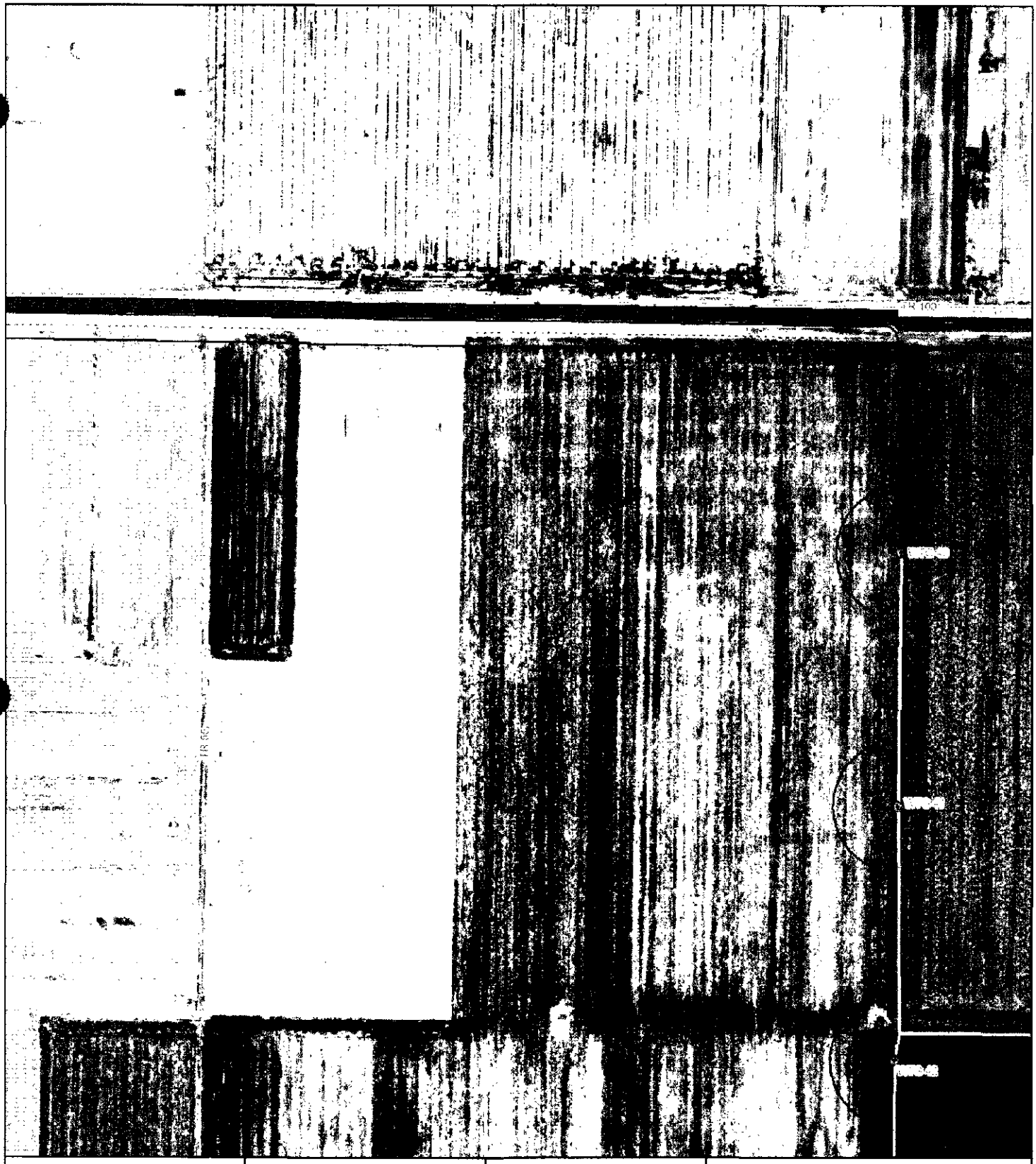
TETRA TECH

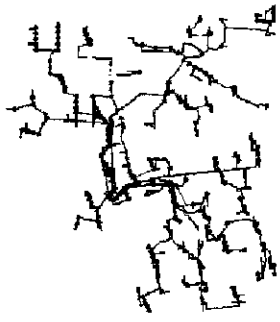
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 04 of 39

September 2009





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- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection Line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

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Feet

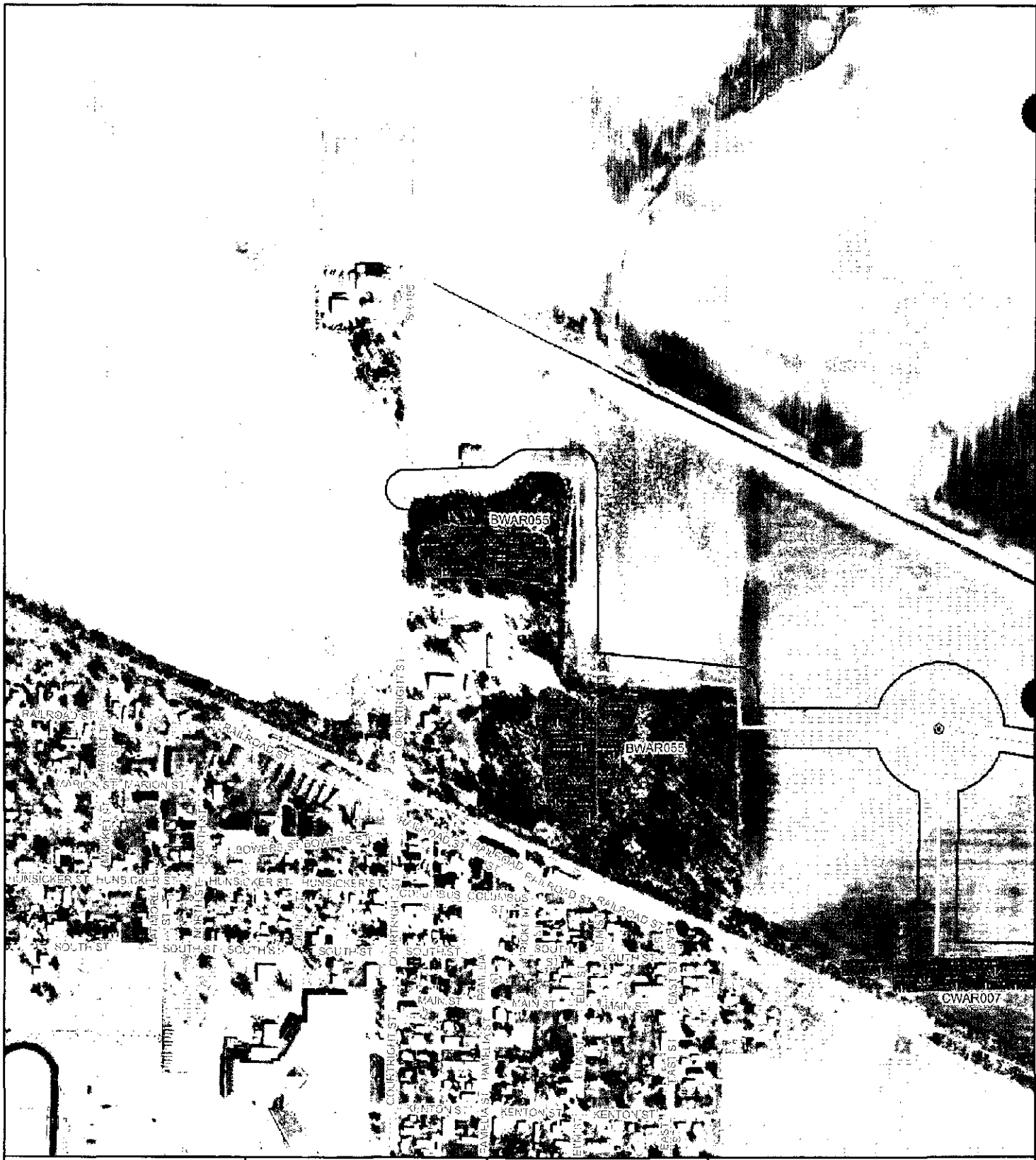
TETRA TECH

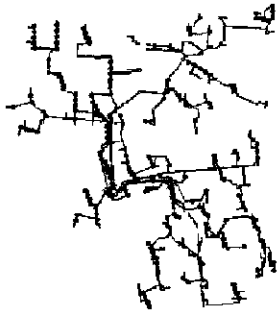
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 05 of 39

September 2009





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- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collector line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

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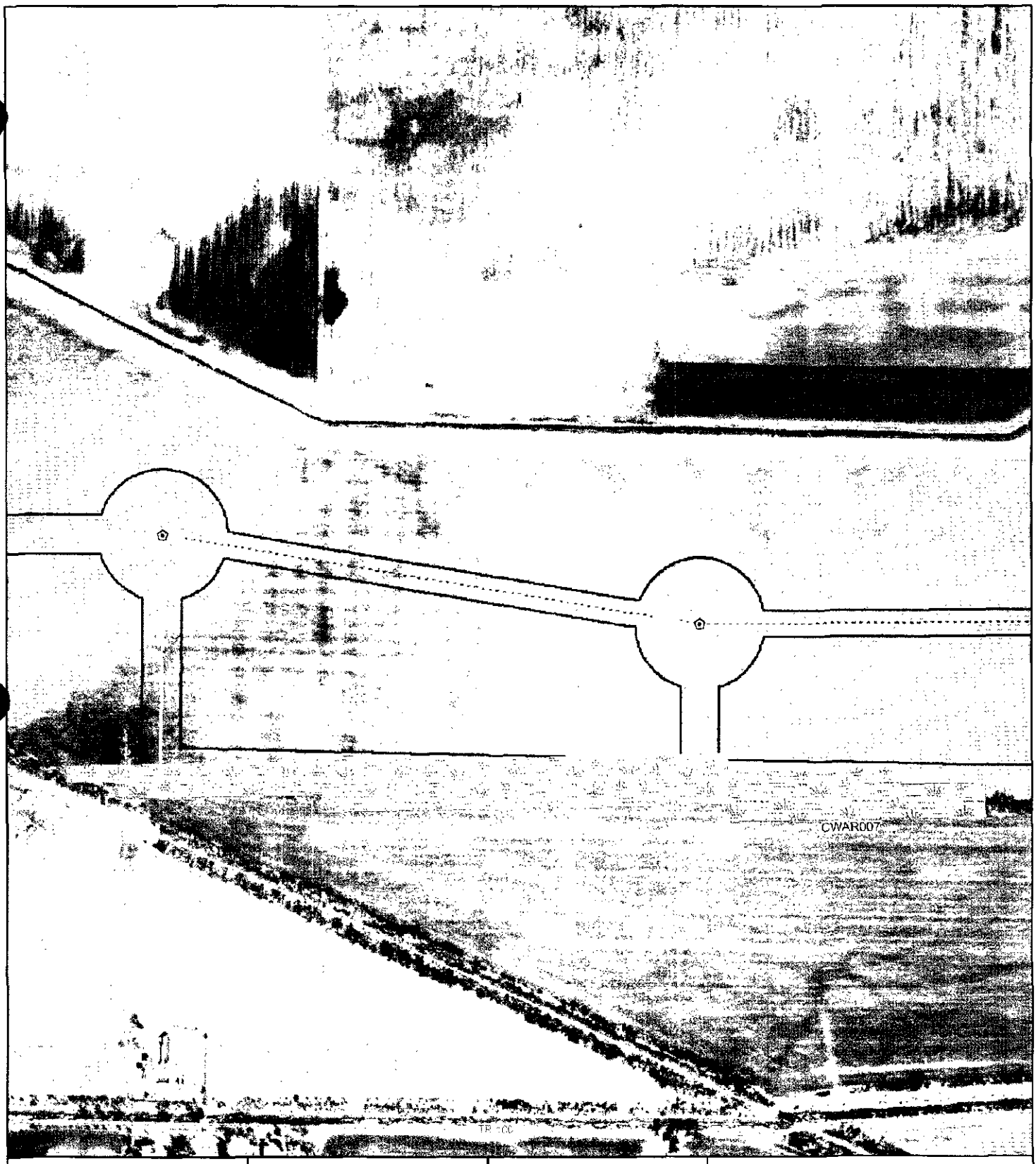
TETRA TECH

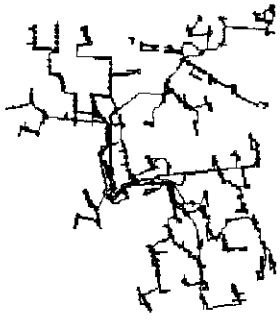
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 06 of 39

September 2009





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- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

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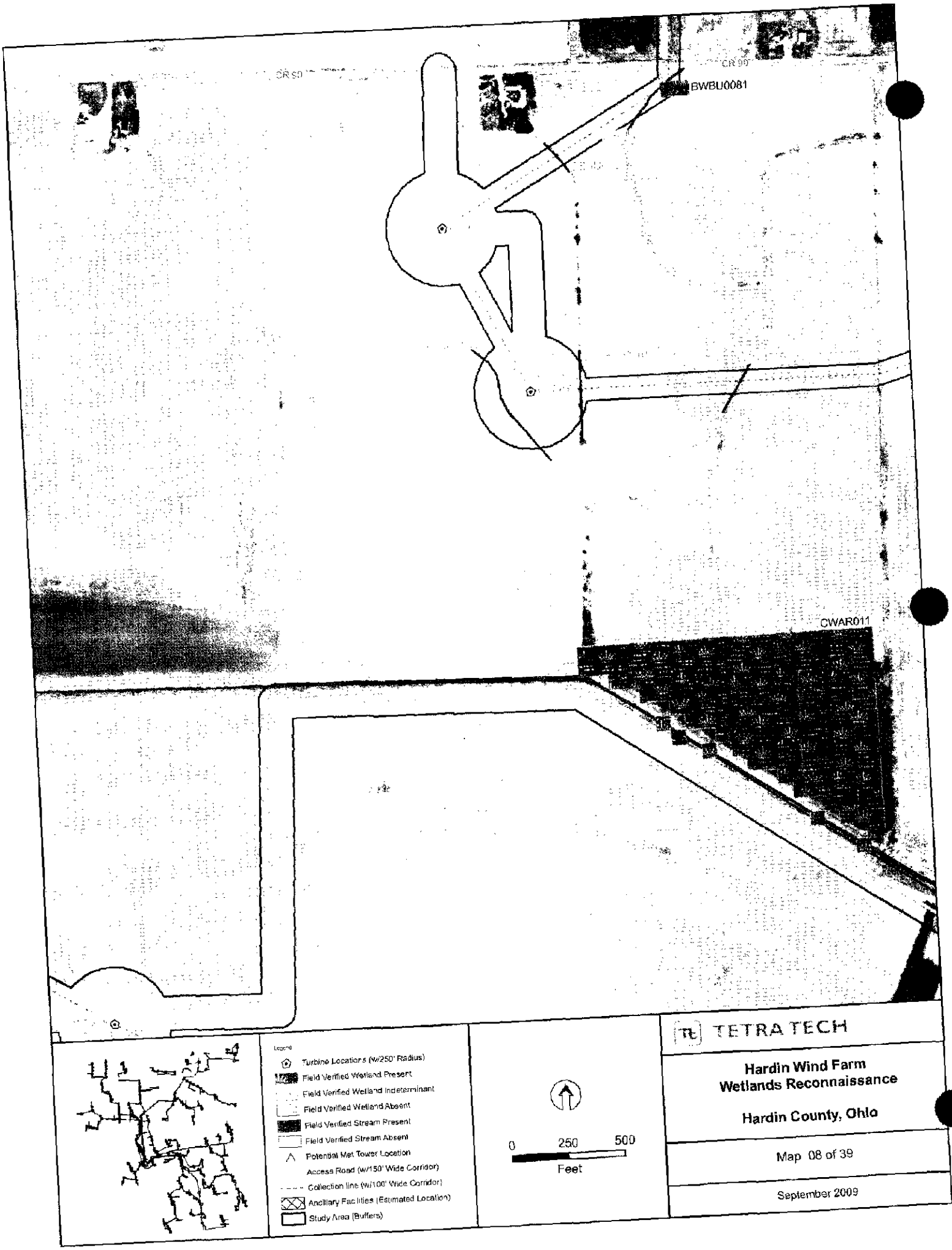
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 07 of 39

September 2009



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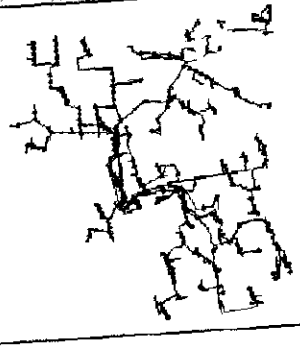
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 08 of 39

September 2009



Legend
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- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (W/150' Wide Corridor)
- Collection line (W/ 00' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

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Feet

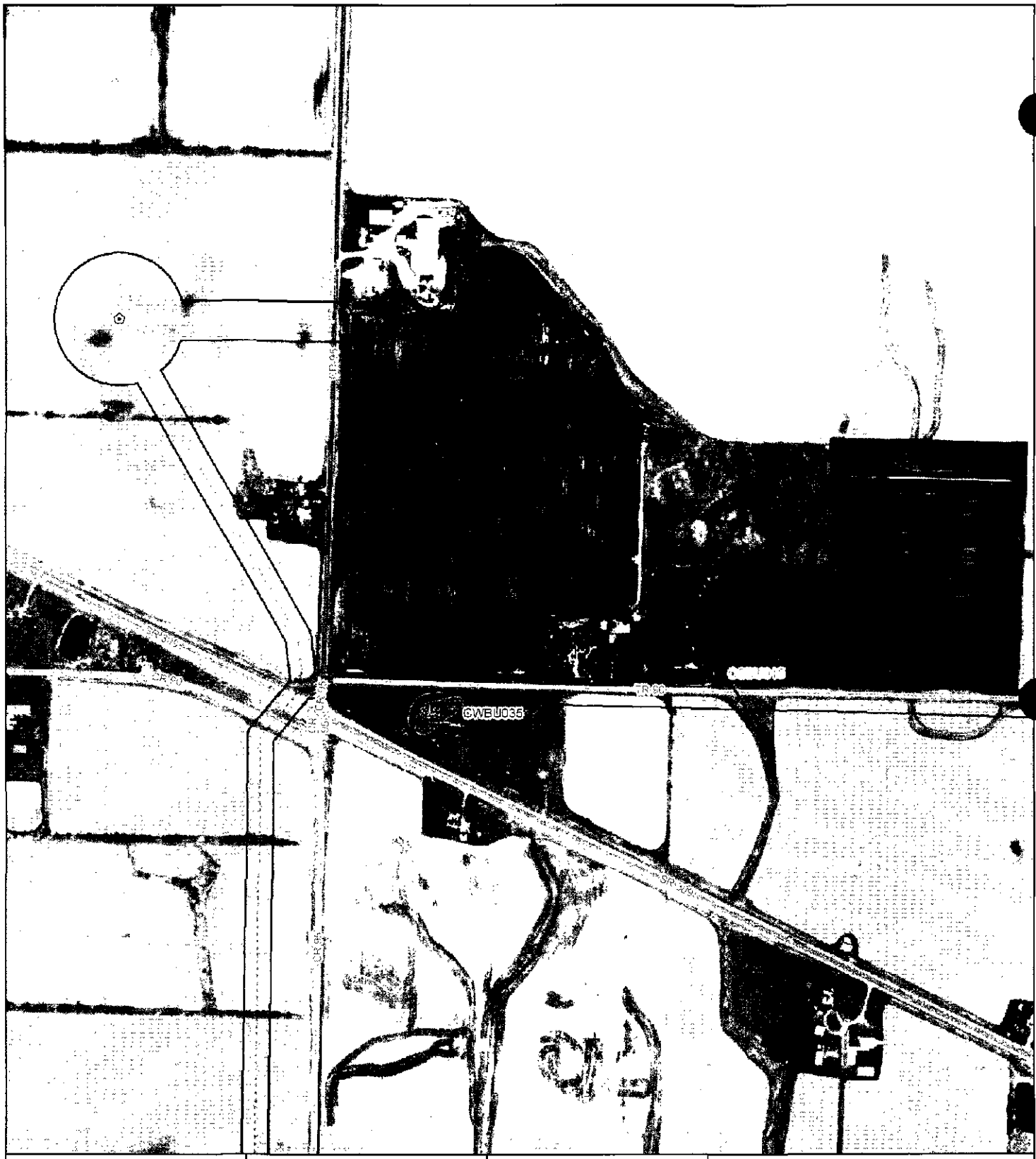
TETRA TECH

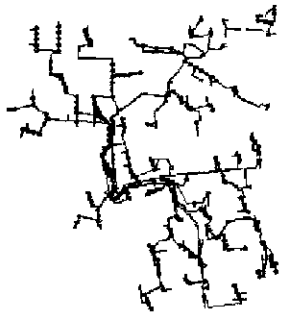
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 09 of 39

September 2009





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- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

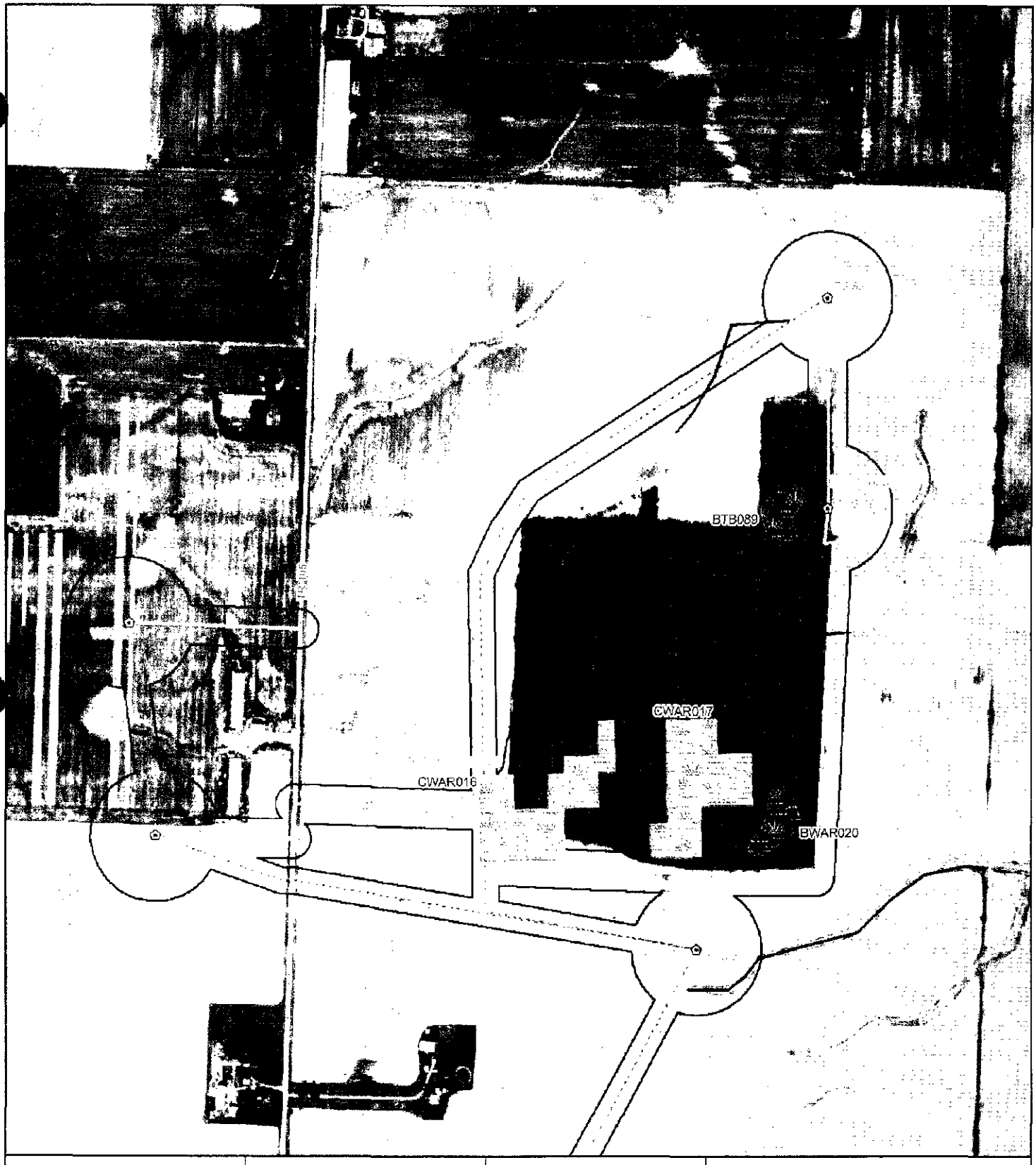
TETRA TECH

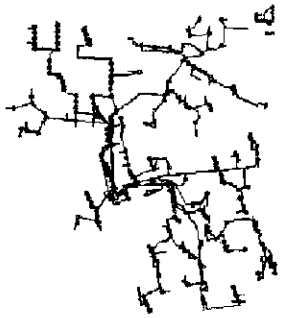
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 10 of 39

September 2009





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- Field Verified Wet and Indeterminant
- Field Verified Wet and Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

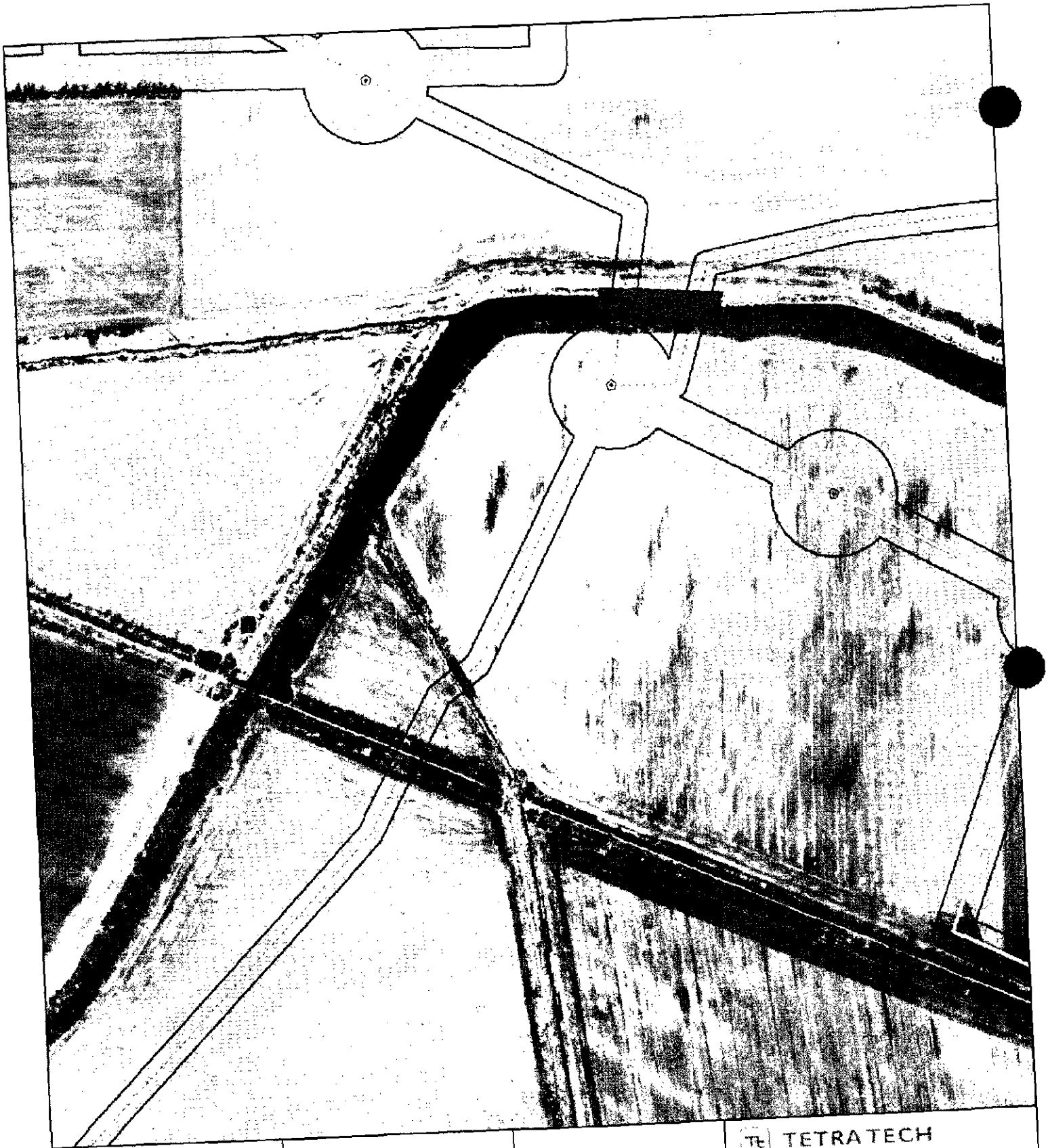
TETRA TECH

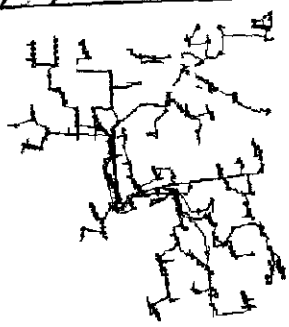
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 11 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
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- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

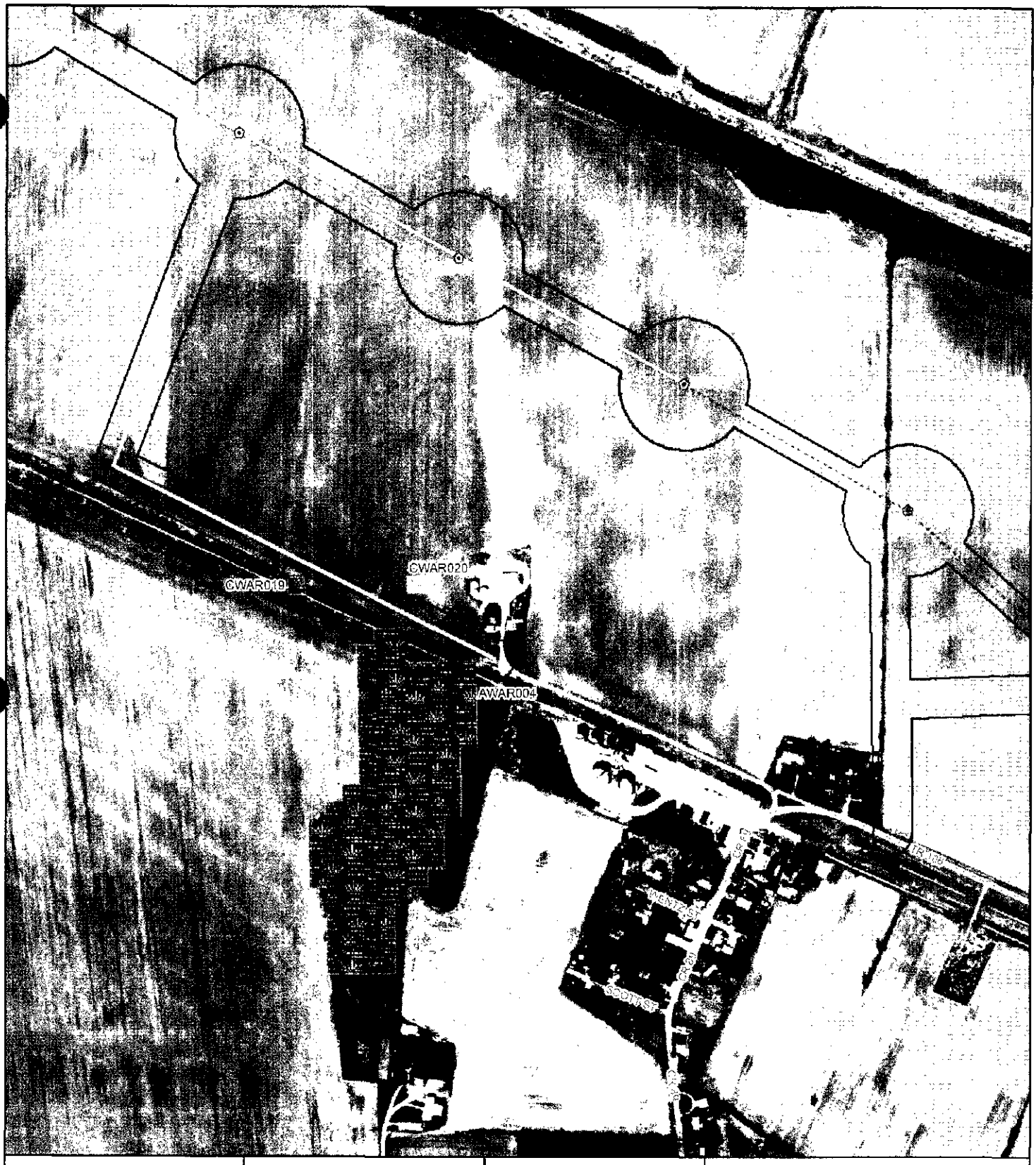
TETRATECH

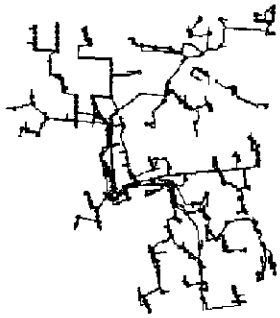
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 12 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

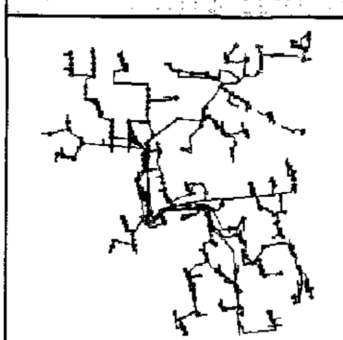
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 13 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

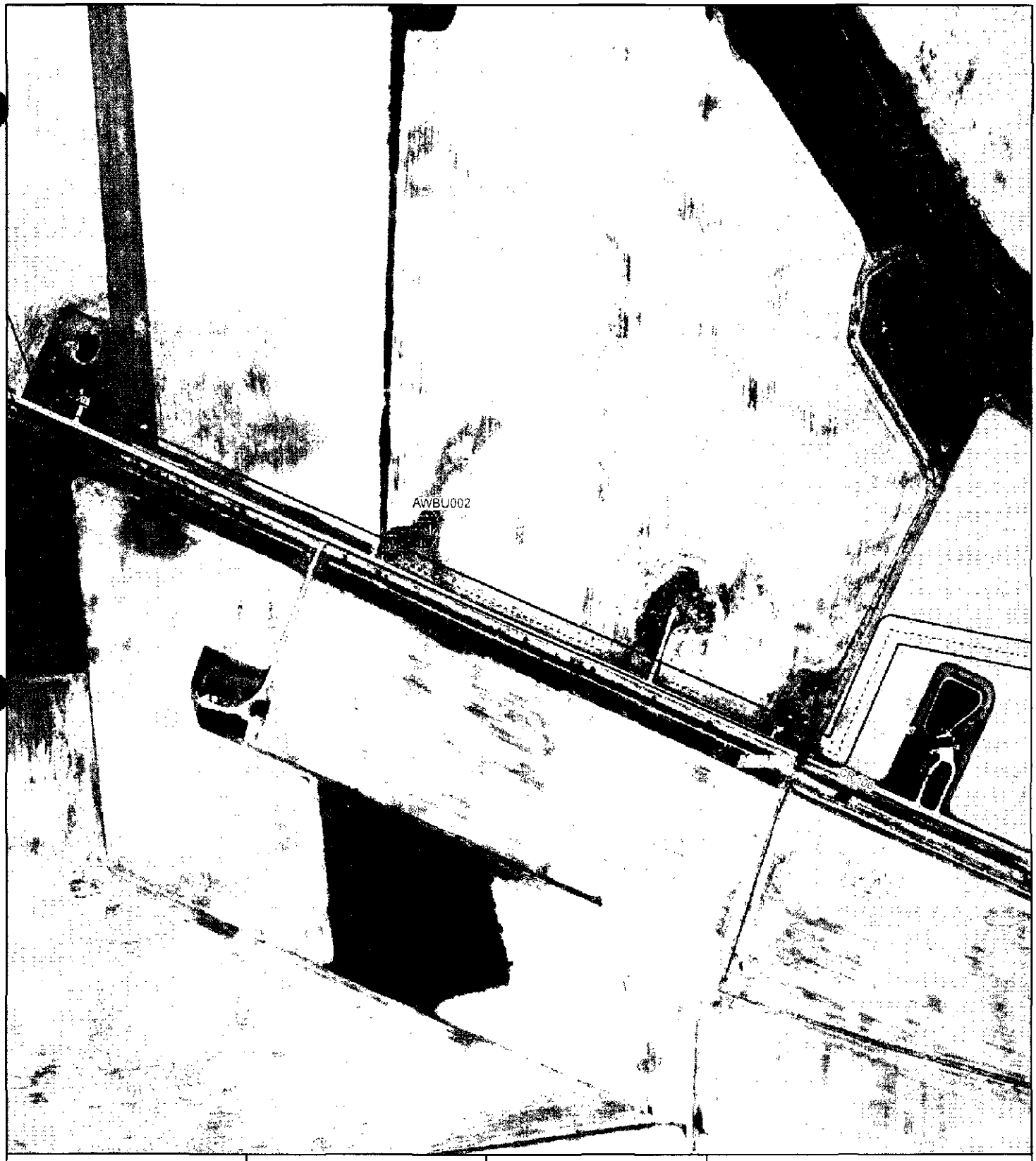
TETRA TECH

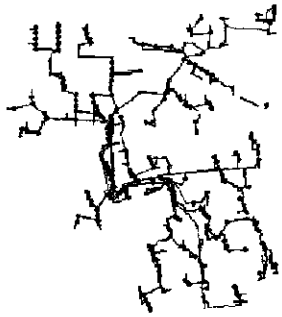
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 14 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

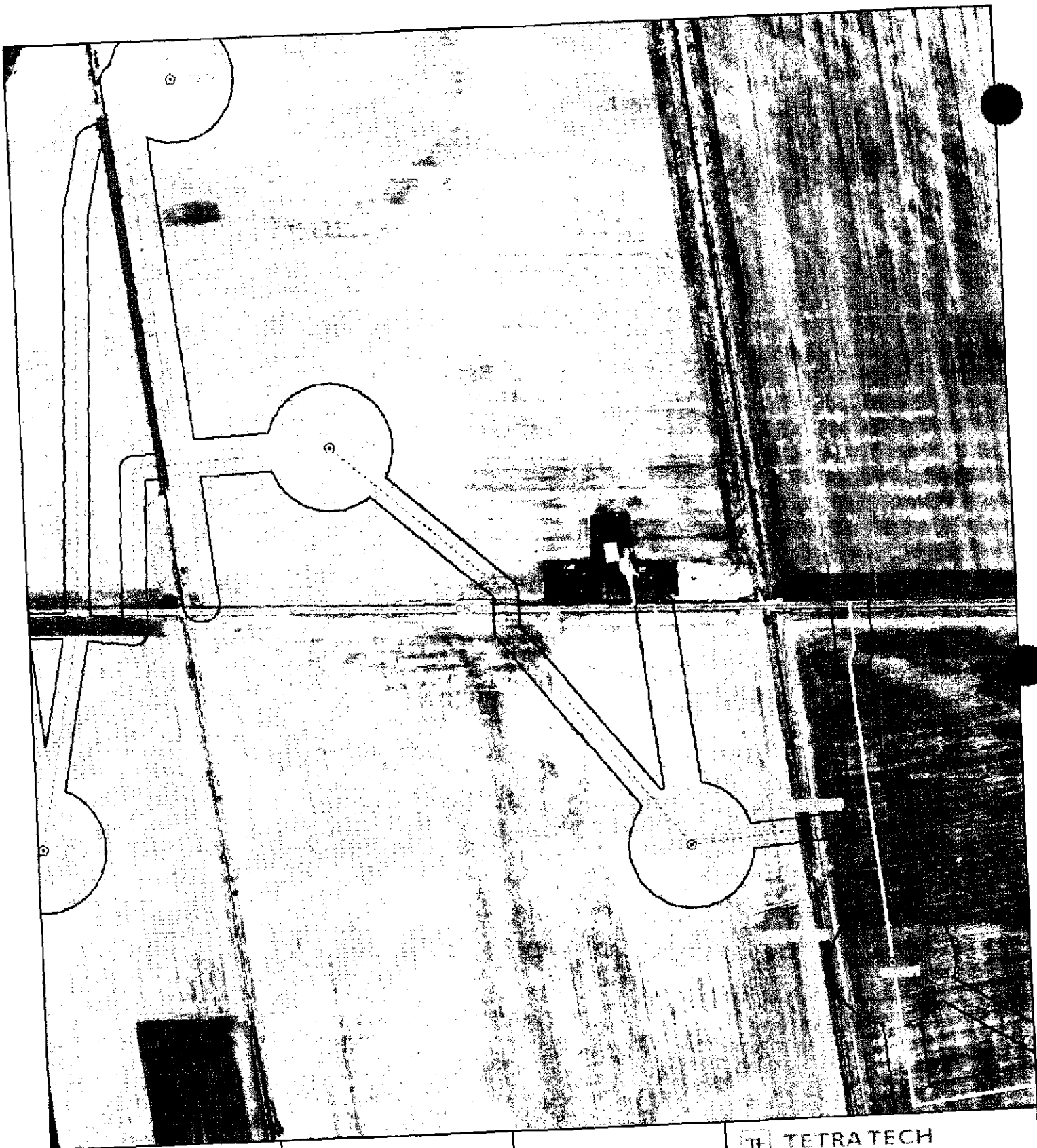
TETRATECH

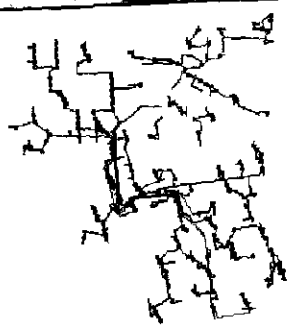
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 15 of 39

September 2009





Legend

- Turbine Location's (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

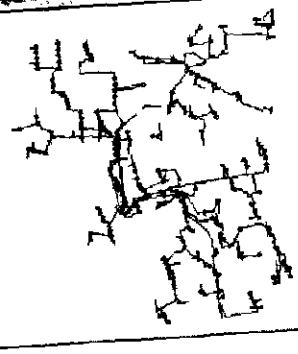
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 16 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

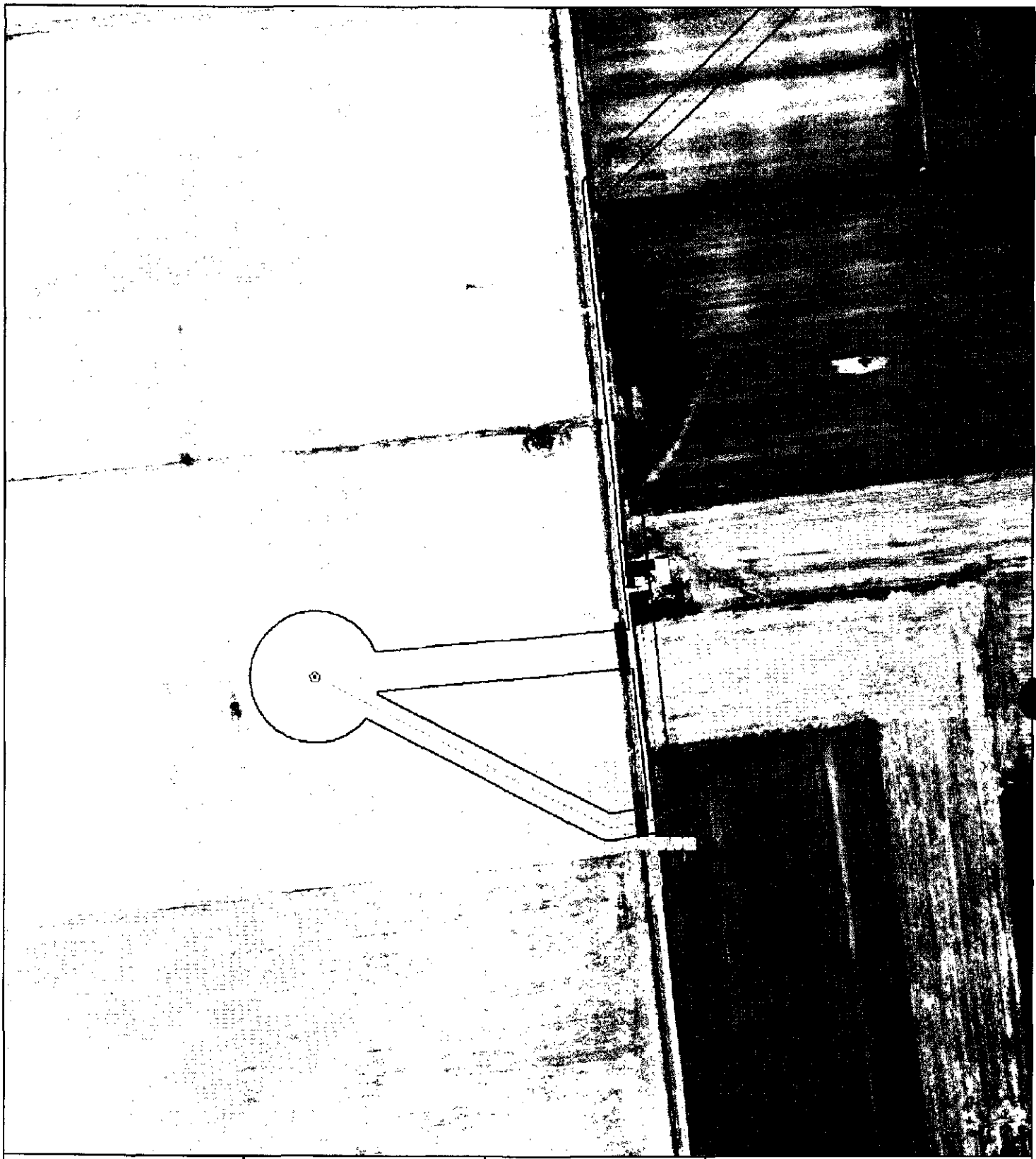
TETRATECH

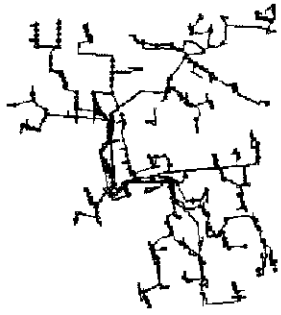
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 17 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

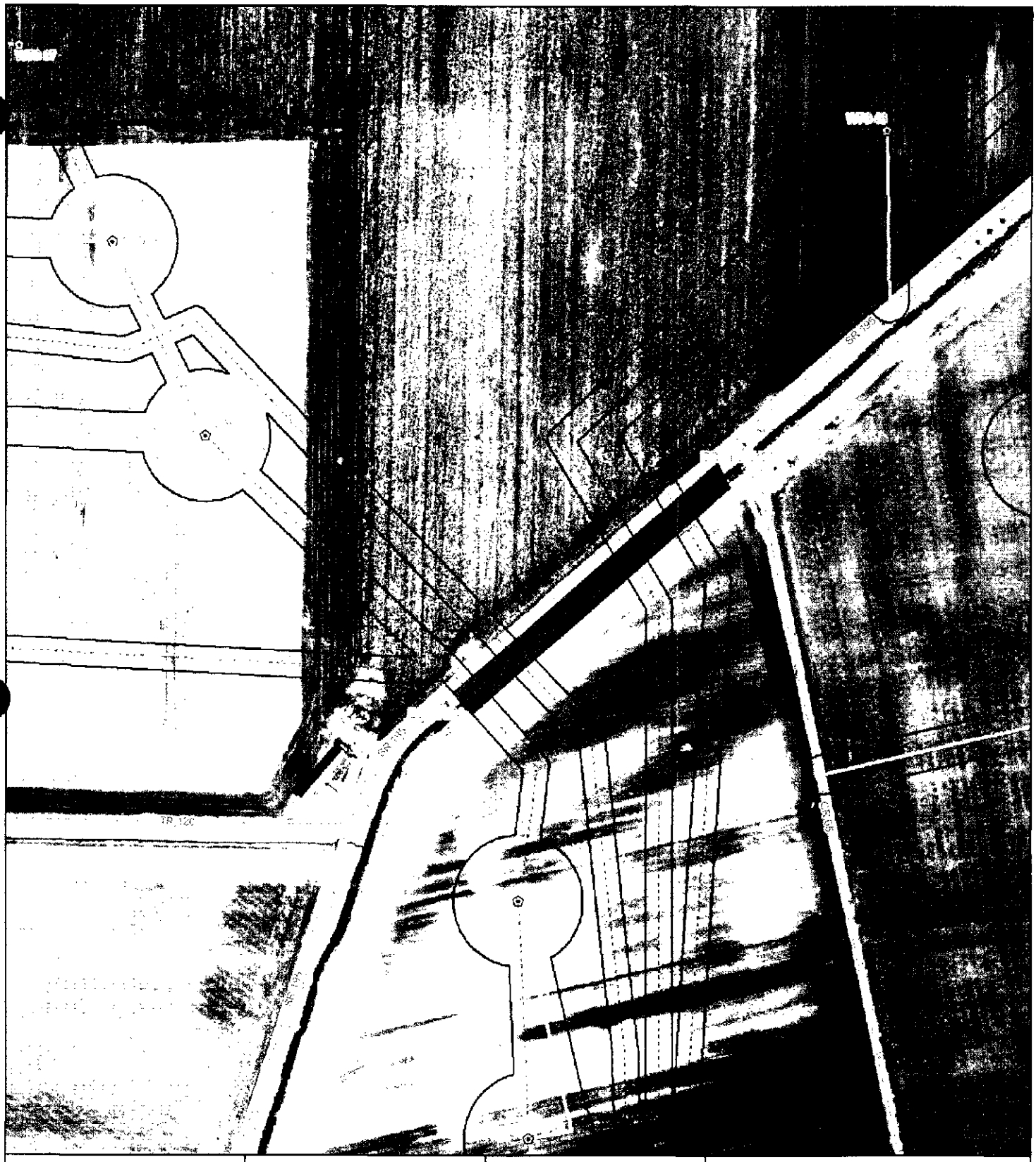
TETRA TECH

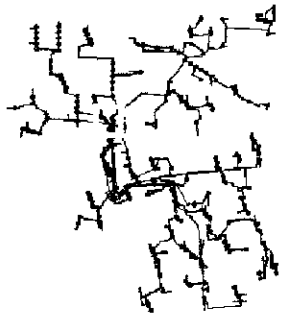
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 18 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

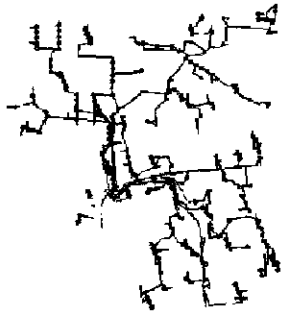
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 19 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

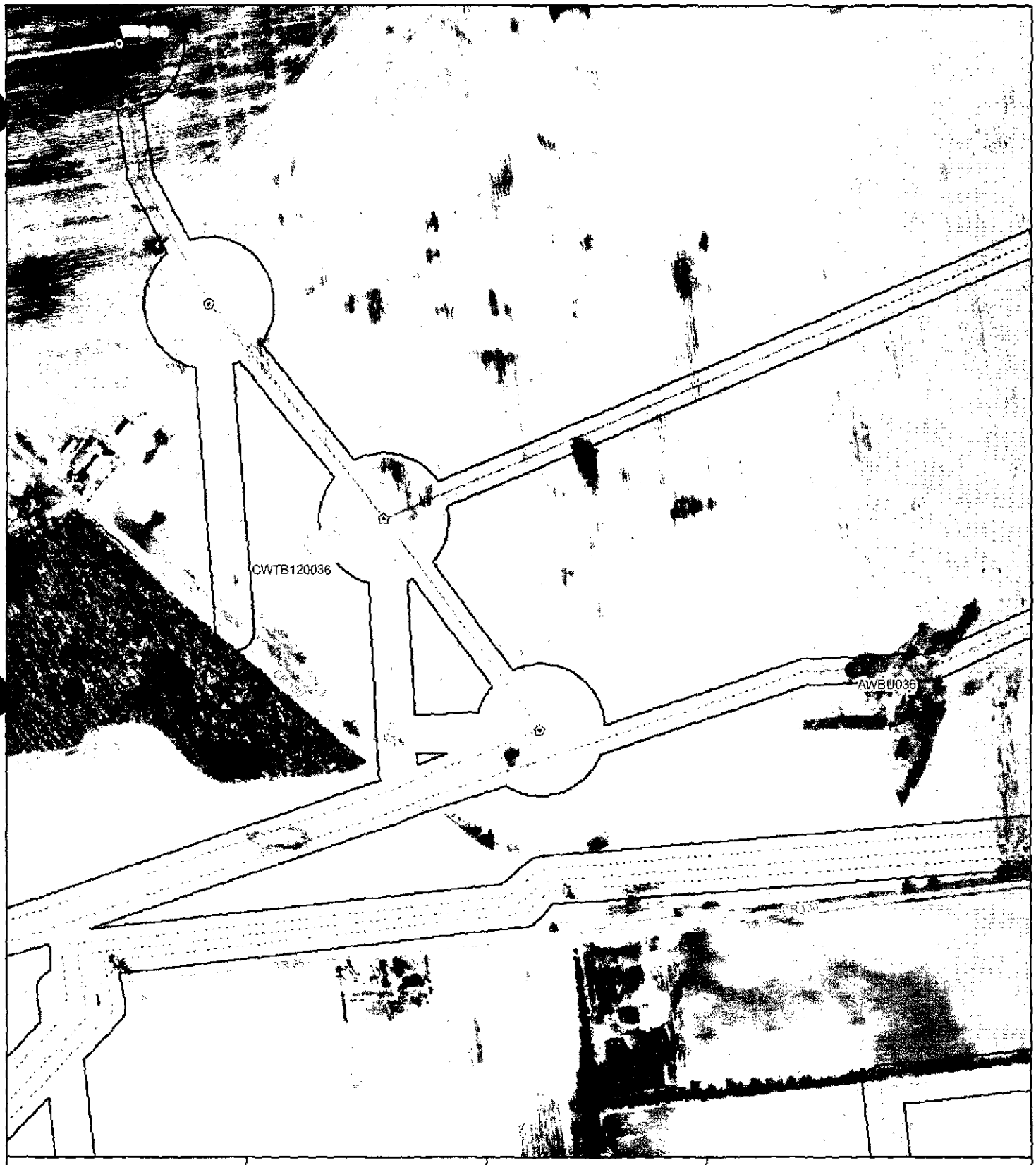
TETRATECH

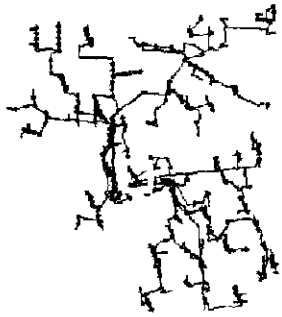
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 20 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

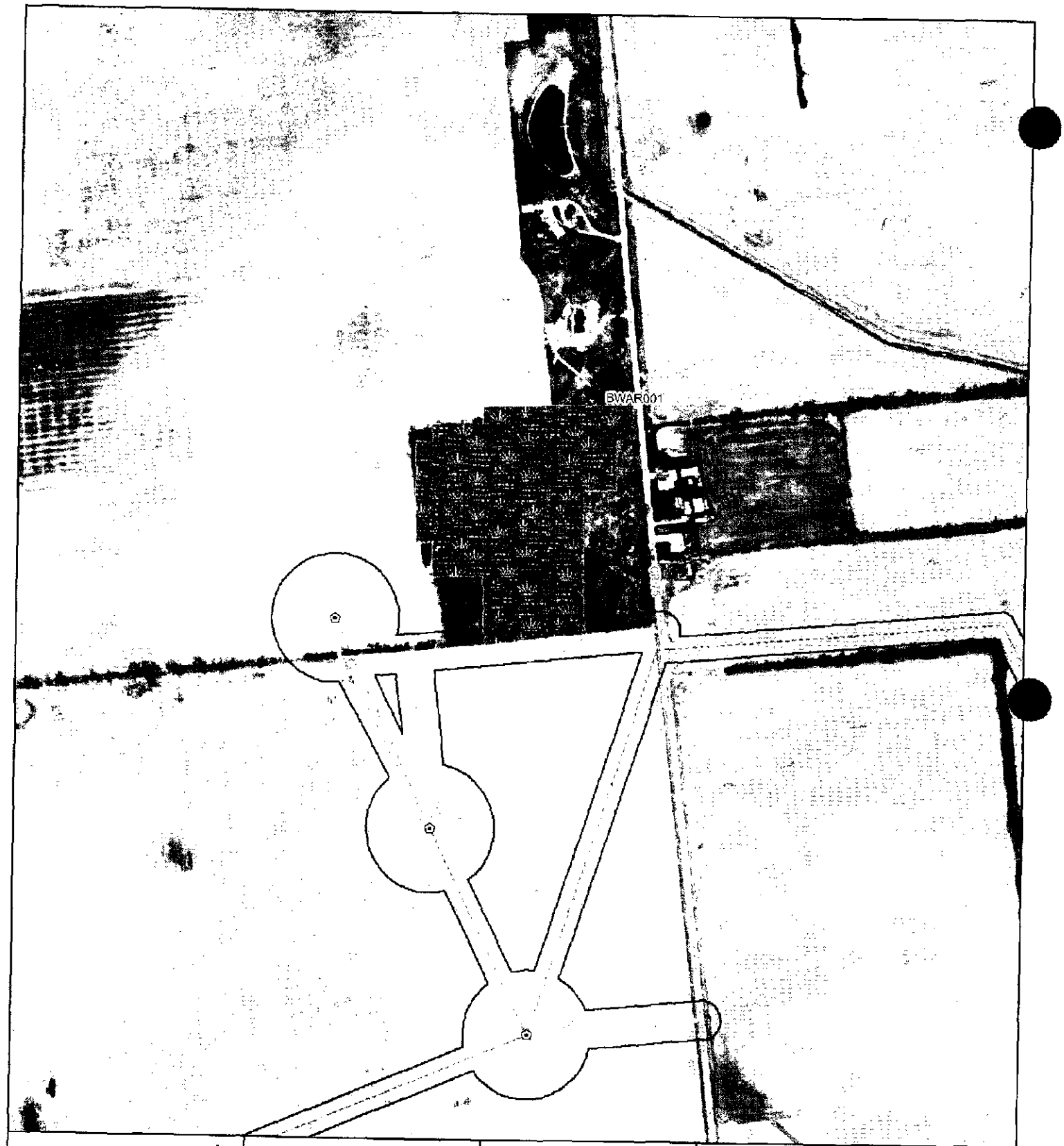
TETRATECH

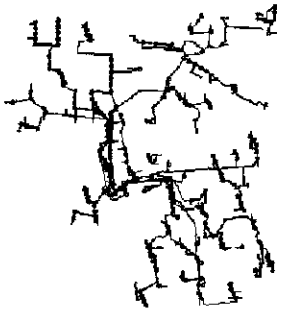
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 21 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

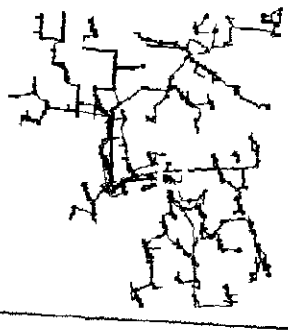
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 22 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

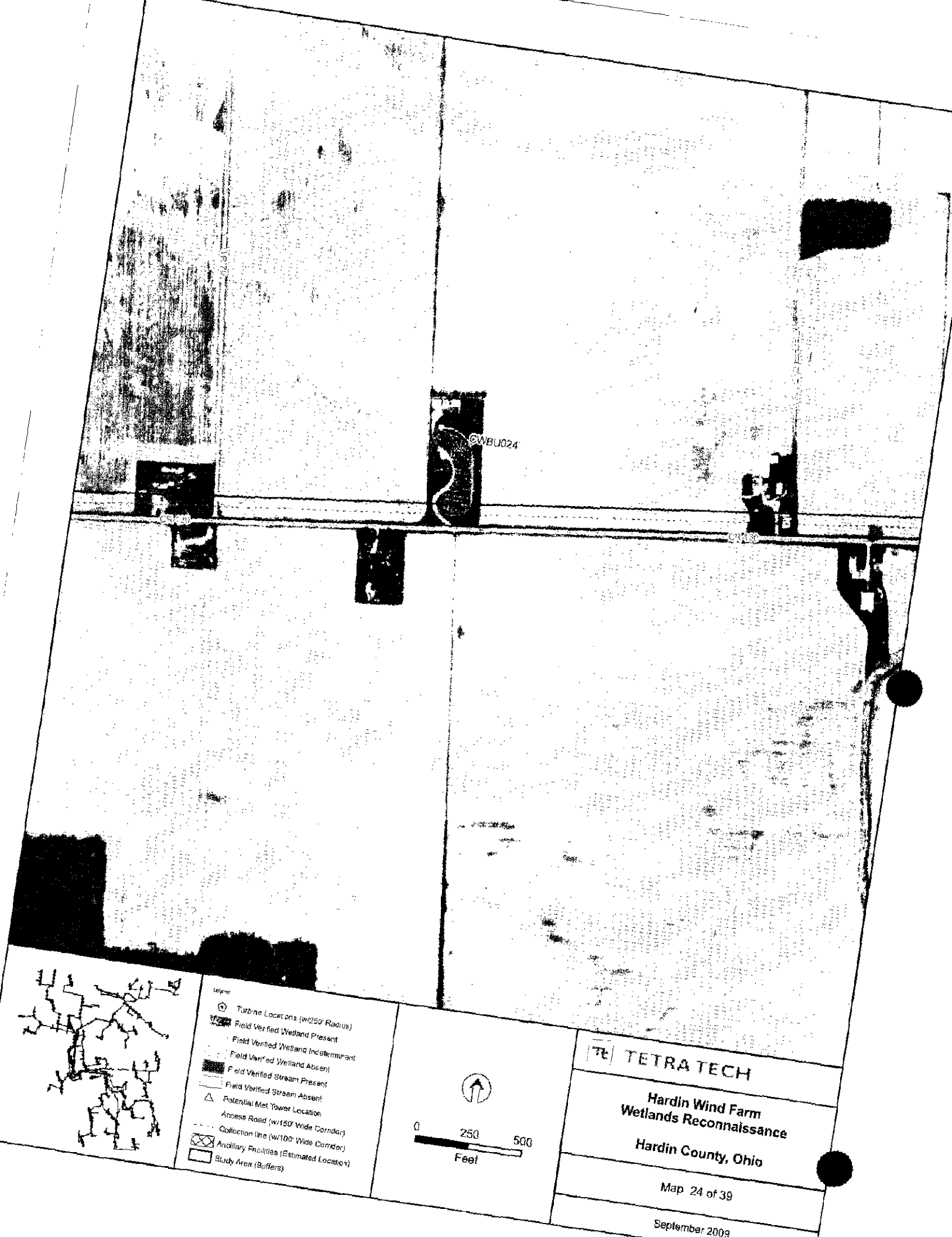
TETRA TECH

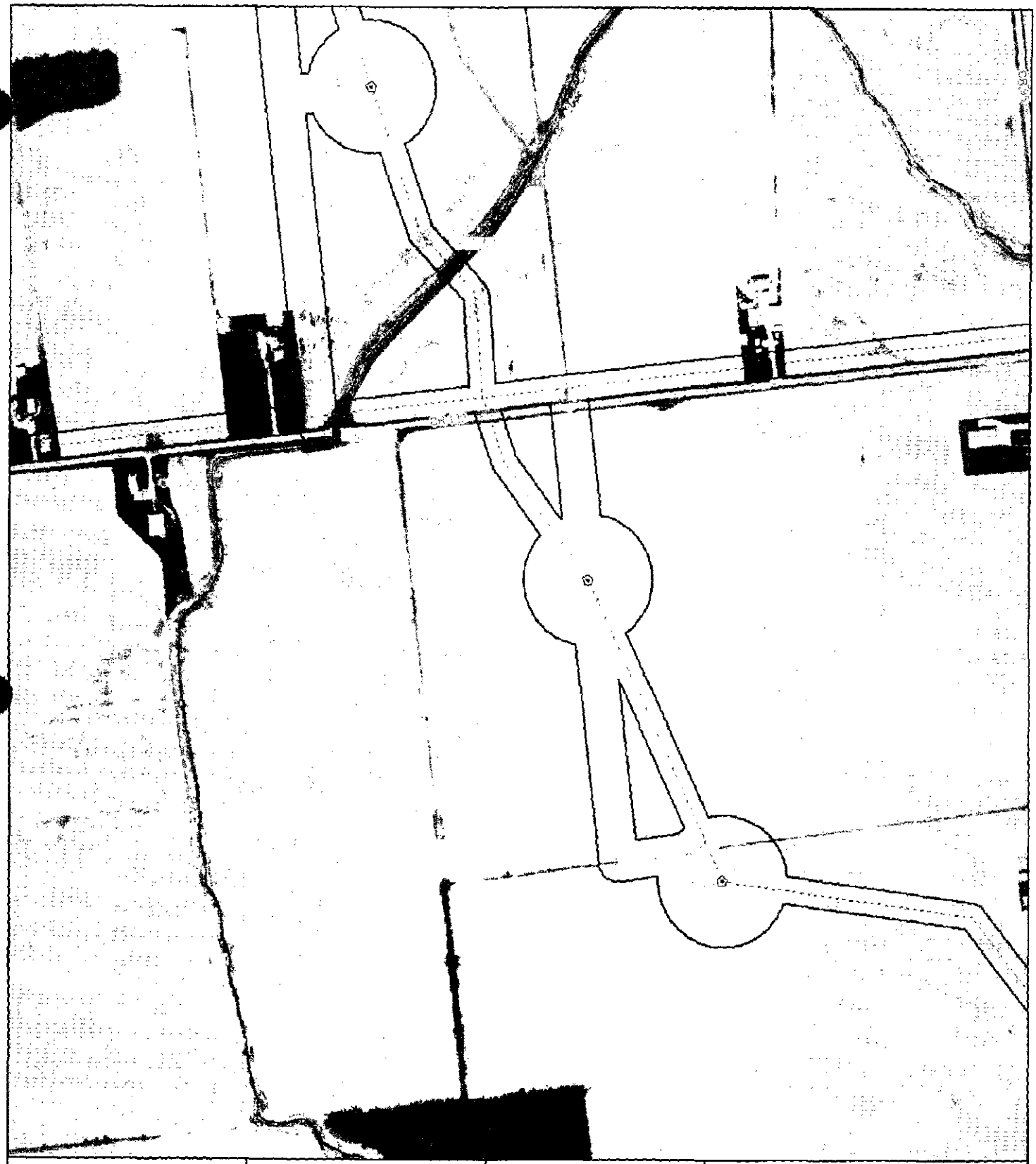
Hardin Wind Farm
Wetlands Reconnaissance

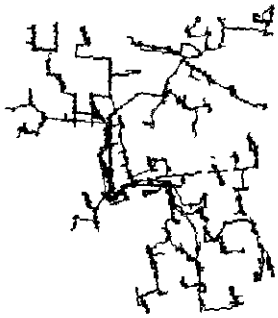
Hardin County, Ohio

Map 23 of 39

September 2009


CWBU024
CR 150
Legend
Turbine Locations (w/250' Radius)
Field Verified Wetland Present
Field Verified Wetland Indeterminant
Field Verified Wetland Absent
Field Verified Stream Present
Field Verified Stream Absent
Potential Met Tower Location
Access Road (w/150' Wide Corridor)
Collection line (w/100' Wide Corridor)
Ancillary Facilities (Estimated Location)
Study Area (Buffers)
0
250
500
Feet
TETRA TECH
Hardin Wind Farm
Wetlands Reconnaissance
Hardin County, Ohio
Map 24 of 39
September 2009





Legend

- Turbine Locations (w/260' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

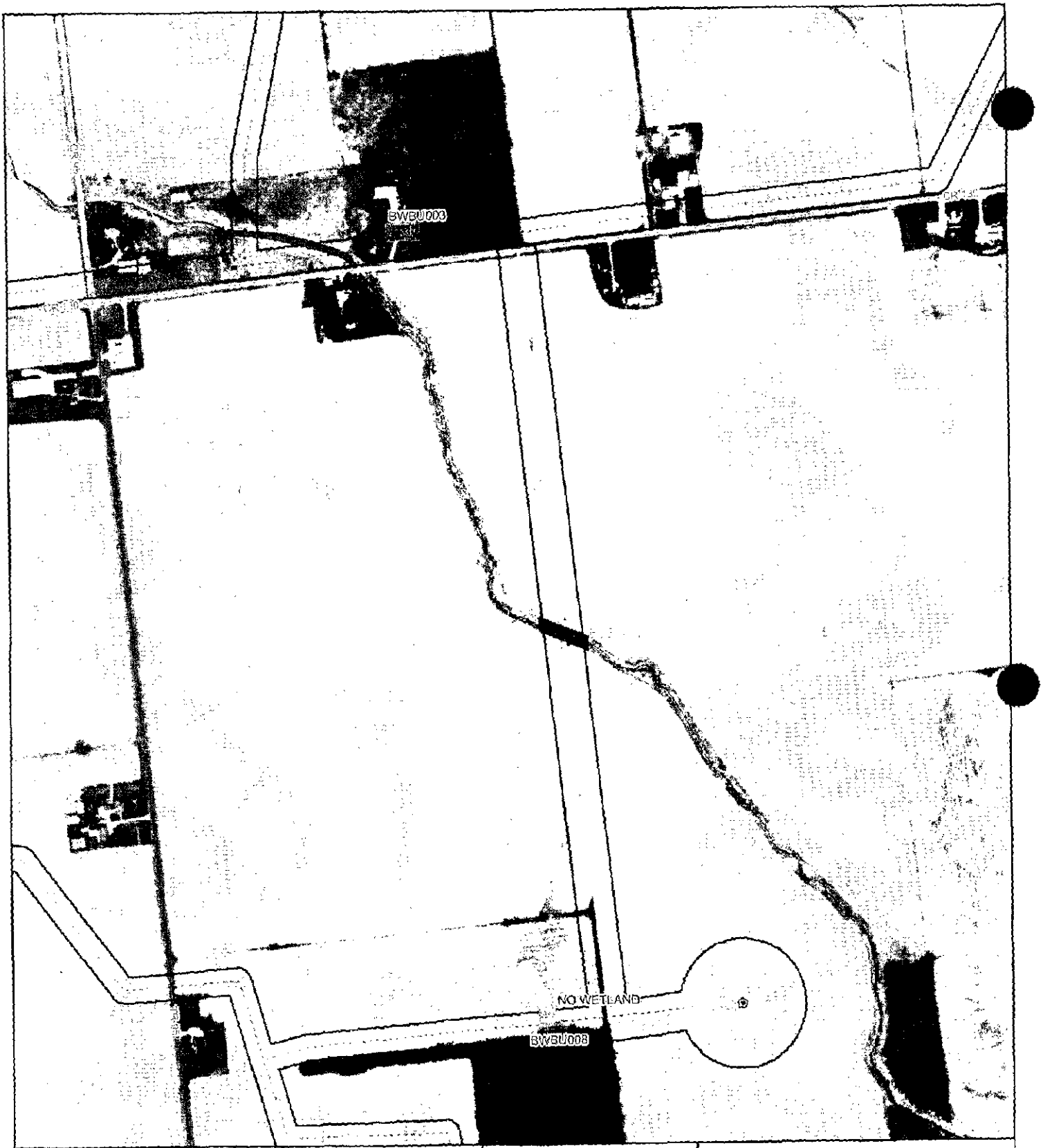
TETRA TECH

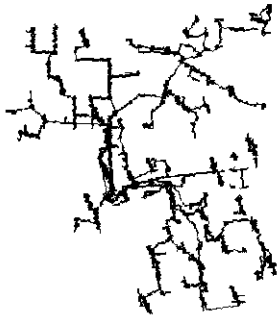
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 25 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

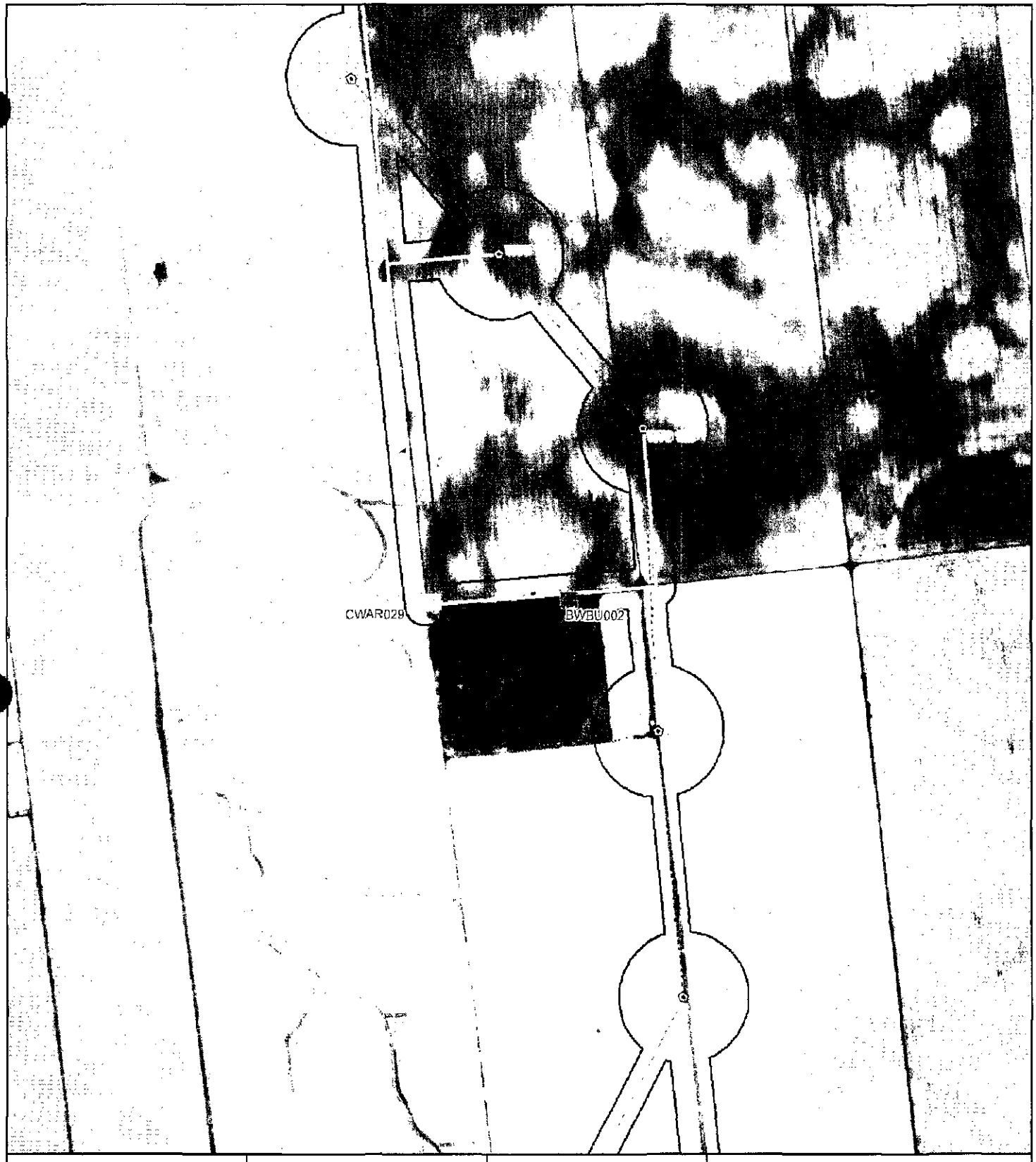
TETRA TECH

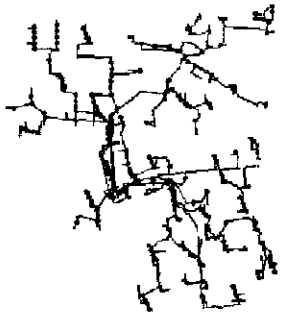
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 26 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- *Access Road (w/150' Wide Corridor)*
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

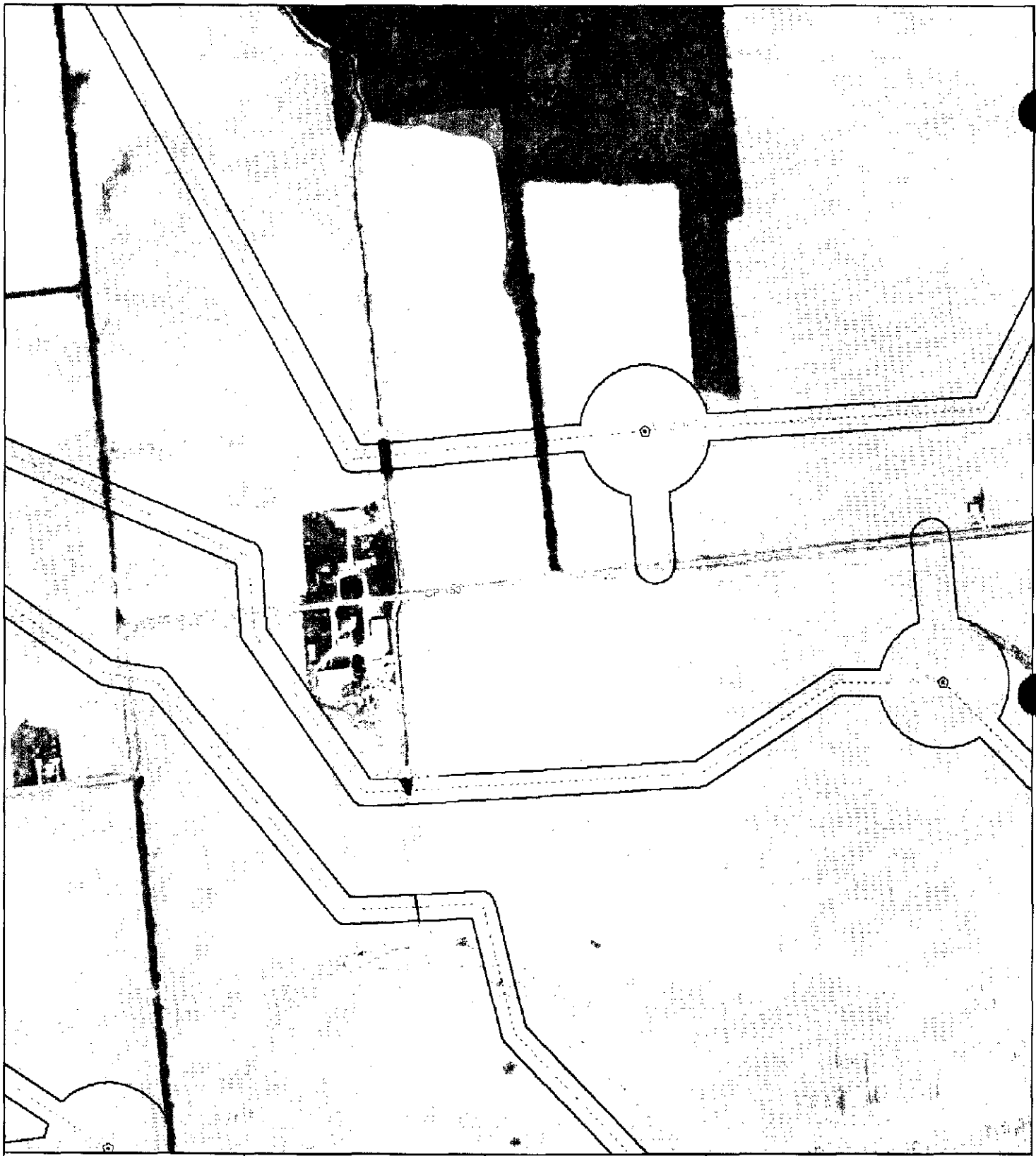
TETRA TECH

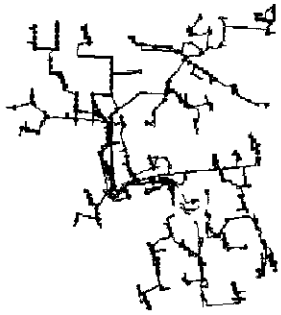
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 27 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

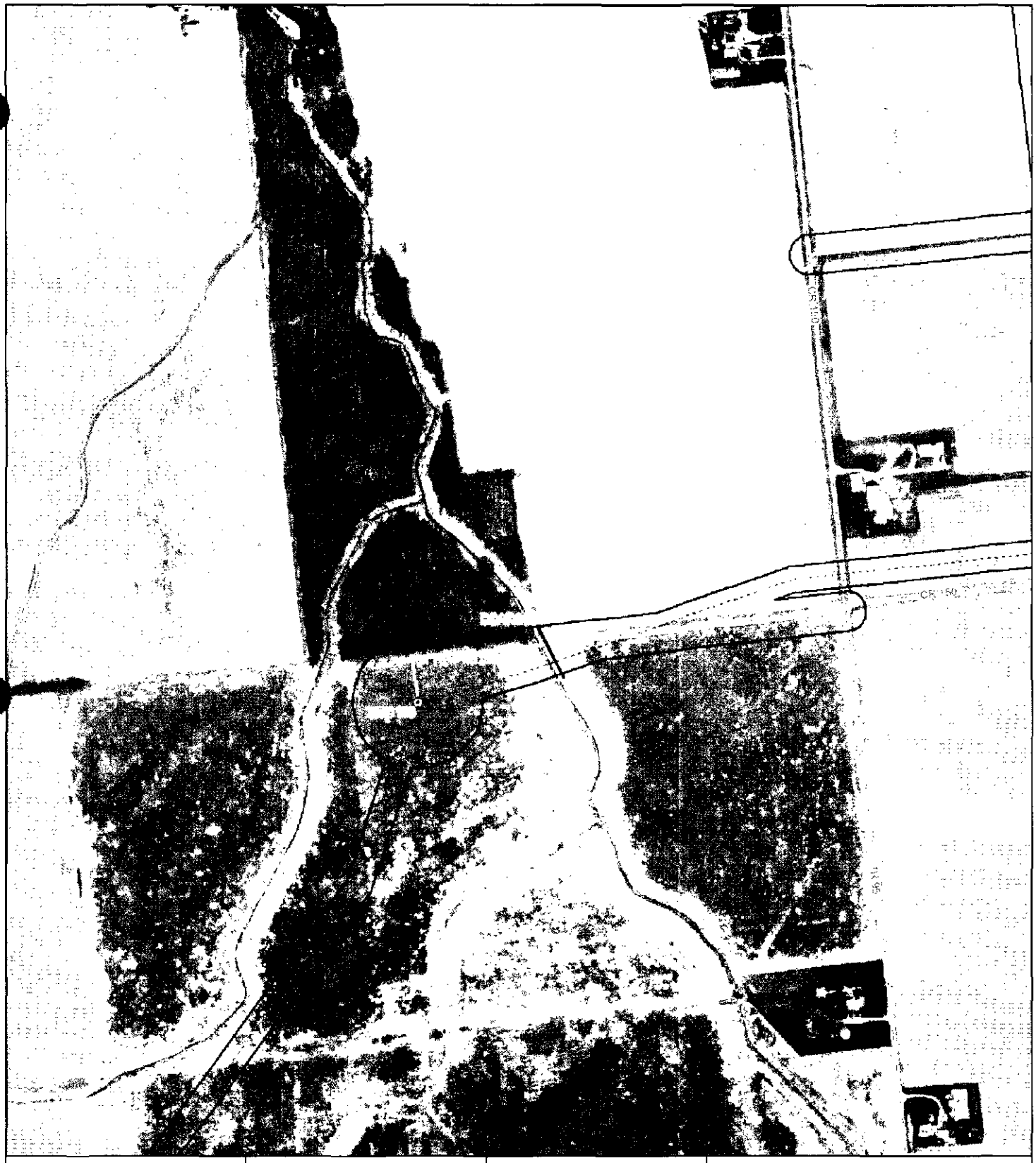
TETRA TECH

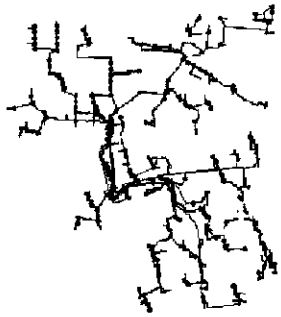
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 28 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminate
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

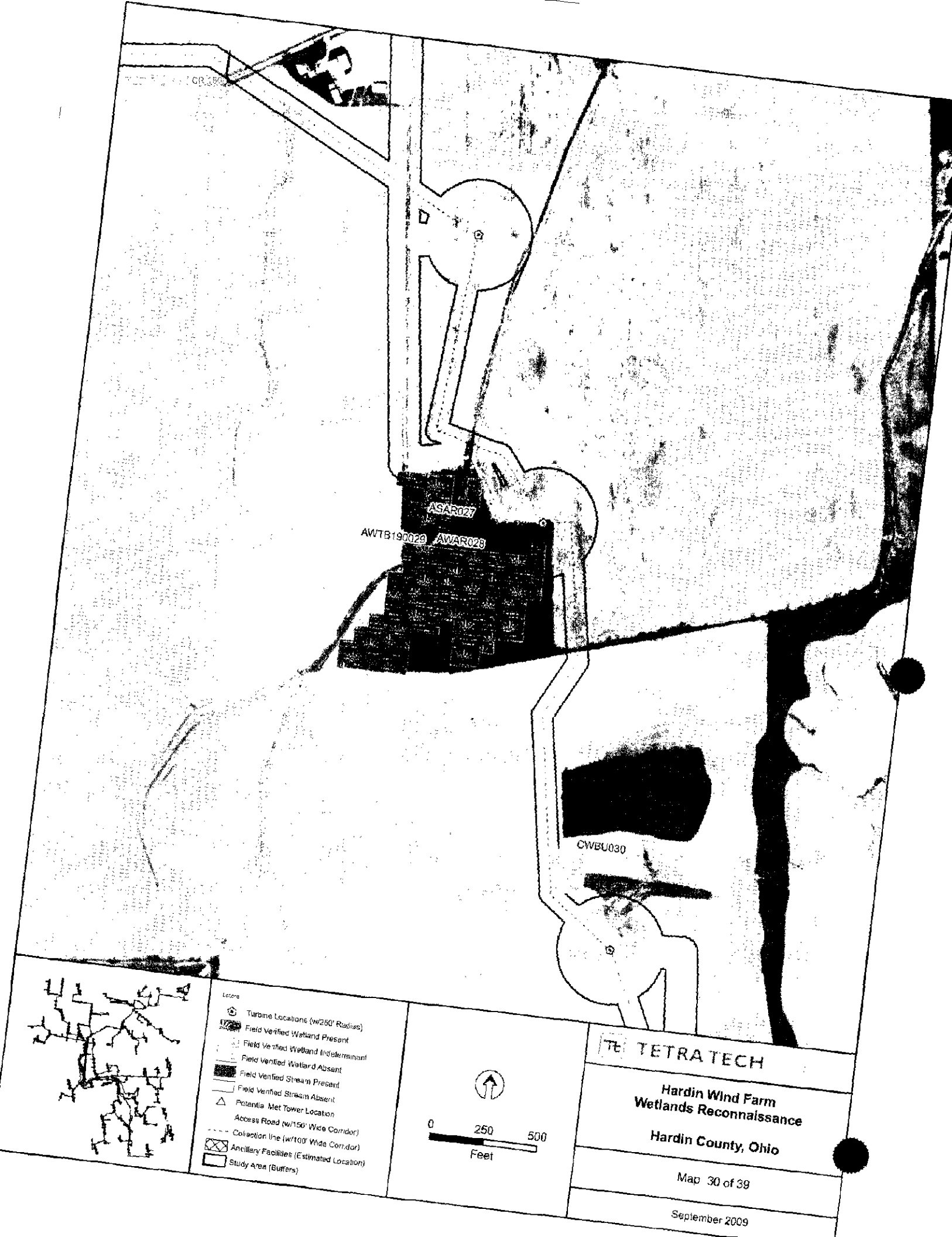
TETRA TECH

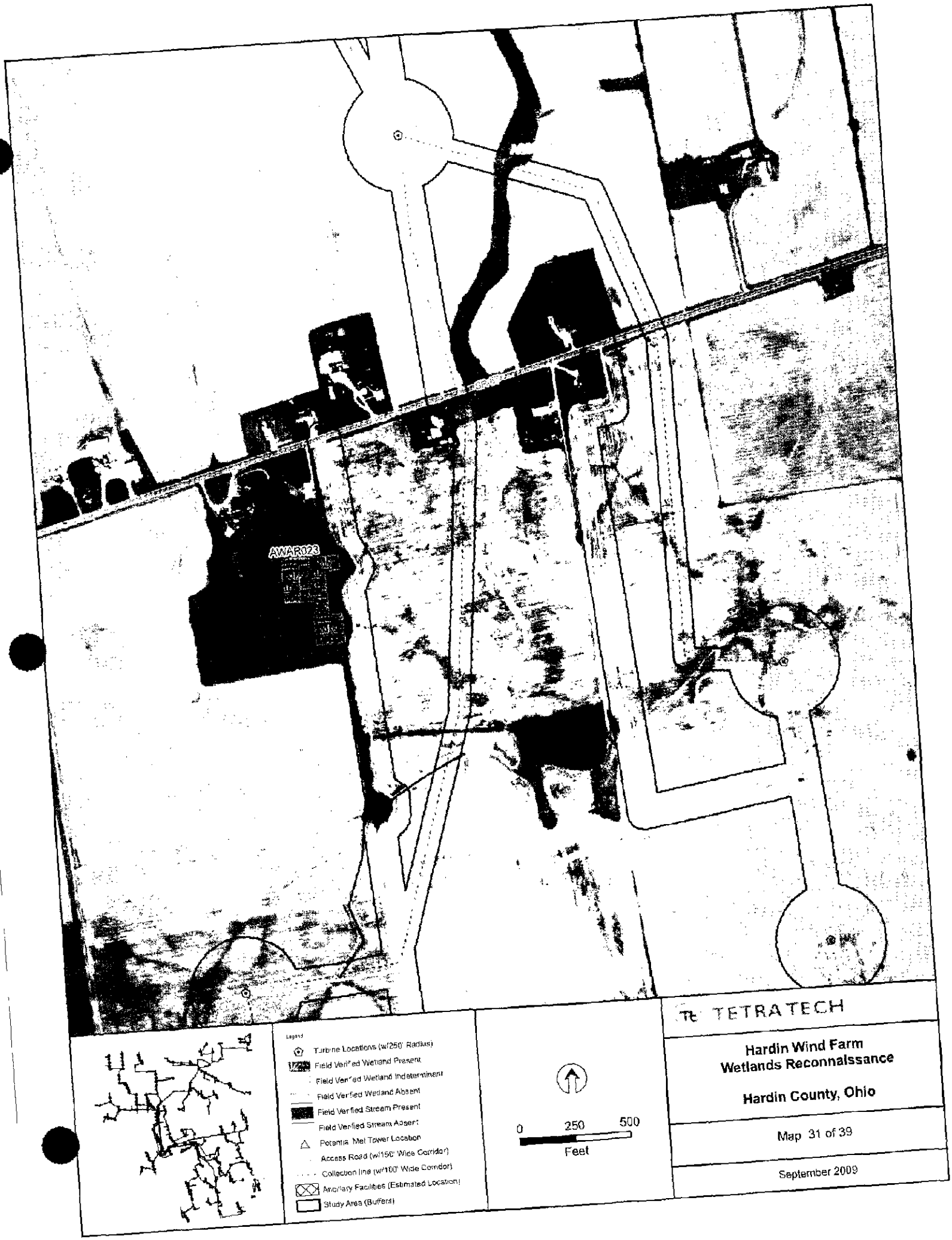
Hardin Wind Farm
Wetlands Reconnaissance

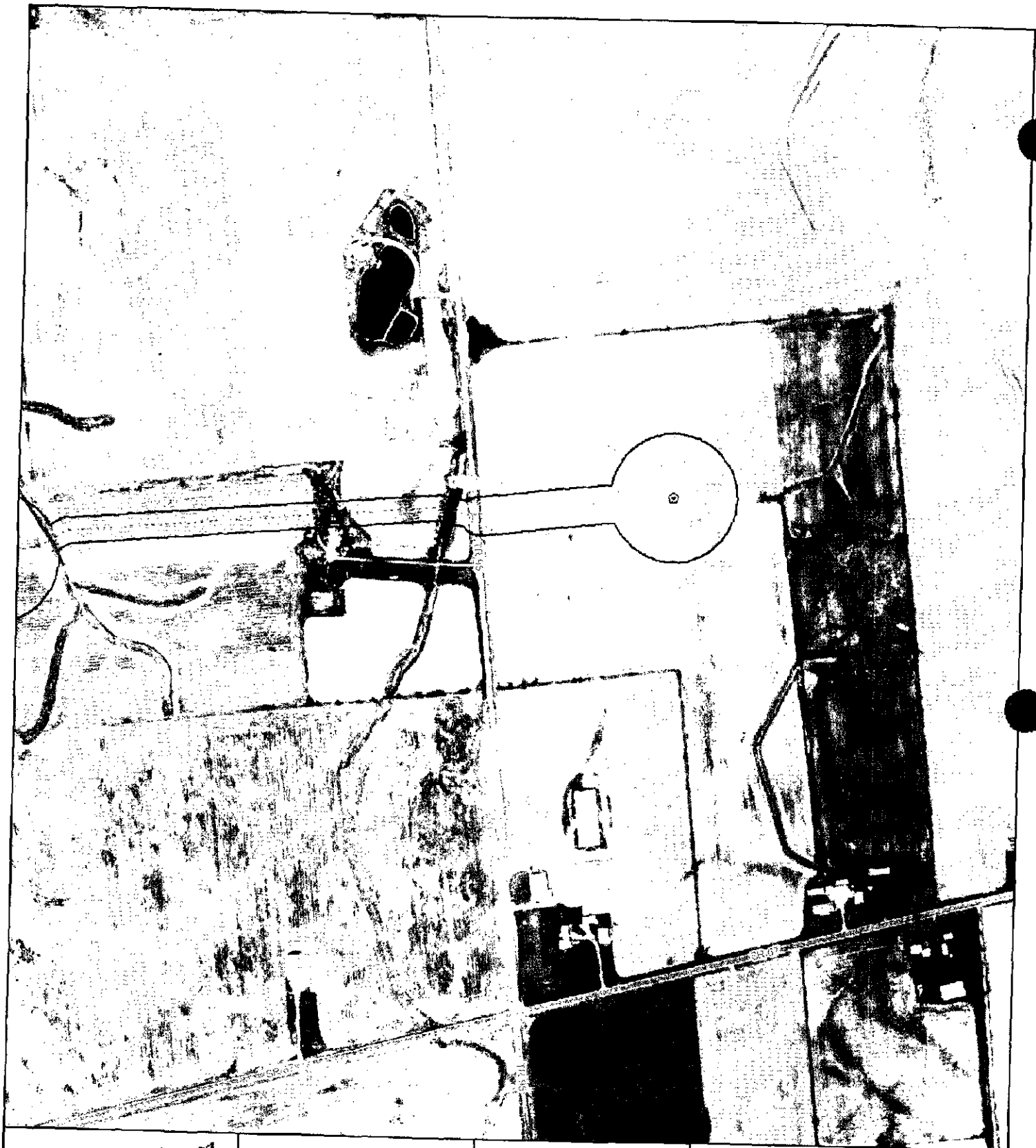
Hardin County, Ohio

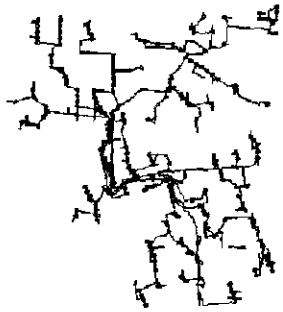
Map 29 of 39

September 2009


ASAR027
AWTB190029
AWAR028
CWBU030
Turbine Locations (w/250' Radius)
Field Verified Wetland Present
Field Verified Wetland Indeterminant
Field Verified Wetland Absent
Field Verified Stream Present
Field Verified Stream Absent
Potential Met Tower Location
Access Road (w/150' Wide Corridor)
Collection line (w/100' Wide Corridor)
Ancillary Facilities (Estimated Location)
Study Area (Buffers)
0
250
500
Feet
TETRA TECH
Hardin Wind Farm
Wetlands Reconnaissance
Hardin County, Ohio
Map 30 of 39
September 2009


AWAR023
Legend
Turbine Locations (w/250' Radius)
Field Verified Wetland Present
Field Verified Wetland Indeterminent
Field Verified Wetland Absent
Field Verified Stream Present
Field Verified Stream Absent
Potential Met Tower Location
Access Road (w/150' Wide Corridor)
Collection line (w/100' Wide Corridor)
Ancillary Facilities (Estimated Location)
Study Area (Buffers)
0
250
500
Feet
TETRATECH
Hardin Wind Farm
Wetlands Reconnaissance
Hardin County, Ohio
Map 31 of 39
September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection Line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

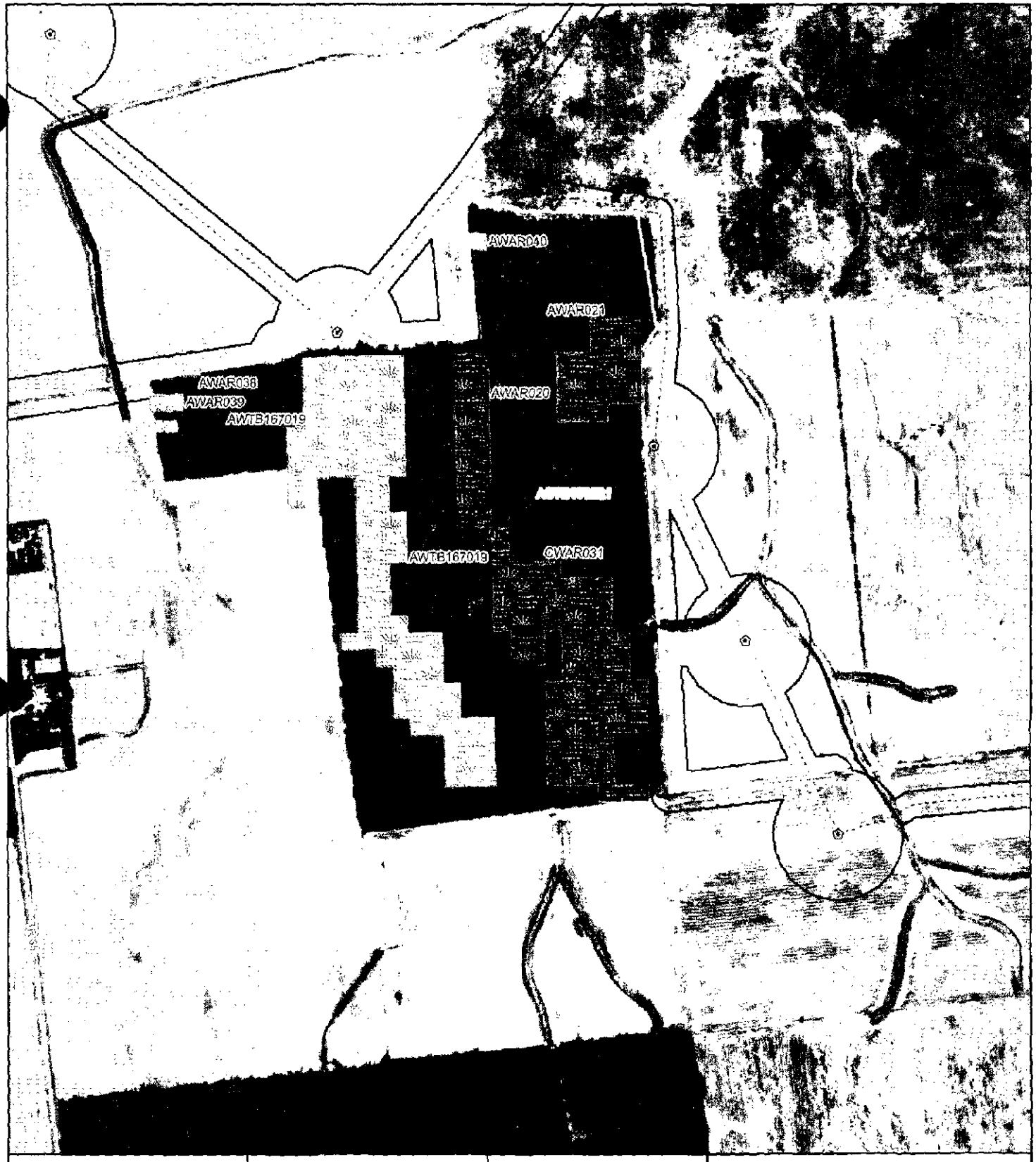
TETRA TECH

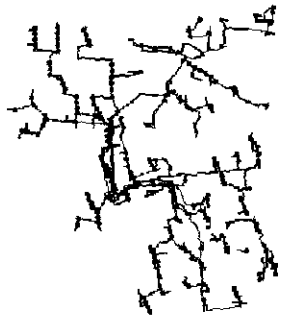
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 32 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

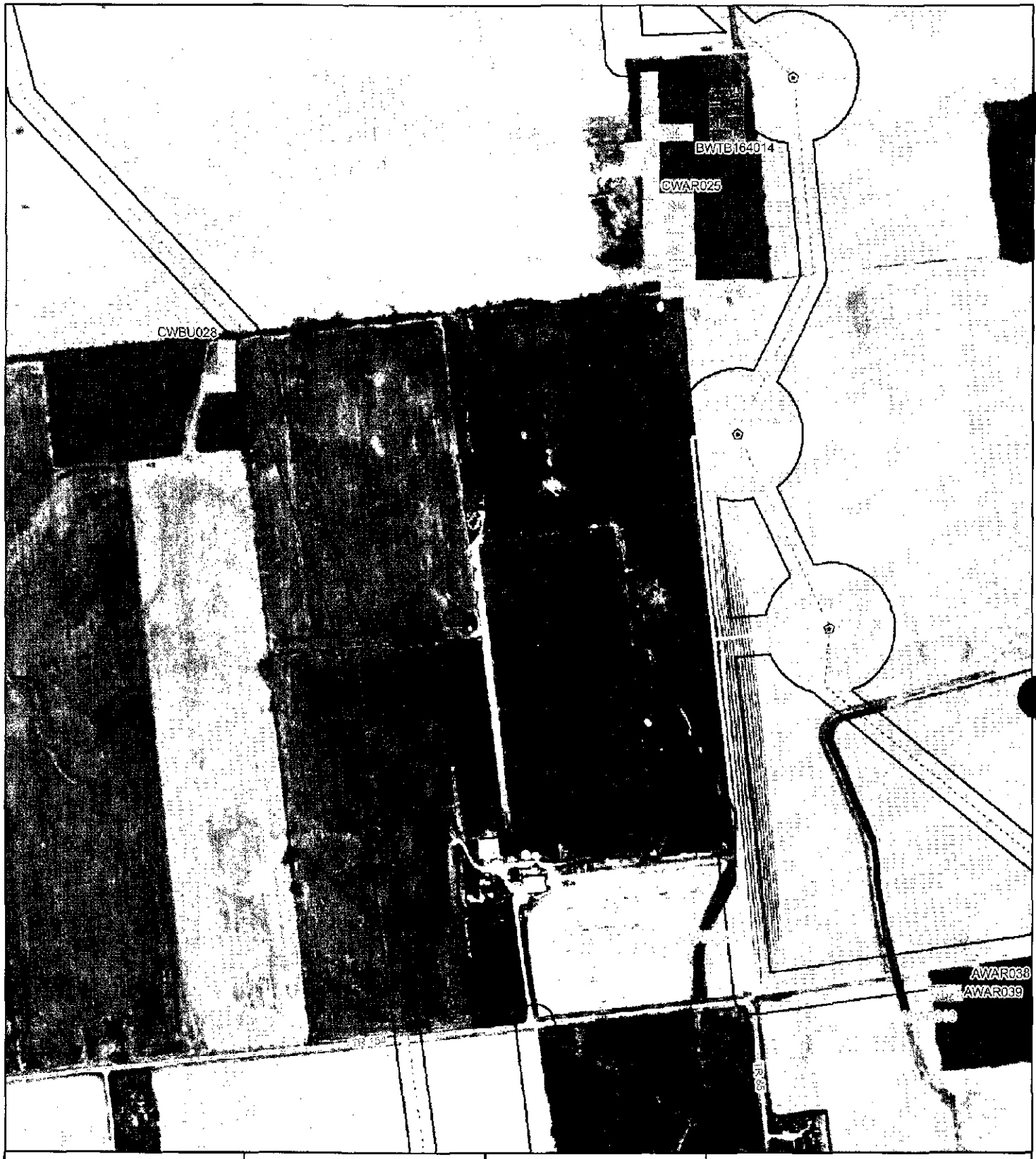
TETRA TECH

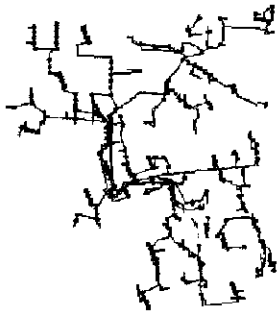
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 33 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection Line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

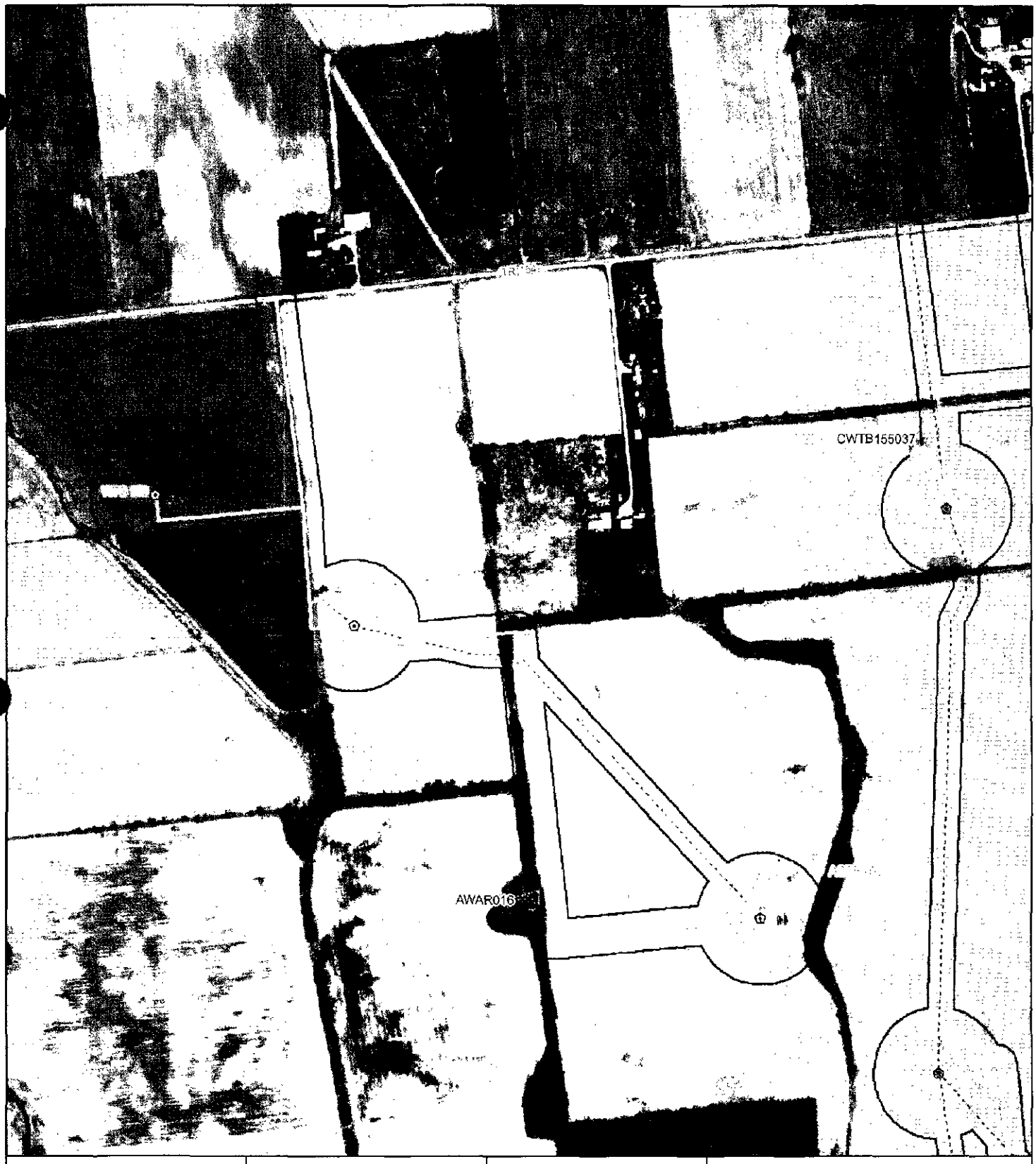
TETRA TECH

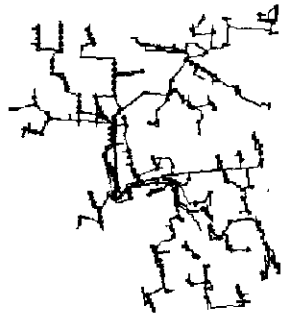
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 34 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wet and Present
- Field Verified Wet and Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection Line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

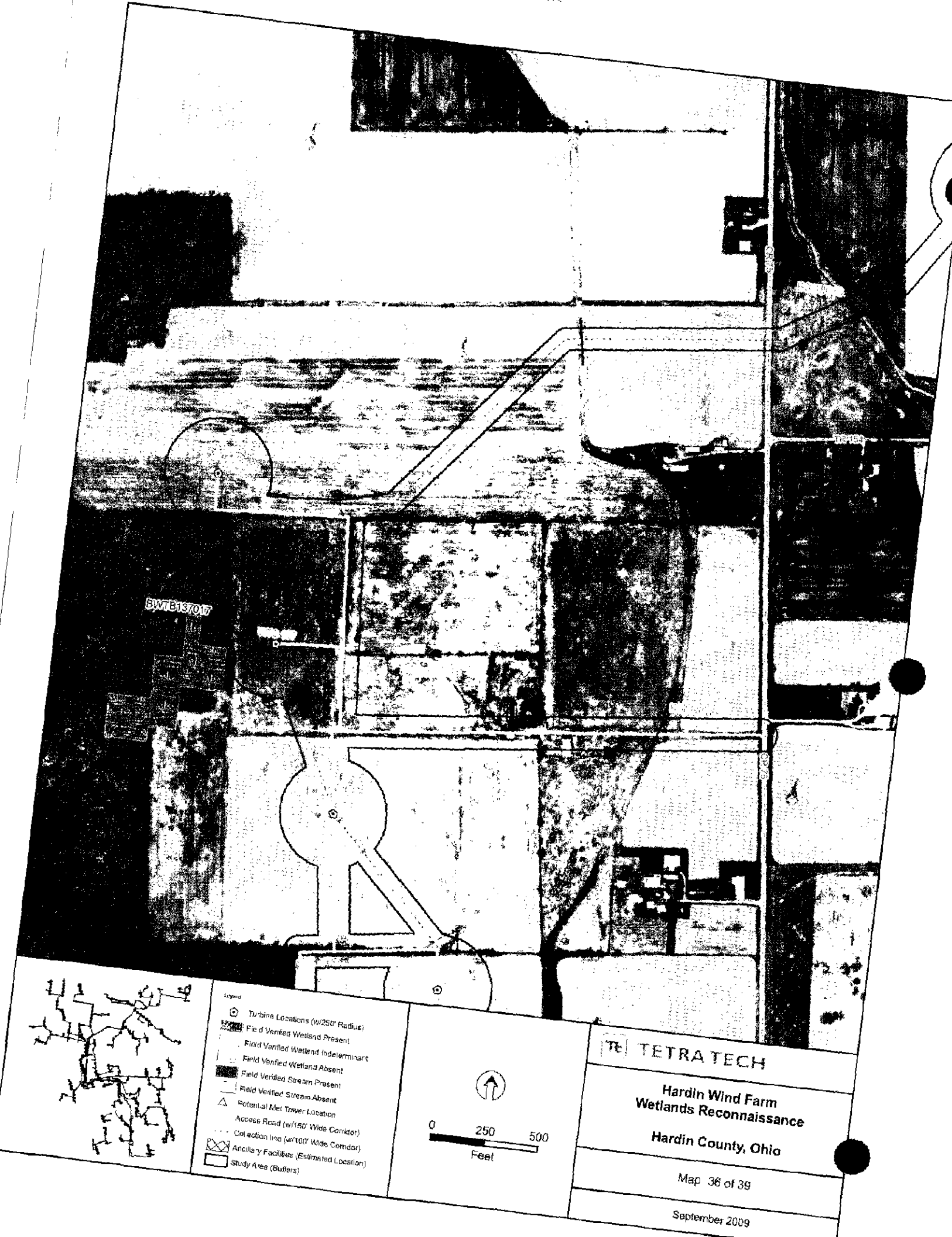
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 35 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

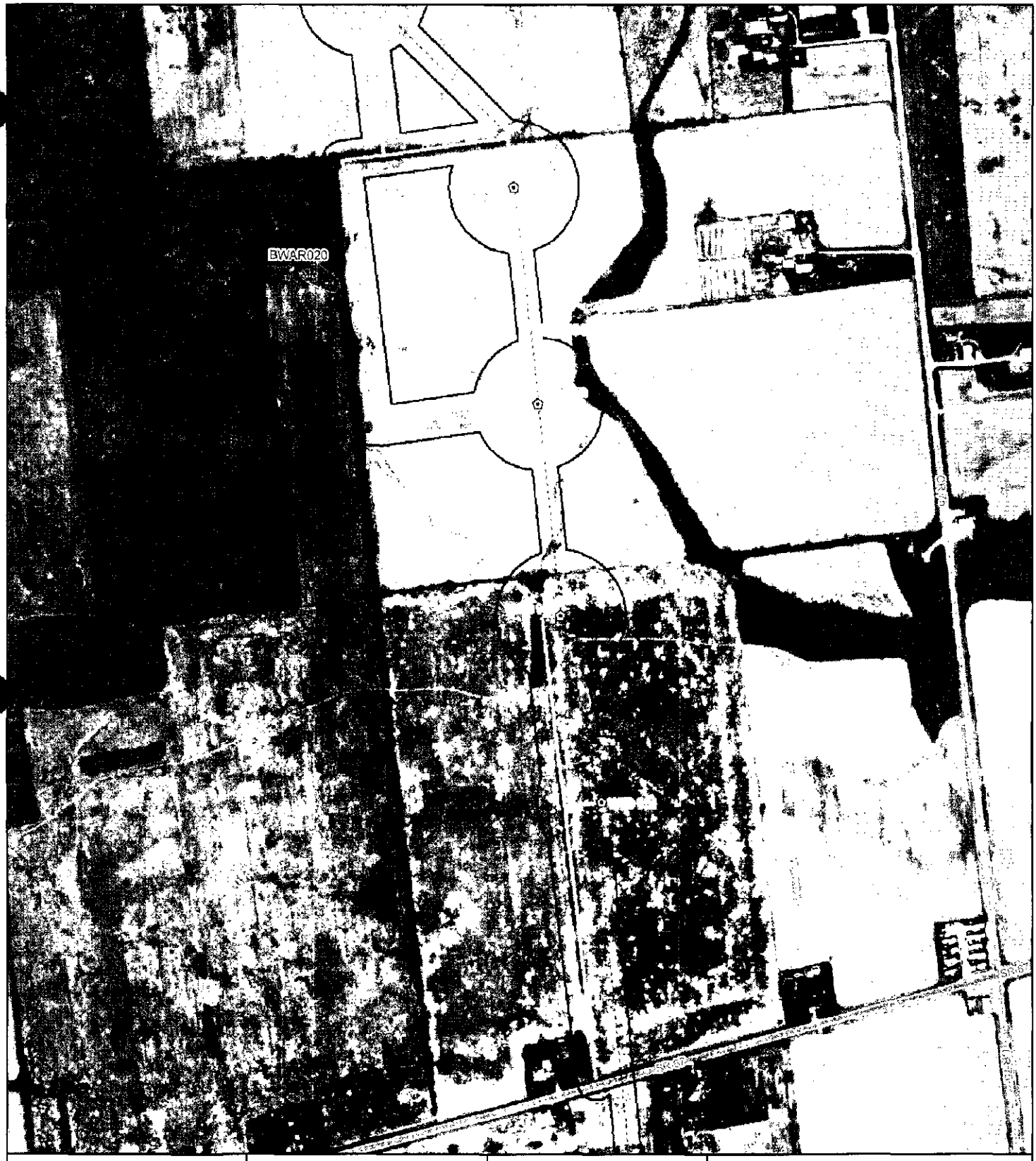
TETRA TECH

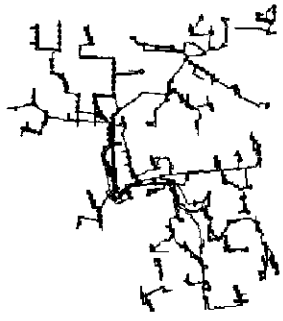
Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 36 of 39

September 2009





Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

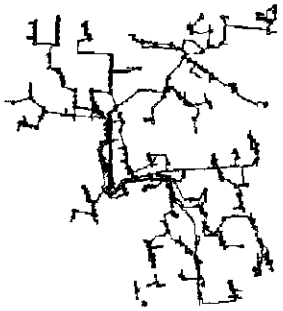
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 37 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

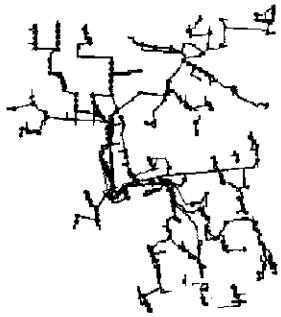
TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

Hardin County, Ohio

Map 38 of 39

September 2009



Legend

- Turbine Locations (w/250' Radius)
- Field Verified Wetland Present
- Field Verified Wetland Indeterminant
- Field Verified Wetland Absent
- Field Verified Stream Present
- Field Verified Stream Absent
- Potential Met Tower Location
- Access Road (w/150' Wide Corridor)
- Collection line (w/100' Wide Corridor)
- Ancillary Facilities (Estimated Location)
- Study Area (Buffers)

0 250 500

Feet

TETRA TECH

Hardin Wind Farm
Wetlands Reconnaissance

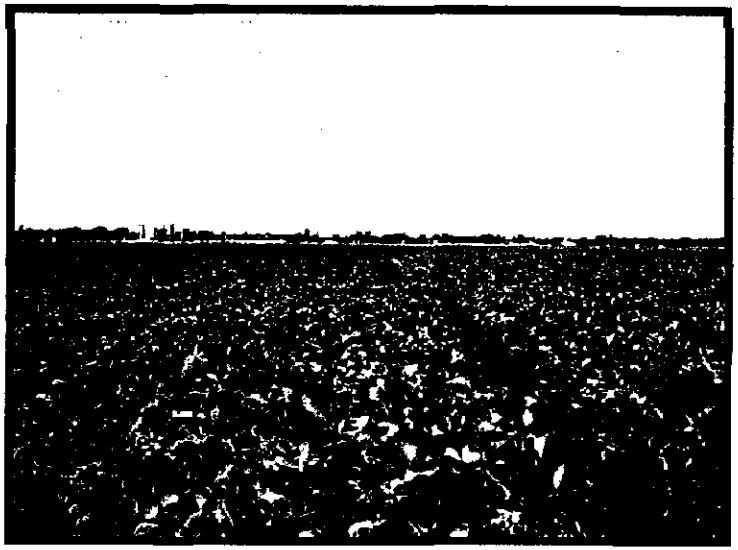
Hardin County, Ohio

Map 39 of 39

September 2009

ATTACHMENT B

Site Photographs



CWTB002001, CWBU002, CWTB03003 (Turbines 1, 2, 3 to North from Turbine 4) (037)

AWAR010 to Northwest (058)

AWAR012 to East, upland (063)

AWAR012 to West, PEM-PFO4 wetland (062)

AWAR014 to East (069)

AWAR014 to West (070)

AWAR016, potential vernal pool to East (075)

AWAR016, potential vernal pool to West, near AR (076)

AWAR020 to North, upland (089)

AWAR020 to South (wetland is farther south than mapped) (088)

AWAR021 to East, upland (092)

AWAR021 to West, potential vernal pool (091)

AWAR021aa to North (093)

AWAR023 to East, potential vernal pool (101)

AWAR028 to South (109)

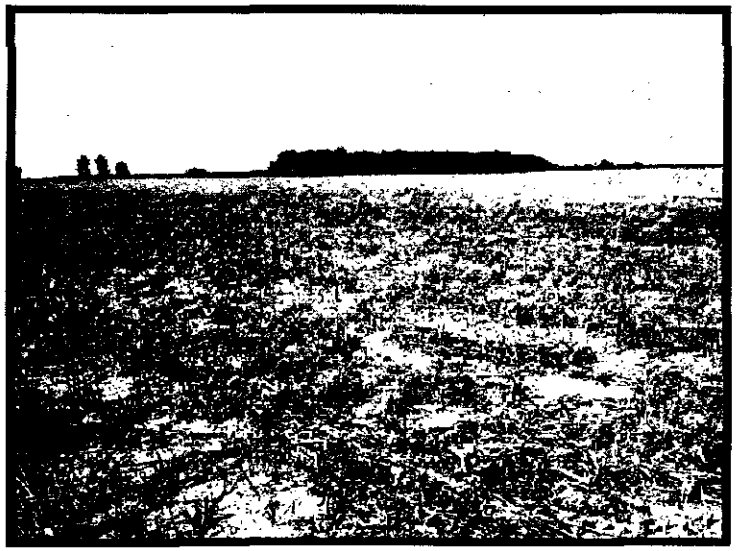
AWAR038 - No wetland in AR West of Turbine 167 (085)

AWAR039 - No wetland in woodlot West of Turbine 167 (084)

AWAR040 - No wetland northeast of Turbine 167 along AR (090)

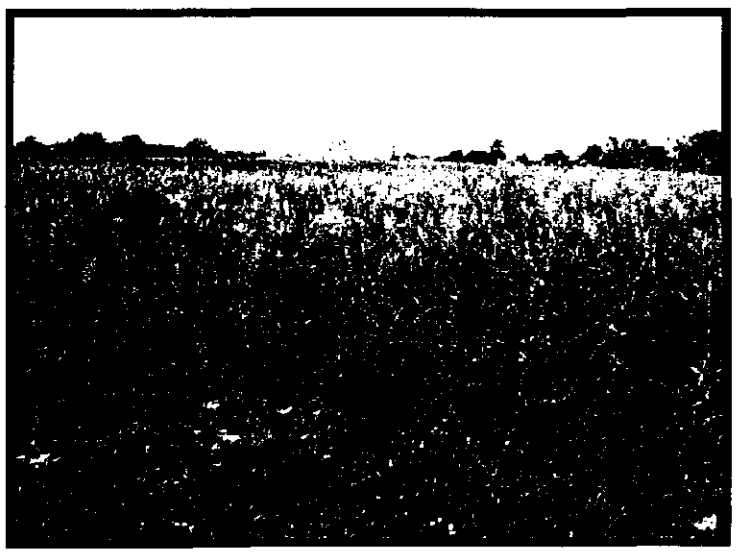
AWBU014 to Northeast (066)

AWBU014 to Southwest (067)

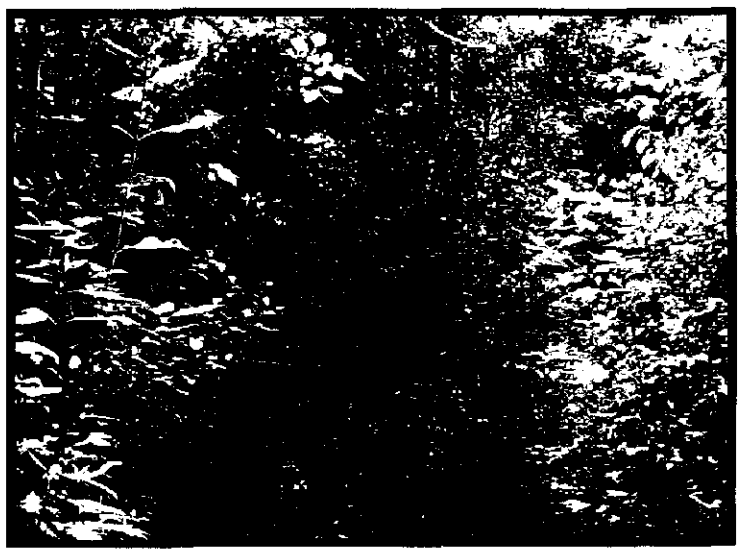


AWBU036 to West (129)

AWTB147009 PFO4 to North (056)

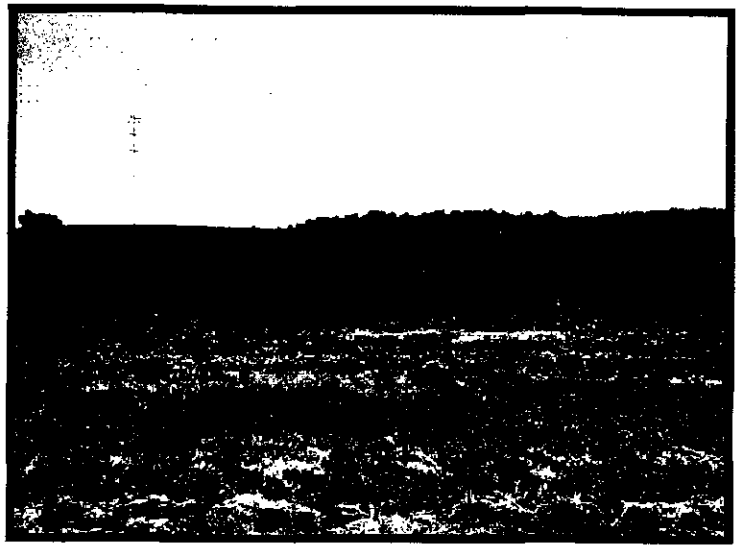


AWTB150013 - OWI wetland not present in corridor (064)



AWTB150013 to South (065)

AWTB151011 to Northwest; altered hydrology (060)



AWTB151011 to Southeast (061)

AWTB167019 to North, upland (087)

AWTB167019 to South, PFO4 (086)

AWTB190029 to West, PFO4 (110)

BWAR001 to West (032)

BWAR020 to West (045)

BWAR055 to E (007)

BWAR055 to S (008)

BWAR055a to NW (006

BWAR102 to South (019)

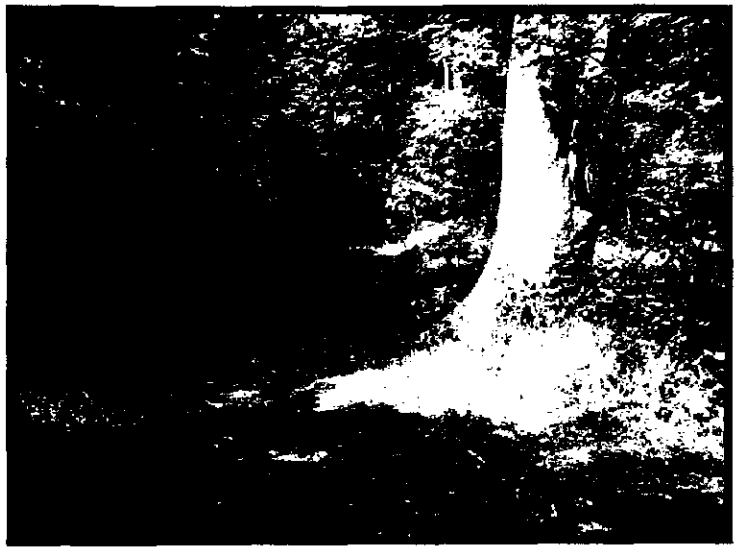
BWBU002 to South (030)

BWBU003 to Northeast (026)

BWBU008 to East (028)

BWBU0081B to E (005)

BWBU0081B to S (004)



BWBU0821 (001)

BWTB089d to South, wetland (013)

BWTB0891d to West, upland (012)

BWTB137017 (041)

BWTB164014A to South (038)

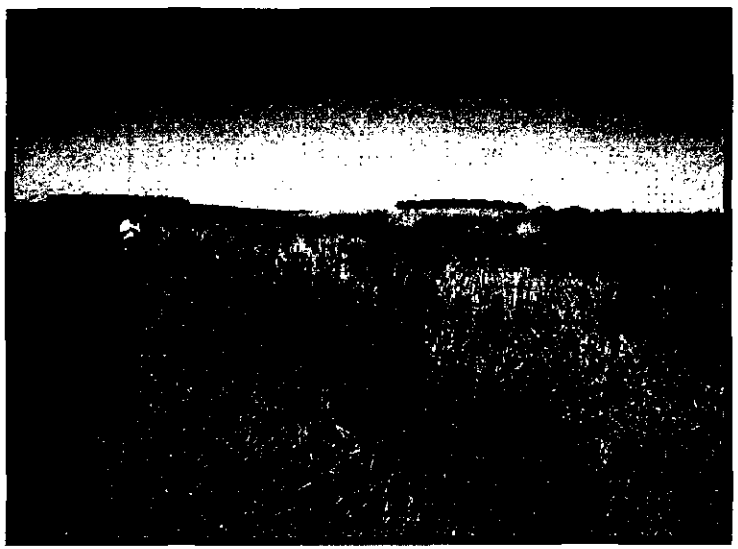
CWAR016 - No wetland in AR Northwest of Turbine 90 (004)

CWAR018 to East (009)

CWAR018 to West (008)

CWBU028 - No wetland between turbines 155 and 131
(079)

Buried Utility West of CR 75, Stream no longer present
(043)



ASAR018 to North (080)

ASAR018 to South (081)

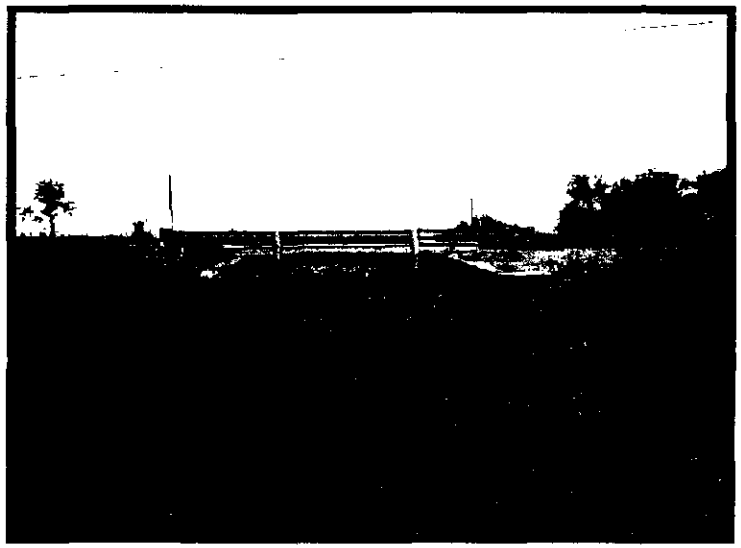
ASAR024 to East, recently modified swale (103)

ASAR024 to West (102)

ASAR024A to Northwest, likely an historical drainage (104)

ASAR027d to South, wetland and stream (108)

ASBU001 to North (017)



ASBU001 to South (018)

ASBU002 to North, small wetland, farmed (019)

ASBU002 to Northwest (020)

ASBU003 to North from buried utility (024)

ASBU003 to South (025)

ASBU005 to North (028)

ASBU005 to South (029)

ASBU006 to East, from culvert (030)

ASBU006 to North, from culvert, towards ASBU005 (032)

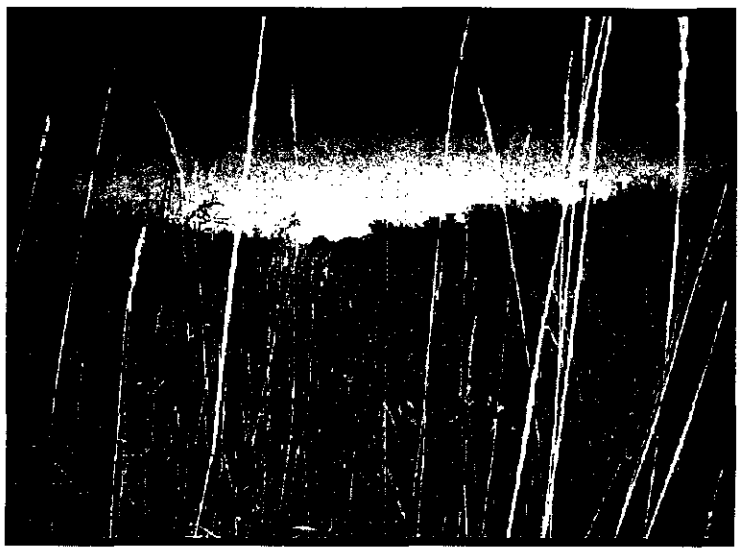
ASBU006 to West, from culvert (031)

ASBU007 to North (039)

ASBU007 to South (040)

ASBU008 to East (042)

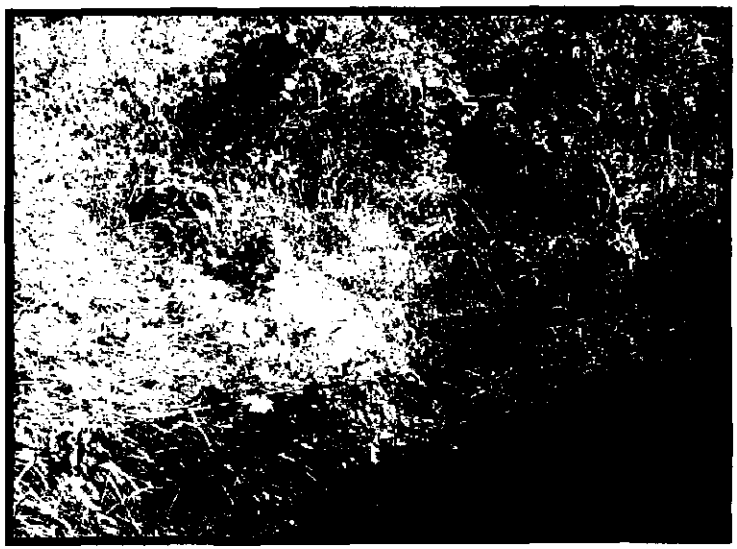
ASBU008 to East from CR 35 at road culvert (044)



ASBU008 to West (043)

ASBU018 to East (083)

ASBU018 to West (082)

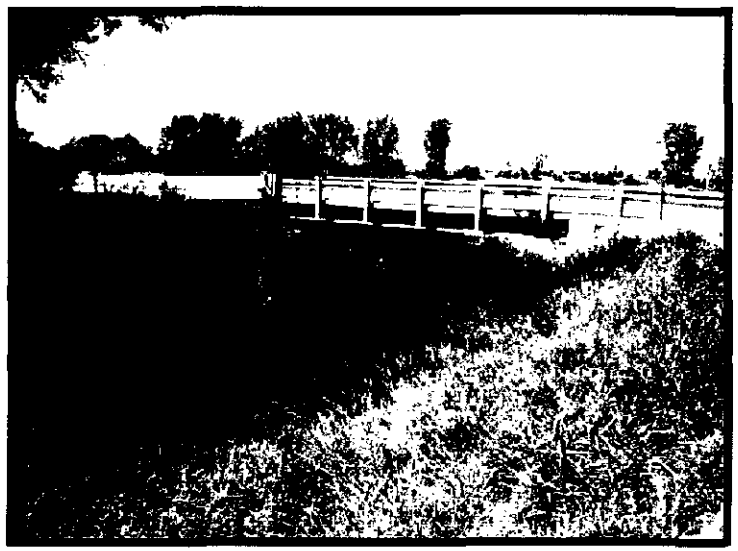


ASBU025 to Northeast (105)

ASBU026 to Northeast (106)

ASBU030A to North (112)

ASBU030A to South (111)



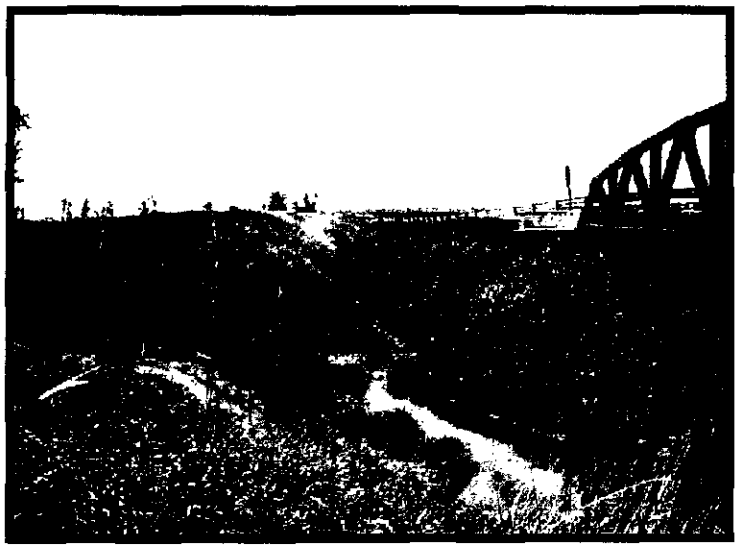
ASBU031A to North (Flat Branch) (113)

ASBU031A to South (Flat Branch) 114

ASBU032 to Northeast (117)

ASBU032 to Southwest (Scioto River) (116)

ASBU032AA to East (119)



ASBU032BB to West, road-side ditch feeds into Scioto River (118)

ASBU033 to North (120)

ASBU033 to South (121)

ASBU034 to Northwest, Scioto River tributary (124)

ASBU034 to Southeast (125)

ASBU037A to Northeast (131)

ASBU037A to Southwest (130)

ASTB071033 to North (122)

ASTB071033 to South (123)

ASTB153015 to Northwest (Flat Branch) (074)

ASTB153015 to Southeast (Flat Branch) (073)

ASTB156017 to North (077)

ASTB156017 to South (078)

ASTB168021A to North-northeast (095)

ASTB169022 to North (097)

ASTB169022 to South (096)

ASTB169022, *dry grassy swale* (098)

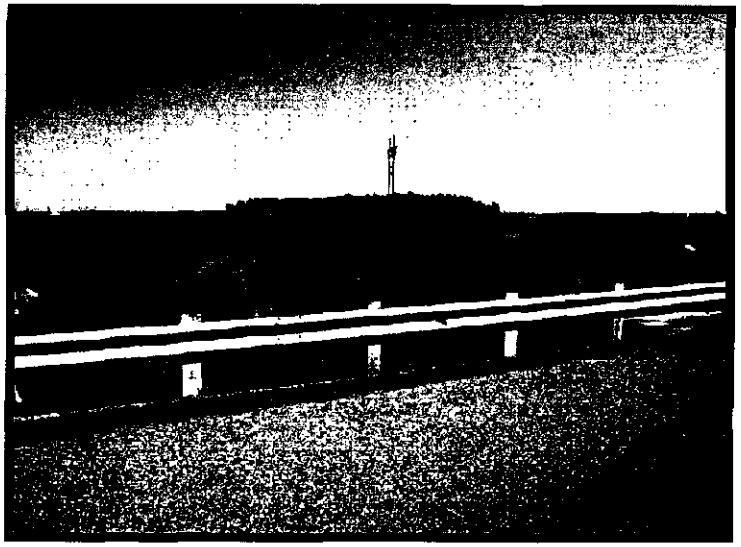
ASTB170022 to North (099)

ASTB170022 to South (100)

ASTB189027 to South (107)

BSAR1 (swale, will rename) to East (011)

BSAR1 (swale, will rename) to West (010)



BSAR006 to Northeast (024)

BSAR015A to West (McCoy Run) (039)

BSAR018 to North (Scioto River tributary) (042)

BSAR107A to South (017)

BSBU004 to Northwest (027)

BSBU005 to Southwest (025)

BSBU007 to South (029)

BSBU009 to Northeast (021)

BSBU010 to East (022)

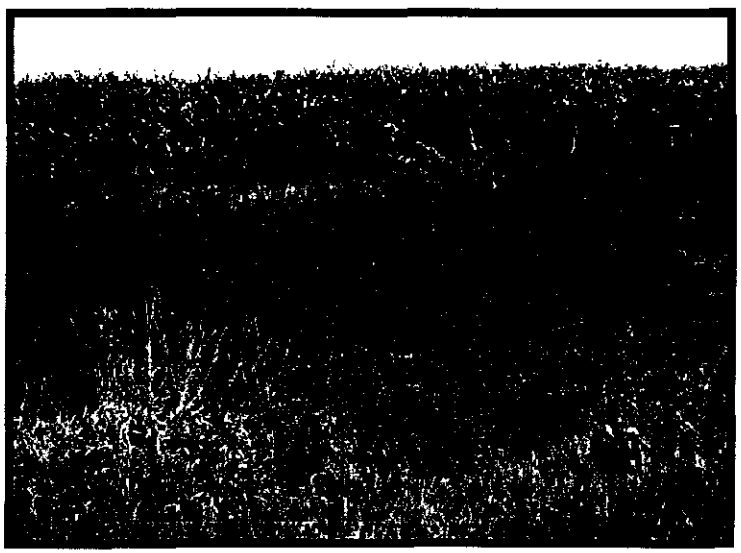
BSBU011 to South (023)

BSBU013A to North (034)

BSBU013C to North (035)

BSBU013E to North (036)

BSBU016A to North (016)



BSBU016A to Northeast (Flat Branch) (040)

BSBU024 to South, Scioto River (4918)

BSTB0821 to East, mapped swale no longer present (003)

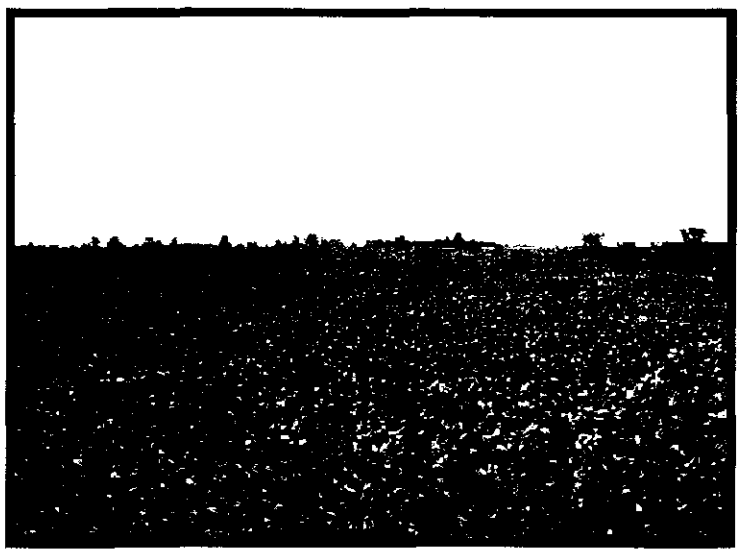
BSTB0821 to South, mapped swale no longer present (002)

BSTB140019A to East (Scioto River tributary) (044)

Turbine 193, 194, 195, 196 (072)

Access Rd West of WTG 164, to South (037)

Access road from Turbine 4 West, to CR 35 (038)



Access road to Turbine 143 to South, from SR 67 (054)

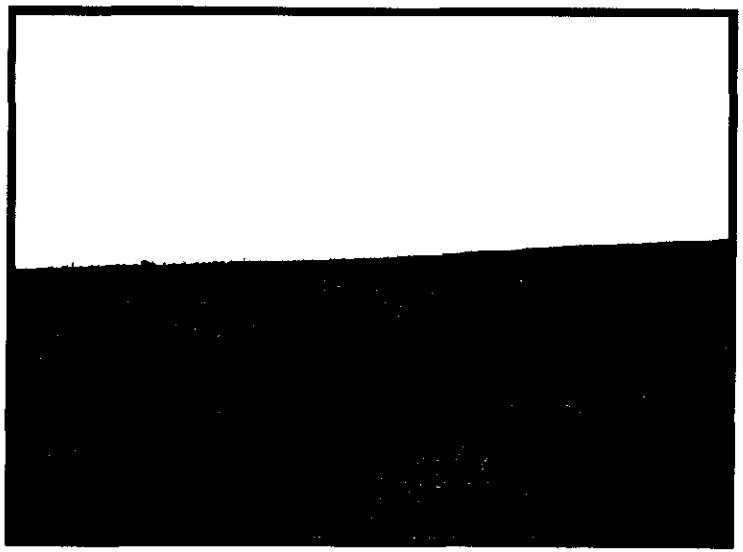
BTB104 (018)

Buried Utility West of Turbine 90 (005)

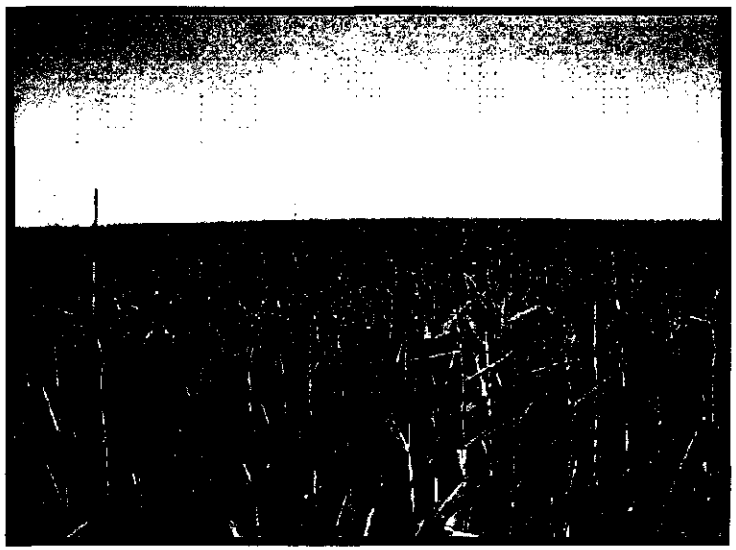
CWAR007, Turbine 53, 56, 58, 59 and Access Road to E (009)

CWAR007, Turbine 55, 56, 58, 59, access road to E (010)

CWTB002001, CWBU002, CWTB03003 (Turbines 1, 2, 3 to North from Turbine 4) (037)



Switching Station to Northwest (126)



Switching Station to Southeast (128)

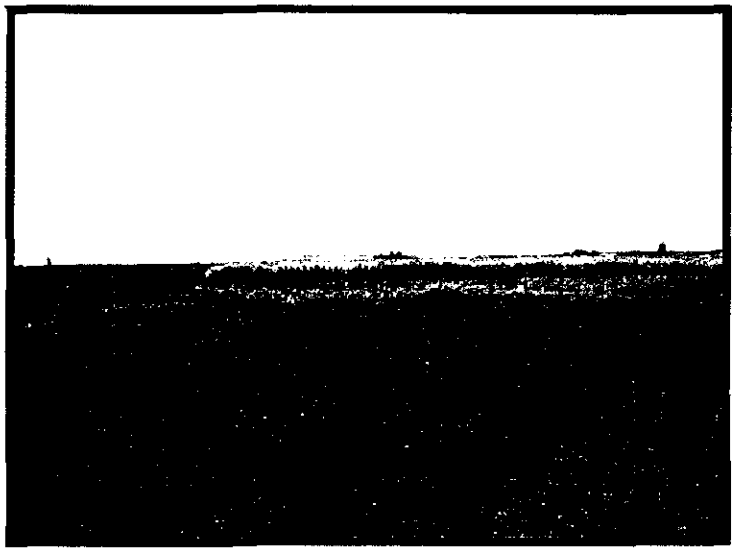
Switching Station to West (127)

Turbine 1 to North (045)

Turbine 1, 2, 3, 4, 5 to South, from TR 92 (041)

Turbine 5 to South from Turbine 4 (036)

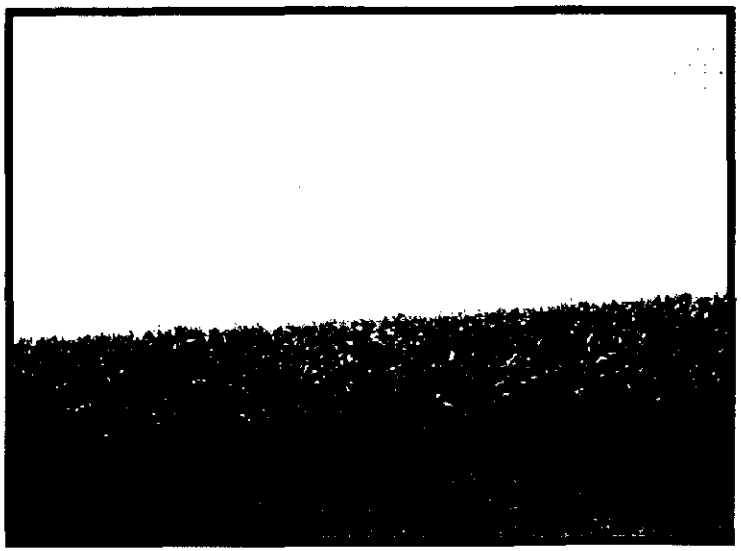
Turbine 6, 7, 8, 9, 10 to North from TR 100 (034)



Turbine 11, 12, 13 to South from TR 100 (046)

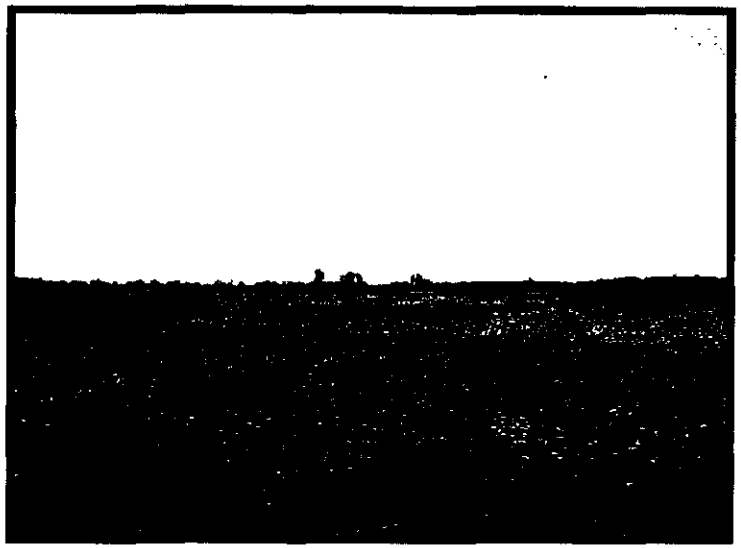
Turbine 14, 15, 16 to North from TR 110 (047)

Turbine 17 to East (049)



Turbine 18, 19 to South from CR 110 (048)

Turbine 21, 22 to North from TR 120 (052)



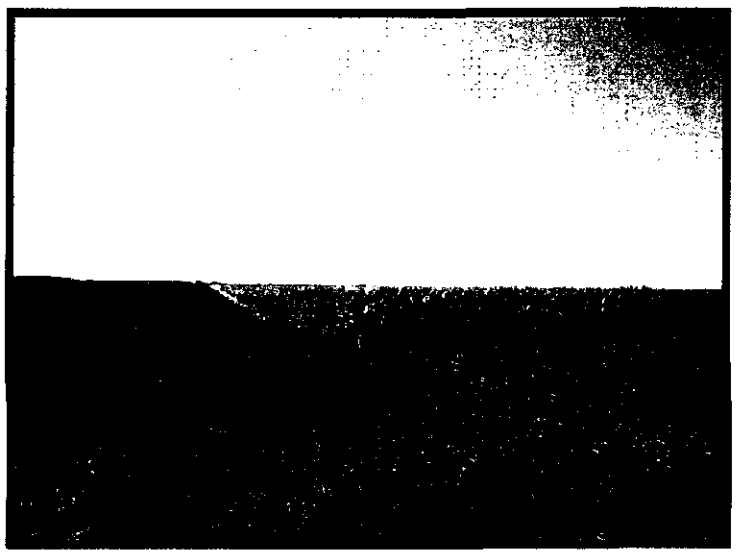
Turbine 22, 23 to South from TR 120 (050)

Turbine 22, 23, 24, 25 to Southwest from TR120 (053)

Turbine 25 to South from TR 120 (051)

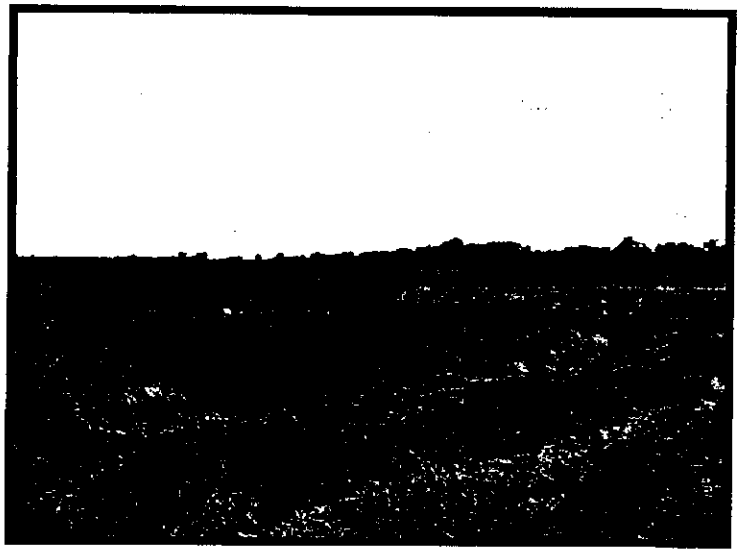
Turbine 26, 27, 28, 29 to South-Southeast from TR 92 (027)

Turbine 40, 41, 42, 43, 44 to South from TR 100 (ASBU006 in foreground) (033)

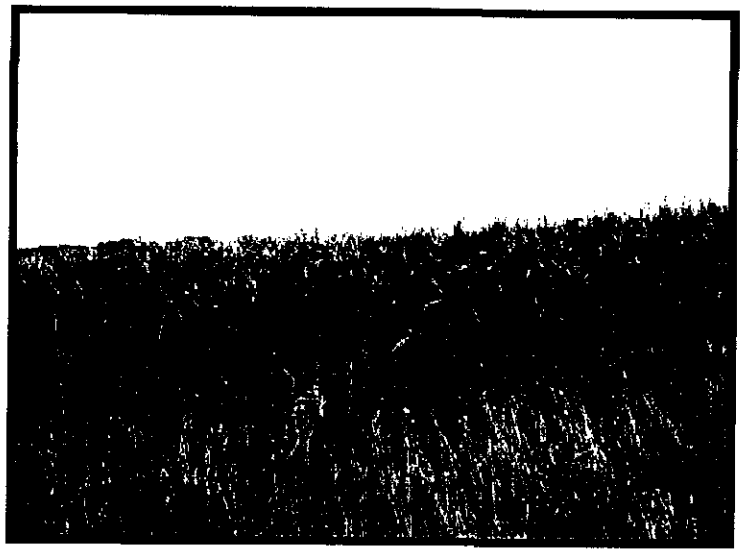


Turbine 49 to South (012)

Turbine 59 to North (011)



Turbine 65 to Northeast (026)



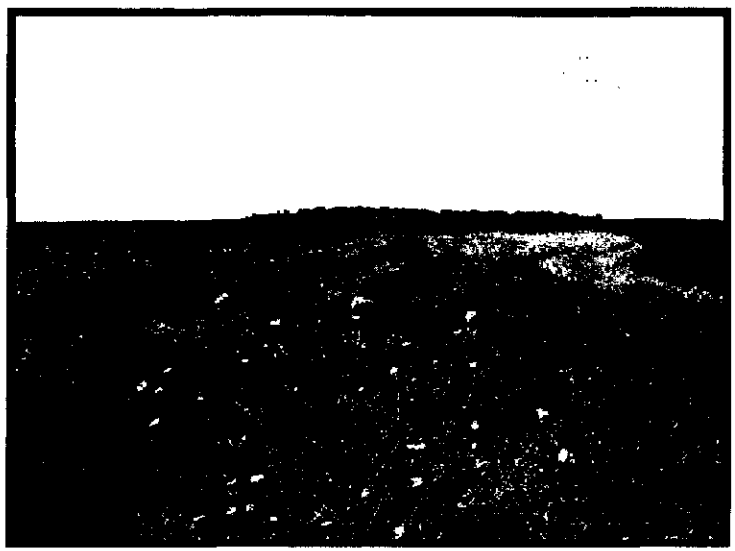
Turbine 76 to East from access road (022)

Turbine 76 to West from access road (ASBU003 in distance) (023)

Turbine 77 to East from access road (021)

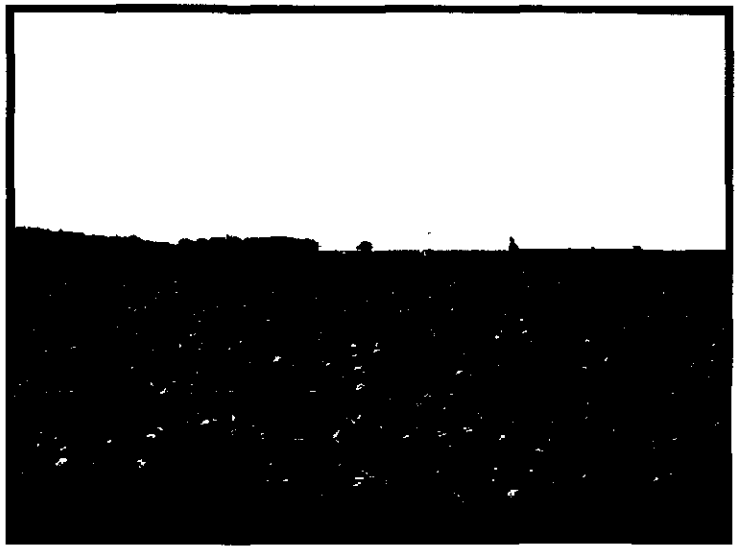
Turbine 88 to North (014)

Turbine 88, grassy swale to East (016)

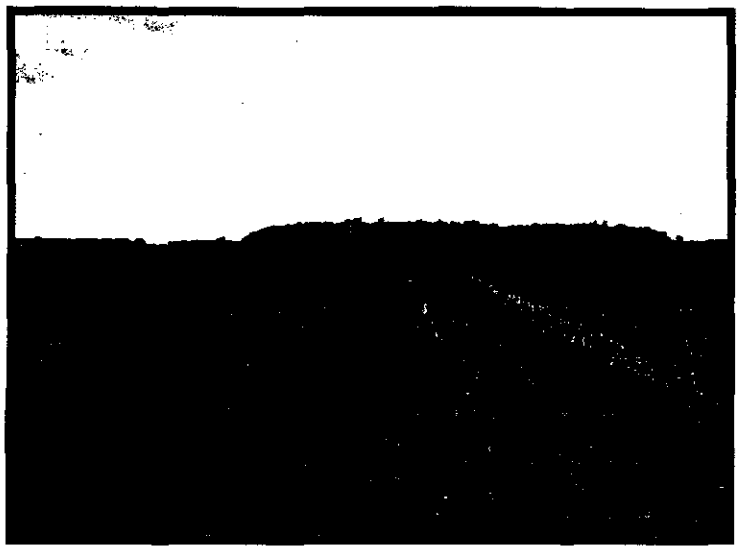


Turbine 88, grassy swale to West (015)

Turbine 90 to North (woods contain CWAR017, not in AR) (007)



Turbine 90 to South (006)



Turbine 91 to North (003)

Turbine 91 to South (002)

Turbine 99, 100, and 101 to Northeast (020)

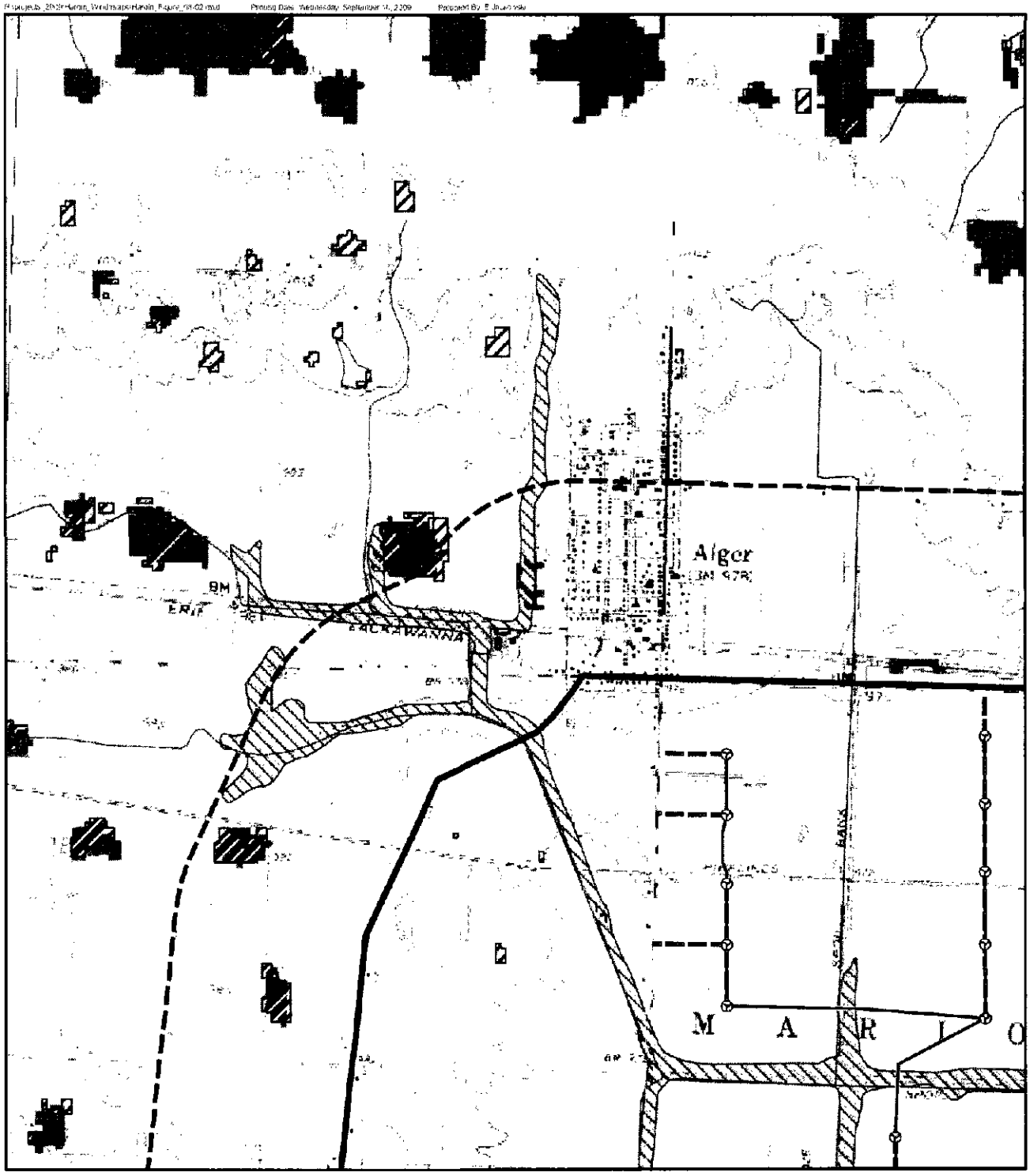
Turbine 146, 147 to Northeast (057)

Turbine 147 to West (055)

Turbine 151 to Northeast (059)

ATTACHMENT C

Revised Layout



Legend

- Proposed 1.5 XLE Turbine Location
- Proposed Access Road
- Proposed Collection Routing To 345kV Line
- River/Stream
- Hardin County OWI Wetlands
- Water Body
- 100-Year Flood Hazard Area
- Park
- ½-Mile Project Boundary Setback
- Study Area Boundary
- Developed, Open Space
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Woody Wetlands
- Emergent Herbaceous Wetlands

Sheet 01 of 15

Notes:
1. U.S.G.S. 7.5 Minute Series Topographic Maps:
   - Harrod Quadrangle, OH; 1961, Photoinsp. 1984
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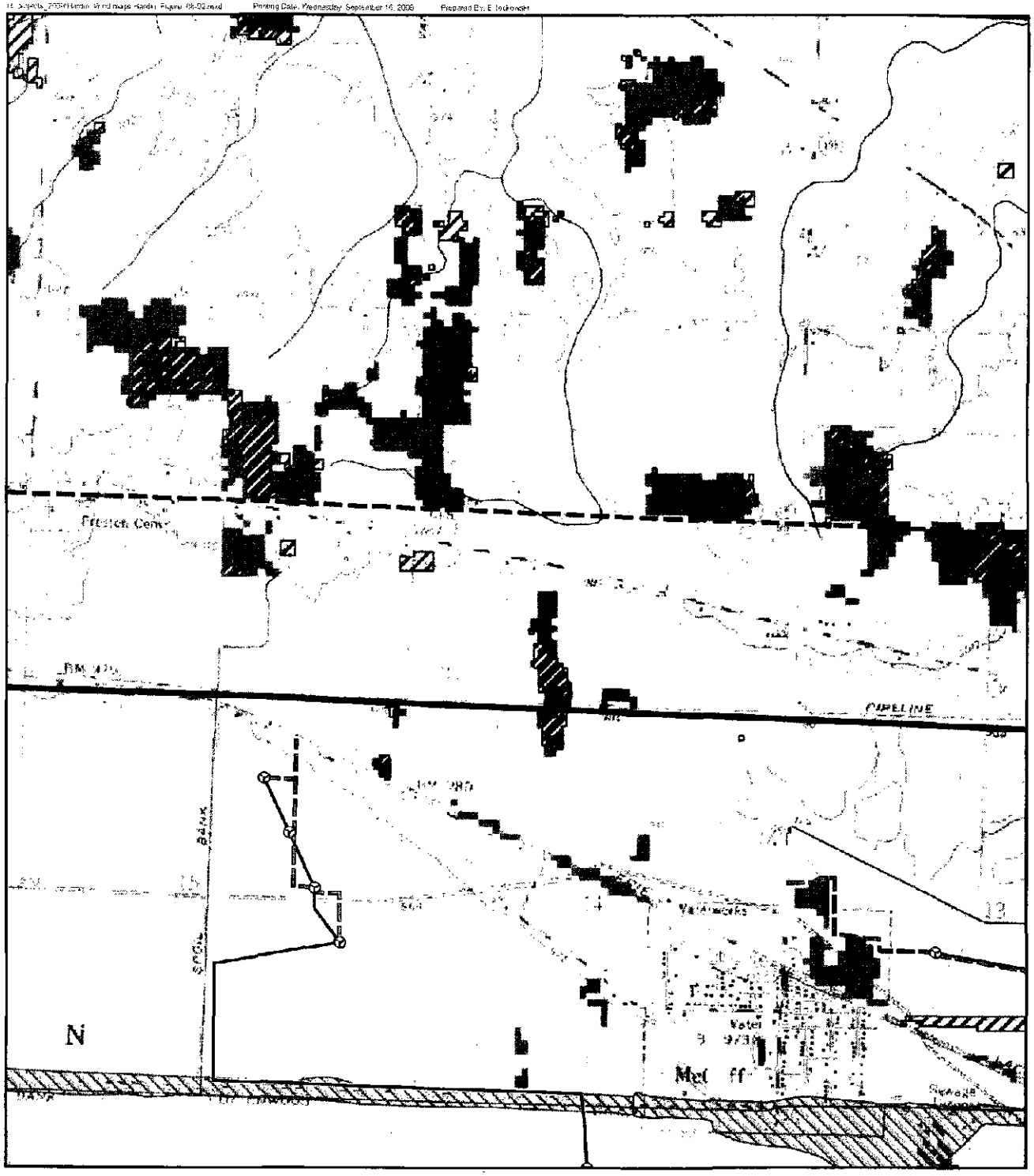
Ecological Impact Map

Hardin Wind Farm, Hardin County, Ohio

Rev. 01

September 16, 2009

hardin wind energy llc



Legend

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Sheet 02 of 15

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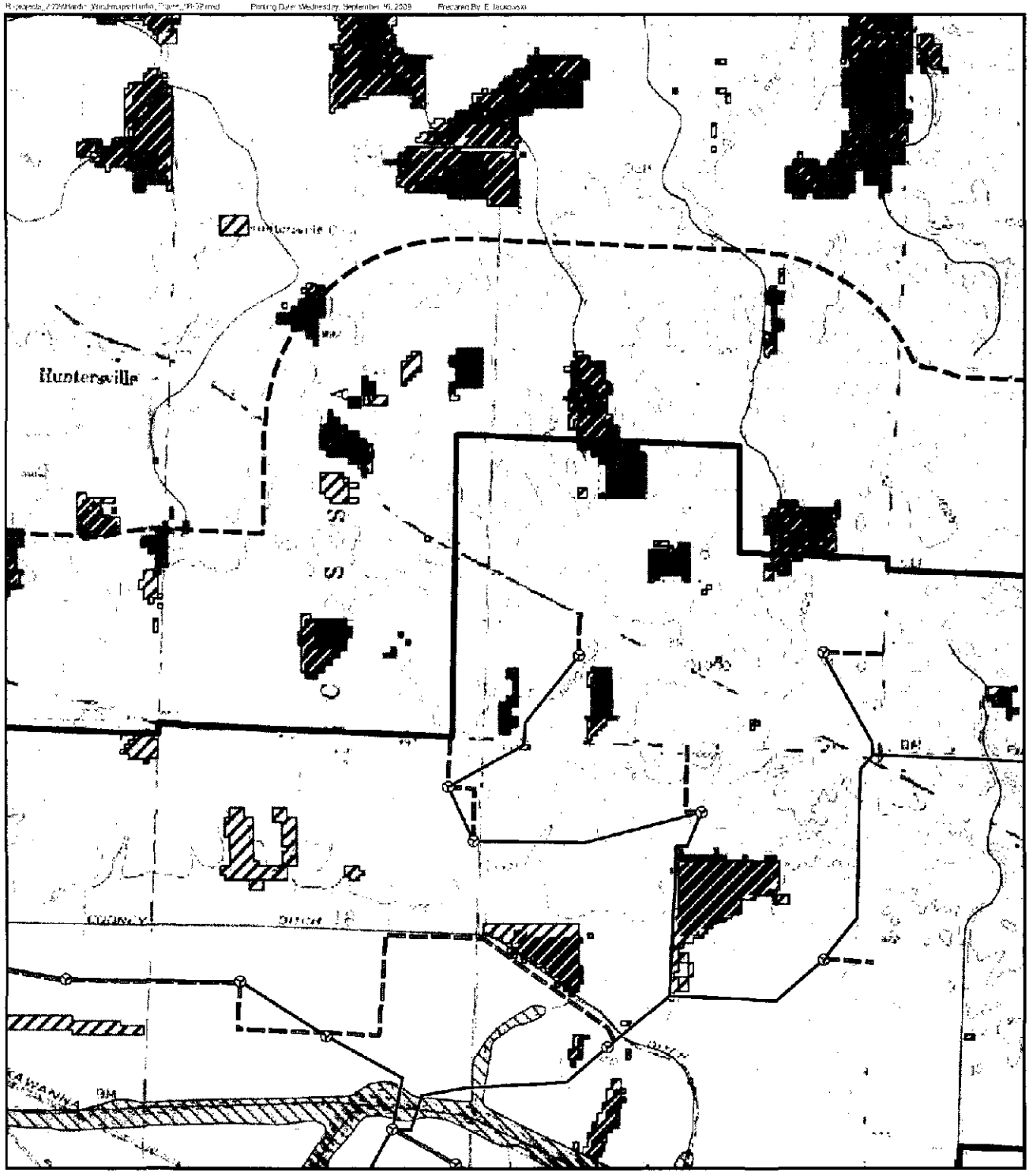

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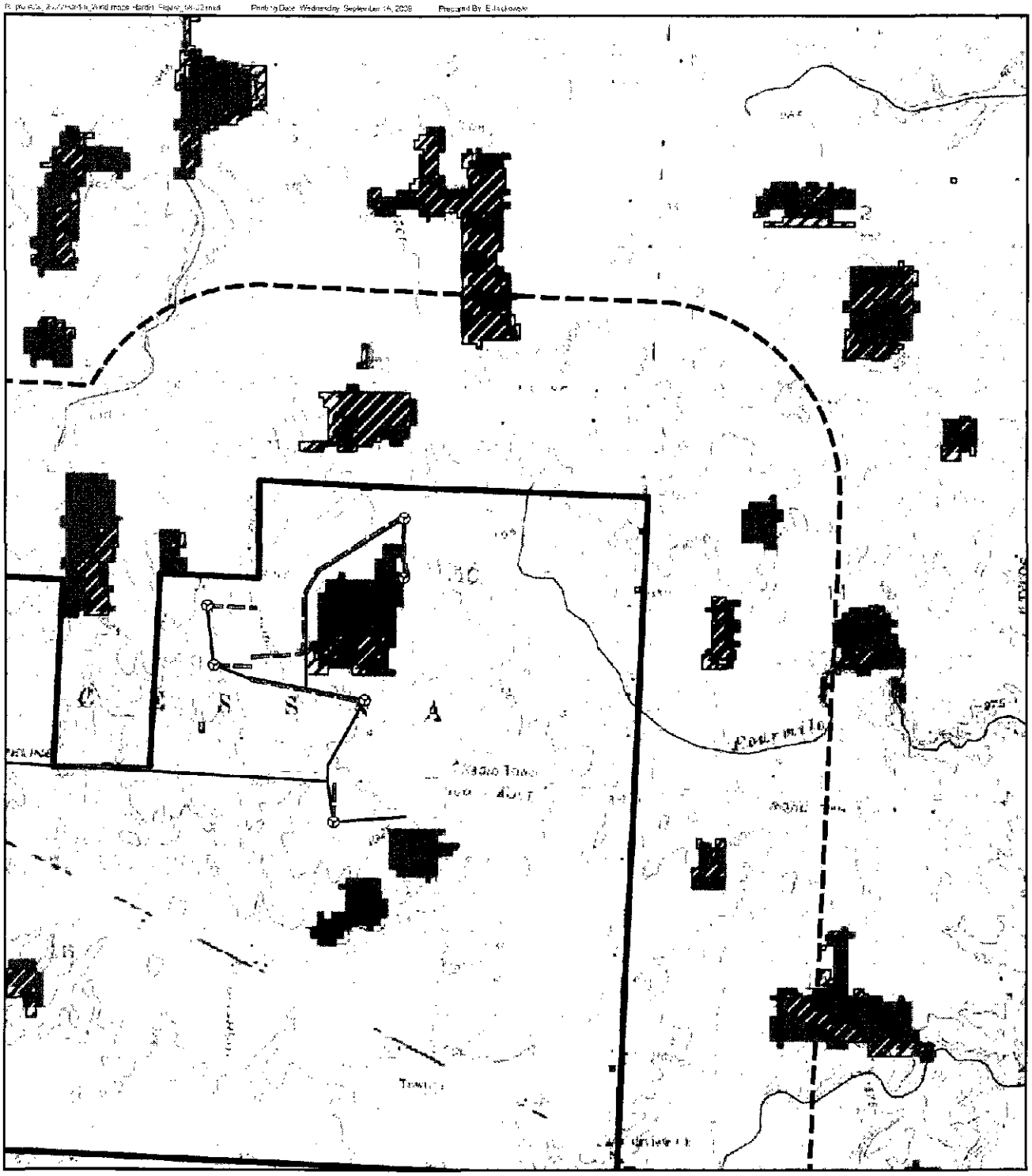

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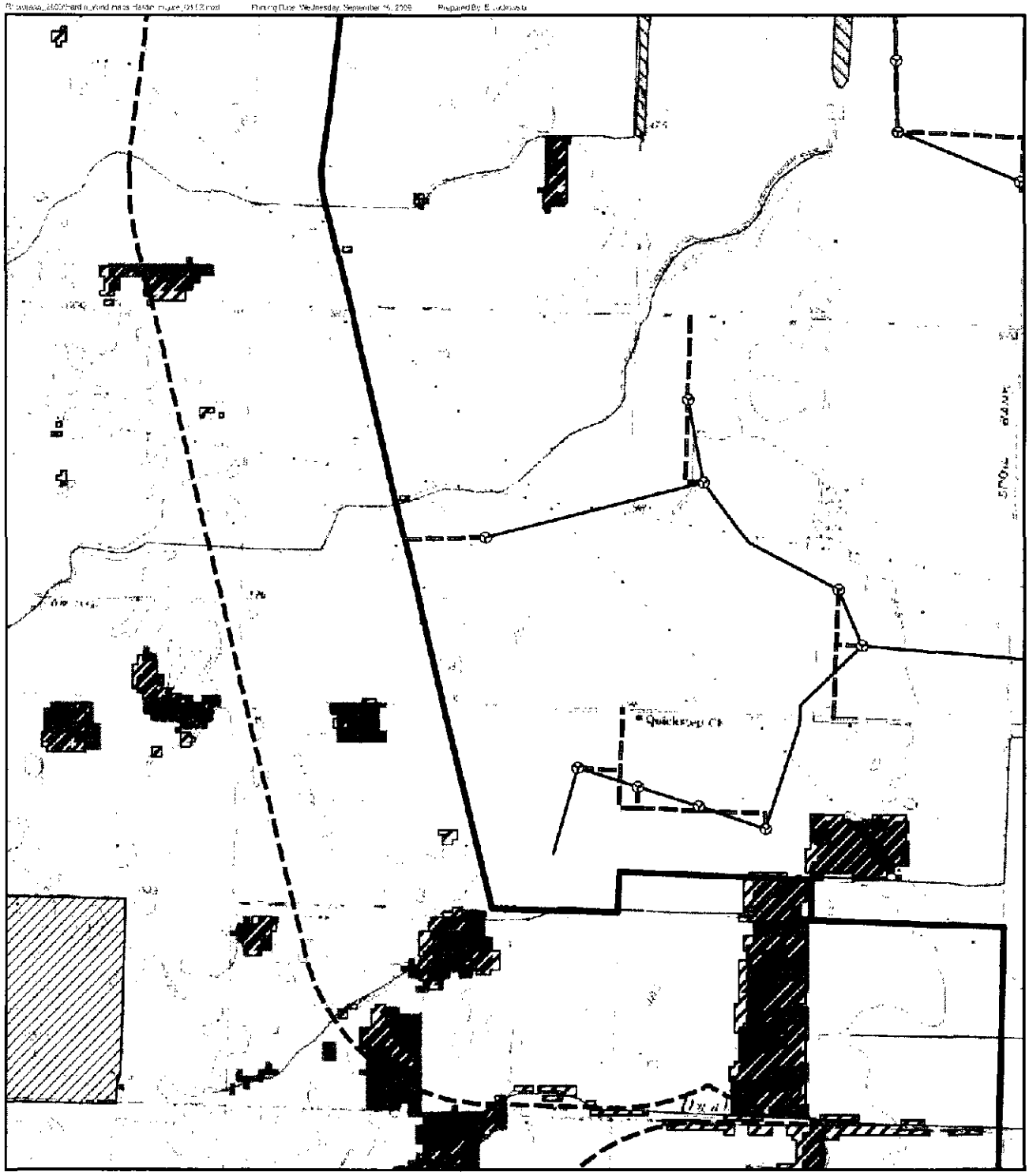

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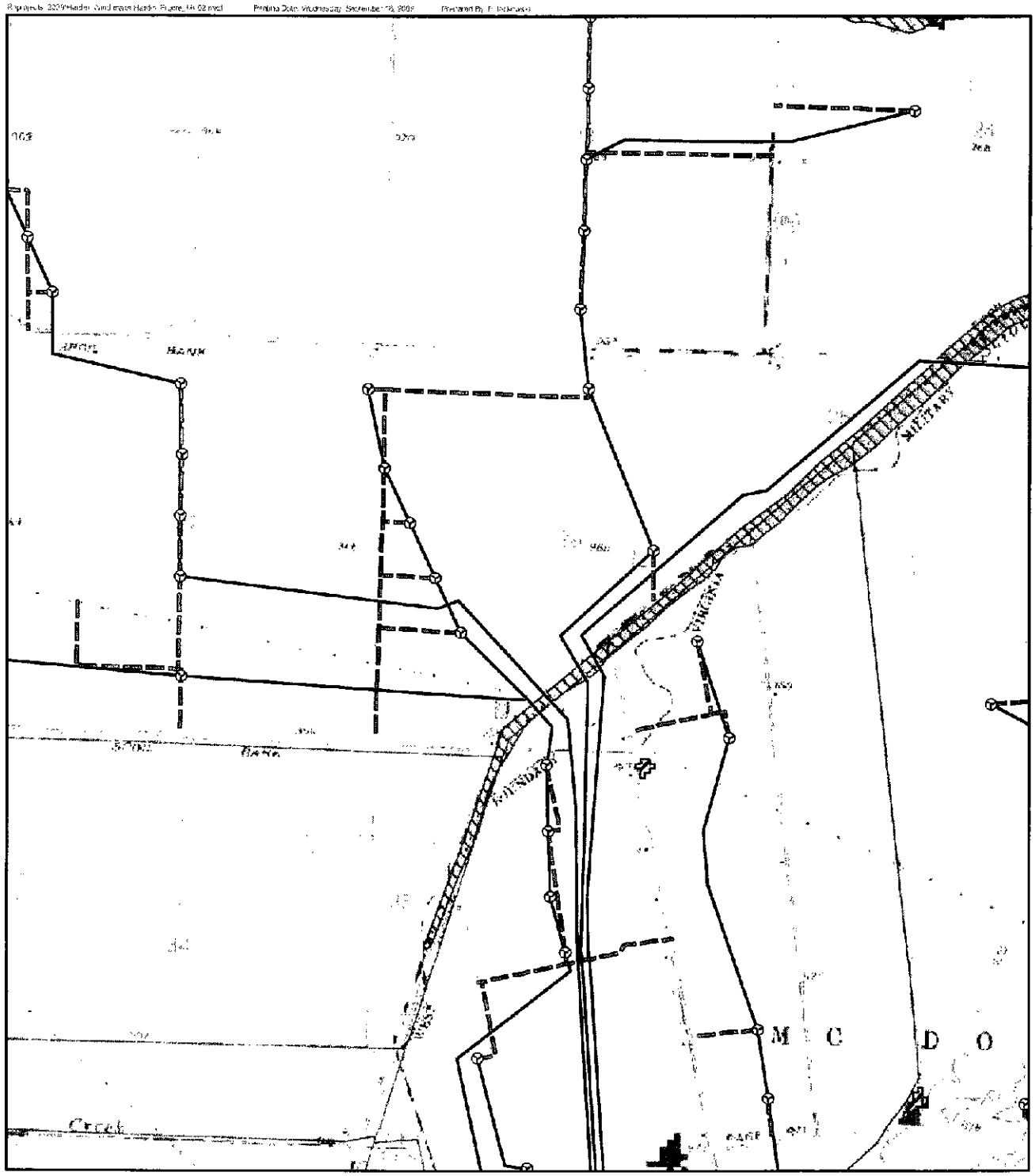

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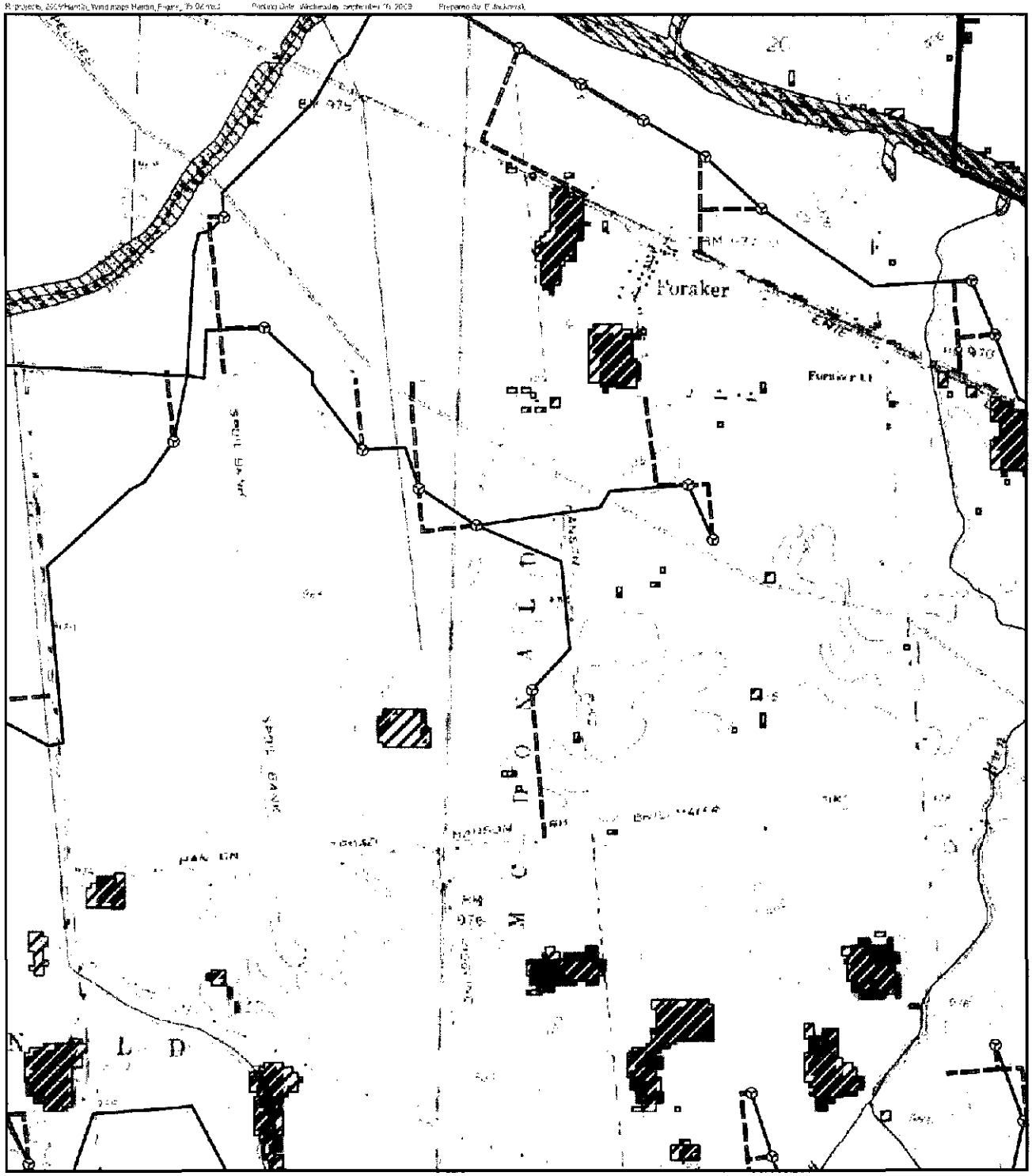

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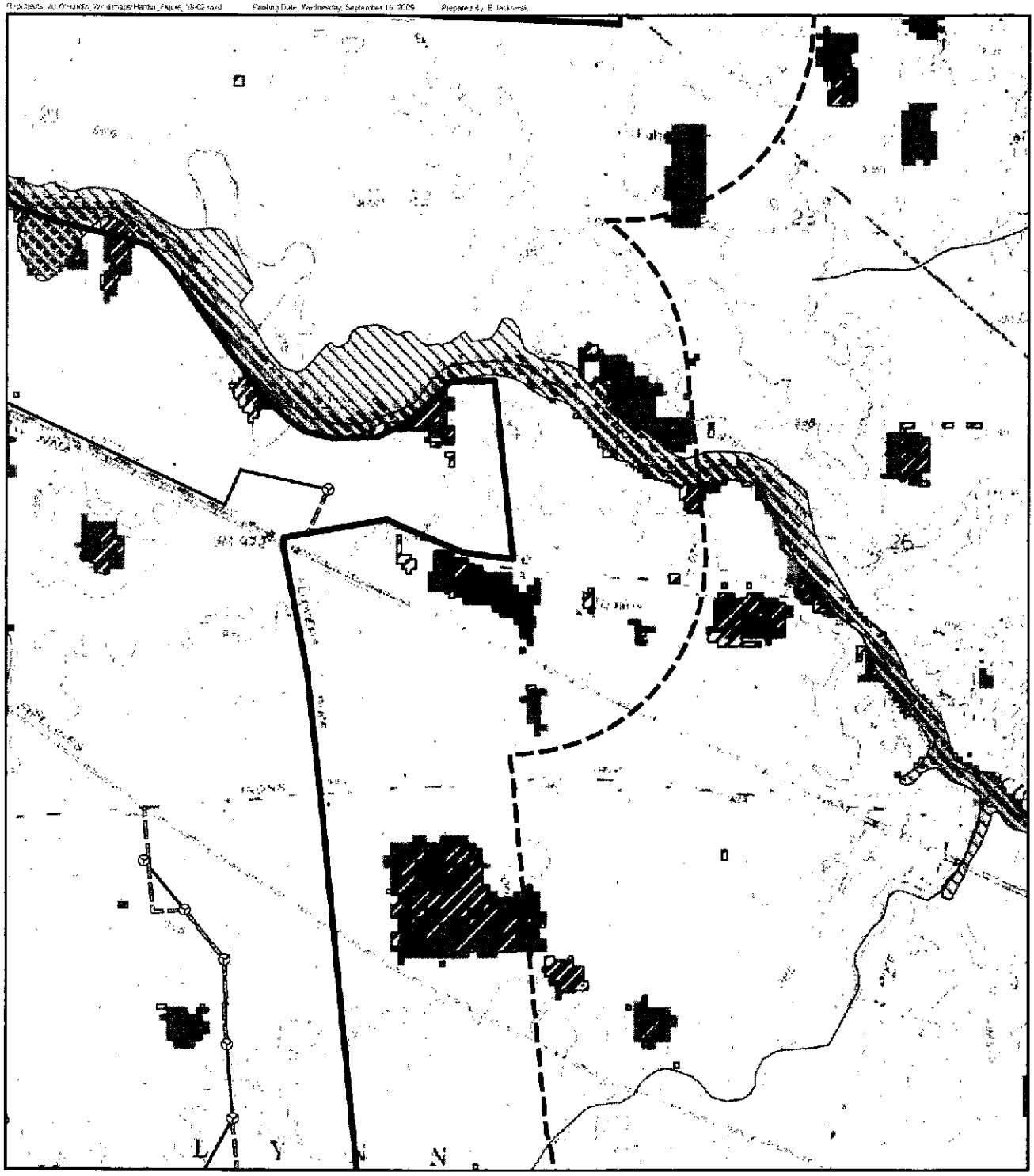

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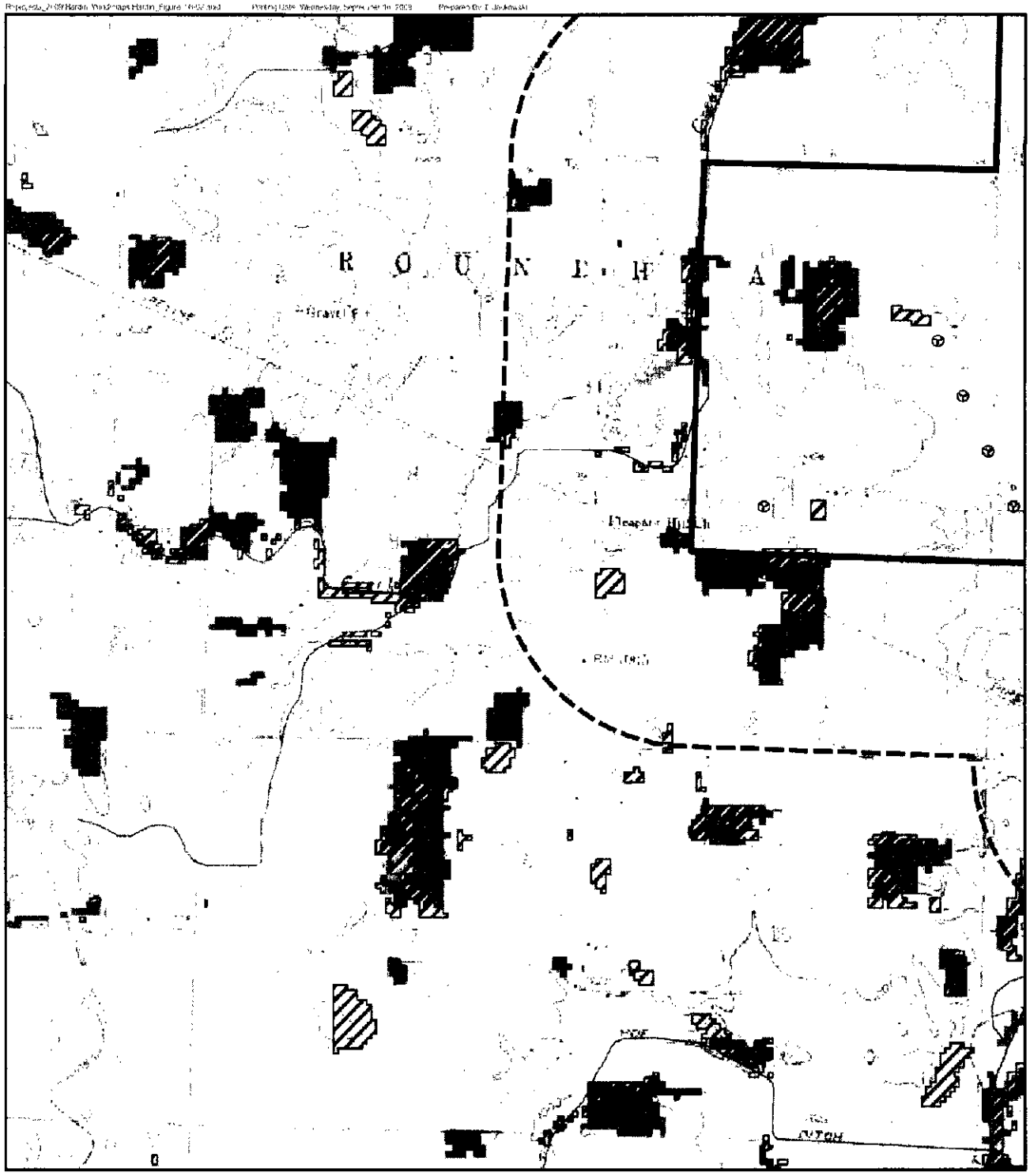

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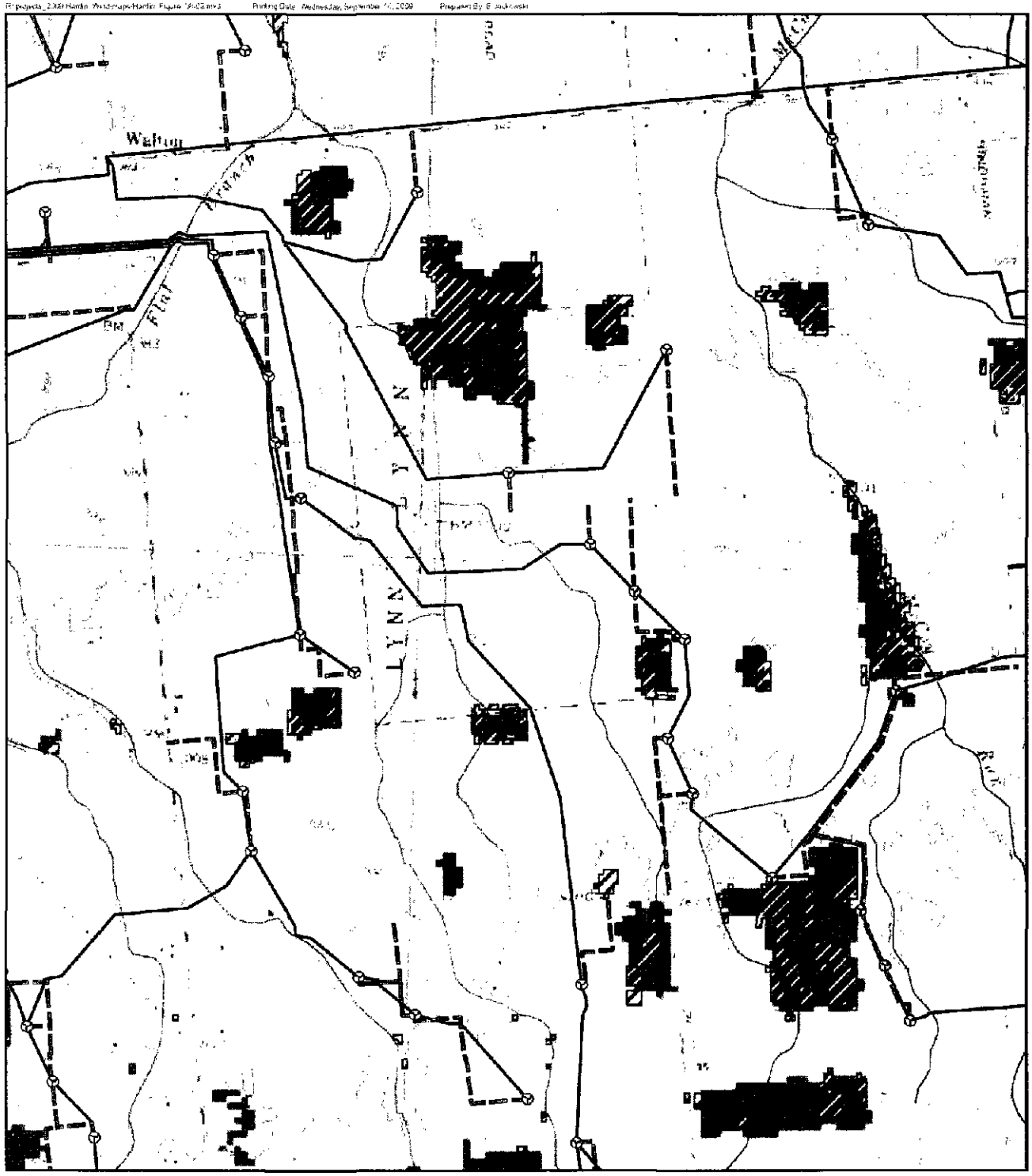

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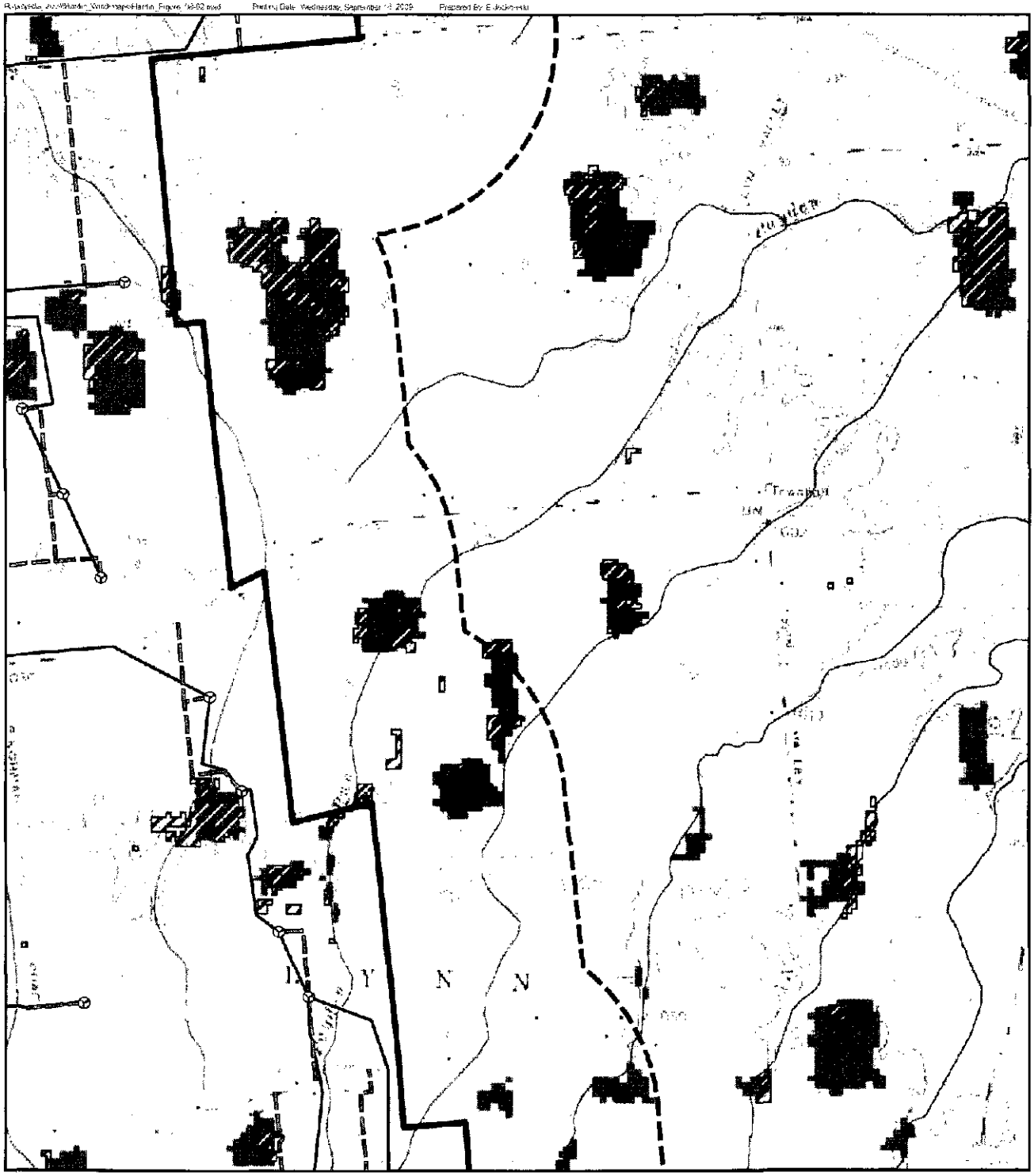

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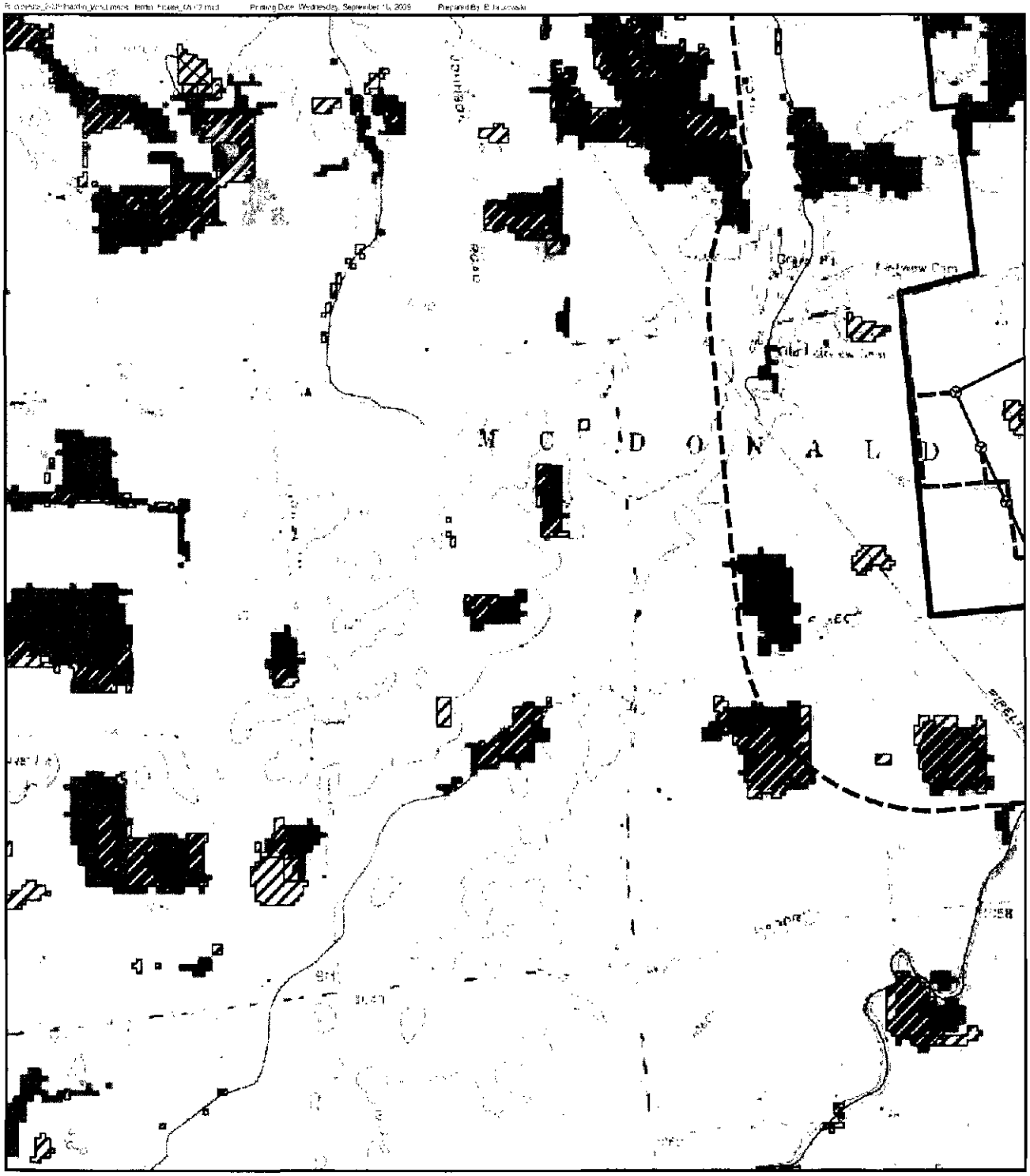

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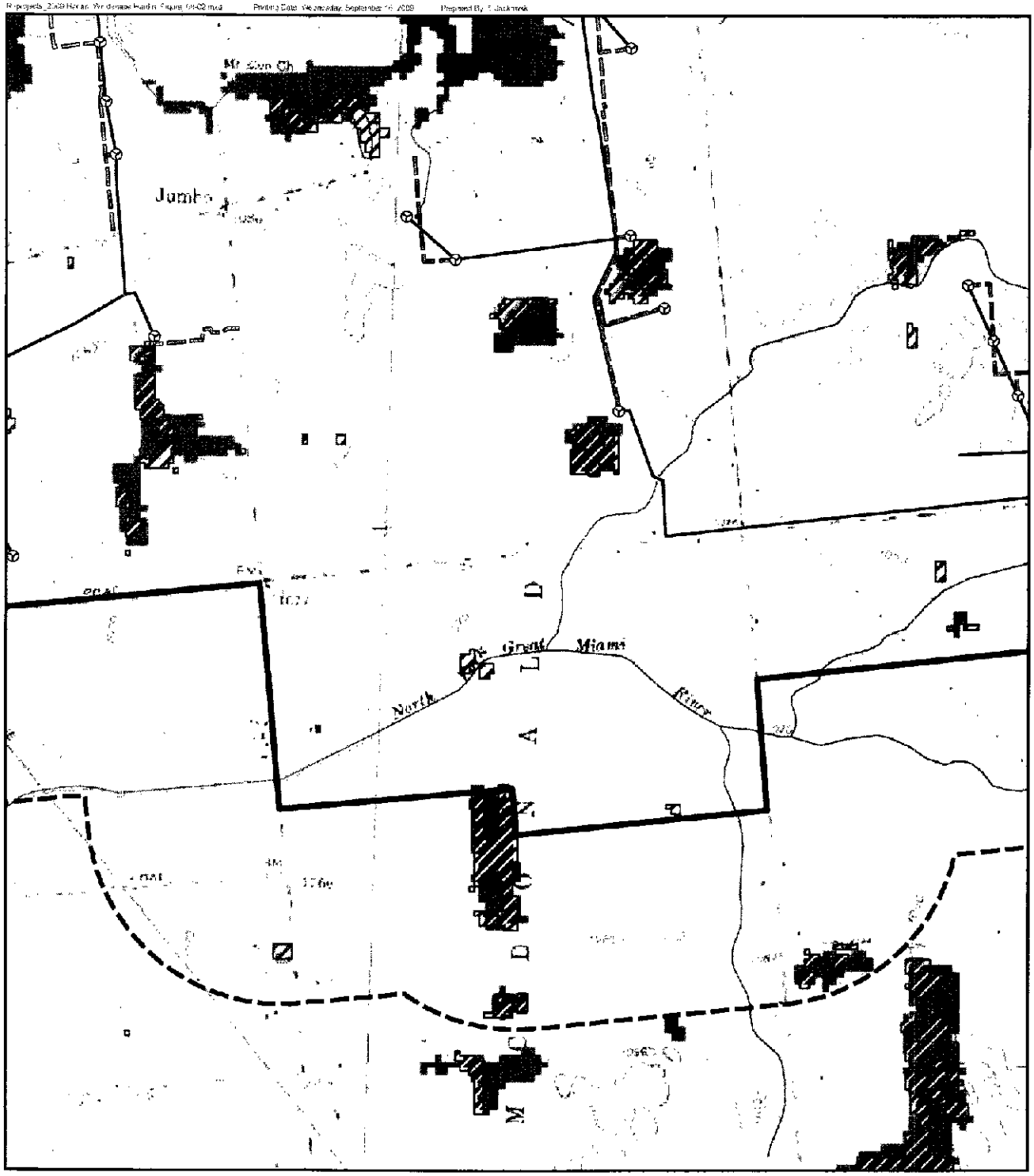

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Statement of Evidence of
Tony Gregory Coggan

Truescape – 3D Visualizations

INTRODUCTION

1.1 My name is Tony Gregory Coggan. I am the Vice President of International Development for the firm Truescape Limited (Truescape).

1.2 I am a computer simulation specialist and prior to joining Truescape I worked in the surveying industry for 17 years. I have 8 years experience working in the 3D photo and video simulations industry, and have completed a wide range of different visualisation projects from photo-simulations for simple projects to full computer generated 3D video simulations for complex projects across New Zealand, Australia and in the United States.

1.3 I have been involved with many simulations that have been commissioned to support permitting applications in New Zealand, Australia and the USA. I have played an integral part in refining the methodology behind the accurate simulation technology used to produce the simulations before the hearing panel today. In 2008, I acted in an Expert Witness capacity on 8 occasions before New Zealand hearing panels and 1 occasion before the Victorian Civil and Administrative Tribunal in Australia.

2. SCOPE OF EVIDENCE

2.1 Hardin Wind Energy LLC engaged Truescape in May 2009 to provide:

- A series of 3 TrueView™ 2 "human field of view" survey controlled photo simulations depicting the proposed Hardin Wind Farm provided as **ATTACHMENT A** (Ref Page 24) in large scale photo format and also in a reduced size booklet format as **ATTACHMENT B** (Ref Page 25).

- Two Zones of Visual Influence (ZVI) diagrams showing the visibility of turbine tips and hubs over the project site provided as **ATTACHMENT C** (Ref Pages 26 and 27).

- A 3D animated shadow simulation. Provided as a CD Attached to this report as **ATTACHMENT D** (Ref Page 28)

2.2 The simulations are a tool to assist with the visual assessment of the proposed Hardin Wind Farm.

2.3 The scope of Truescape's work does not extend to the assessment or interpretation of the simulations for issues relating to the proposed Hardin Wind Farm Project's visibility and its landscape and visual effects.

2.4 The TrueView™2 simulations have been produced in the large scale format which is the correct format to be used when making any visual assessment. To assist the Ohio Power Siting Board the TrueView™2 simulations have also

been produced in a reduced size reference booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams".

2.5 It should be noted that the Ohio Power Siting Board regulations call for "*Photographic interpretation or artists pictorial sketches of the proposed facility from public vantage points within five miles of the proposed facility*" and that the survey accurate simulations attached to this report exceed that requirement with respect to both realism and accuracy.

2.6 The locations of each photo point position complies with the requirement of the Ohio Power Siting Board regulations in that they are all public vantage points that are positioned within five miles of the proposed facility.

2.7 Truescape were directed to each of the Photo Point locations by representatives of Hardin Wind energy LLC.

2.8 The Zone of Visual influence diagrams have been created using Arc GIS software and do not account for conditions that may block or diminish turbine visibility. This includes objects such as buildings, structures and vegetation. The diagrams are attached as **APPENDIX C** (Ref pages 26 and 27) in the booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams".

2.9 The 3D Animated Shadow simulation depicts the length of shadow that each turbine would generate under sunny conditions. The animation Attached as **APPENDIX D** (Ref page 28) reflects sunlight conditions on the 30th May 2009.

2.10 To validate the Truescape methodology I have provided on page 21 a comparison of a simulation against an actual built wind farm. This comparison relates to a simulation Truescape produced for a project in Southland New Zealand called Project White Hill for New Developer Meridian Energy.

2.11 I have set out the following in this report:

- An overview of the TrueView™2 Photo Simulation; (Pages 3-4)
- Methodology; (Pages 5-12)
- Photopoint Locations; (Page 13)
- Model Input Data used to create the simulations; (Pages 14-16)
- Camera Lens Commentary (Page 17 - 19)
- Validation of Truescape Methodology (Page 20)
- Truescape Credentials (Pages 21-22)

- **APPENDIX A** – TrueView™ 2 Large Scale Photo Simulations. Attached as hard copy photo simulations (See Page 24)

- **APPENDIX B** – Reduced Size TrueView™2 Photo Simulations attached in hard copy in booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams". (See Page 25)

- **APPENDIX C** – Zone of Visual Influence Diagrams attached in hard copy in booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams". (See pages 26 and 27)

- **APPENDIX D** – Animated Shadow Simulation attached as CD (See page 28)

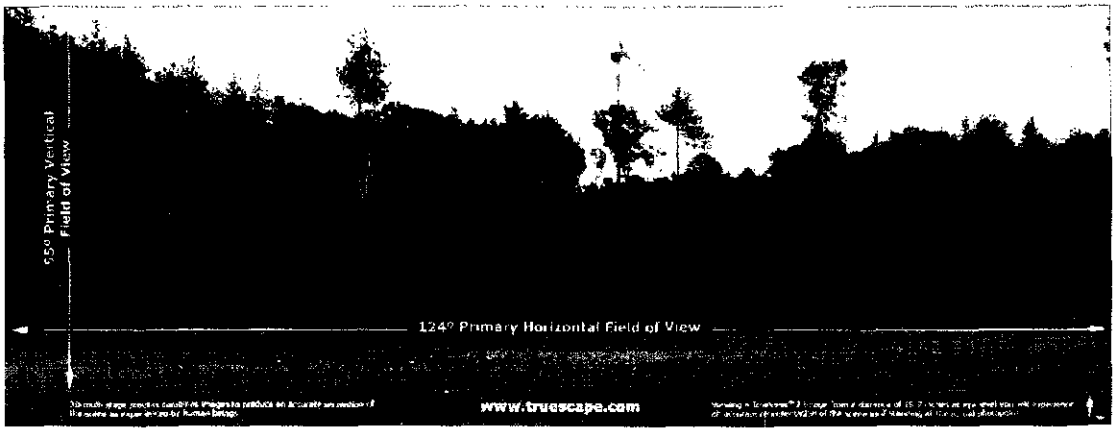
3 SUMARY AND CONCLUSION

3.1 The TrueView™2 photo simulations have been created using a robust methodology which when combined with the datasets outlined in this evidence sees these simulations generated using the most advanced and accurate technology available at the time of creation. Truescape considers the TrueView™2 photo simulations accurately represent the primary human field of view of the Hardin Wind Farm Project when viewed from the surveyed photo-point positions at the same time of day and reflecting the same conditions as those on the day the photographs were taken.

TONY COGGAN

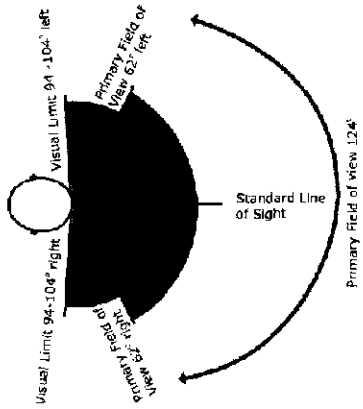
JUNE 2009

TrueView™2 PHOTO SIMULATIONS

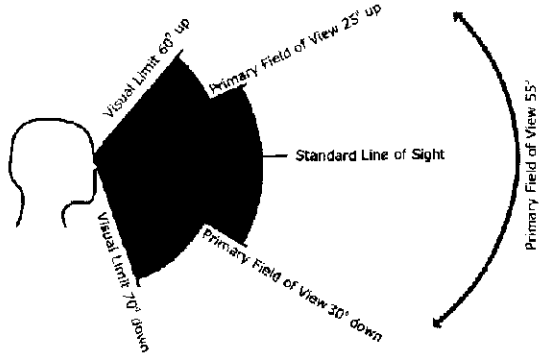


- A TrueView™2 is a high resolution, true scale format photo simulation that represents **The Primary Human Field of View** that would be seen if standing 19.7inches back from actual photopoint position at the same time of day and reflecting the same climatic conditions as those experienced on the day the photograph was taken.

PRIMARY HUMAN FIELD OF VIEW



Primary Human Horizontal Field of View



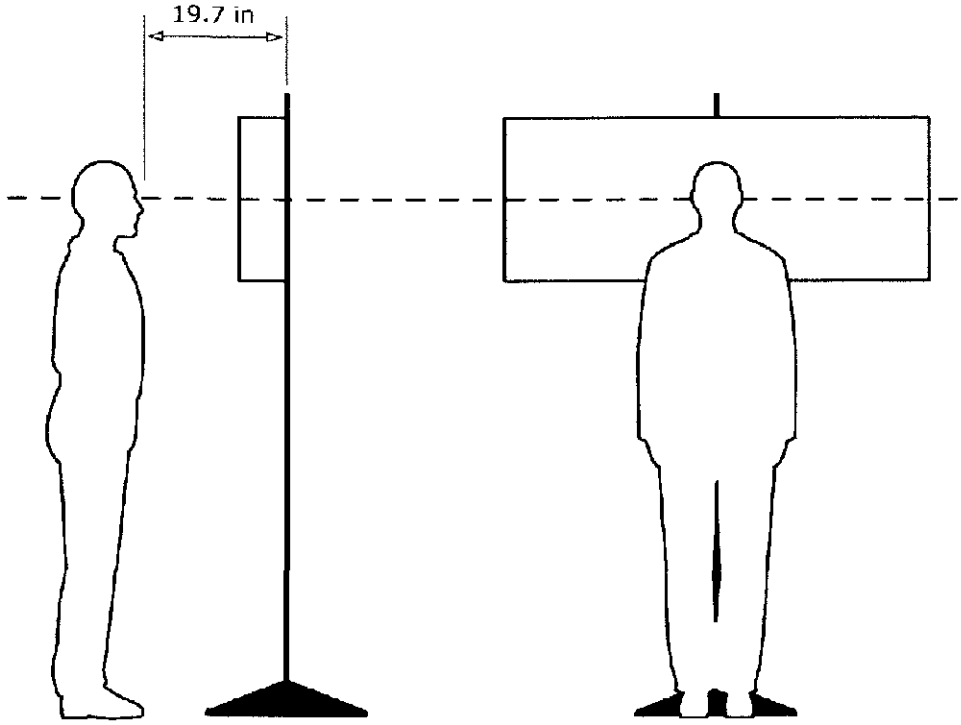
Primary Human Vertical Field of View

Reference: Panero J. and Zelnick M. (1979) *Human dimension and interior space: A source book of design reference standards*, London: The Architectural Press Ltd

TrueView™2 PHOTO SIMULATIONS

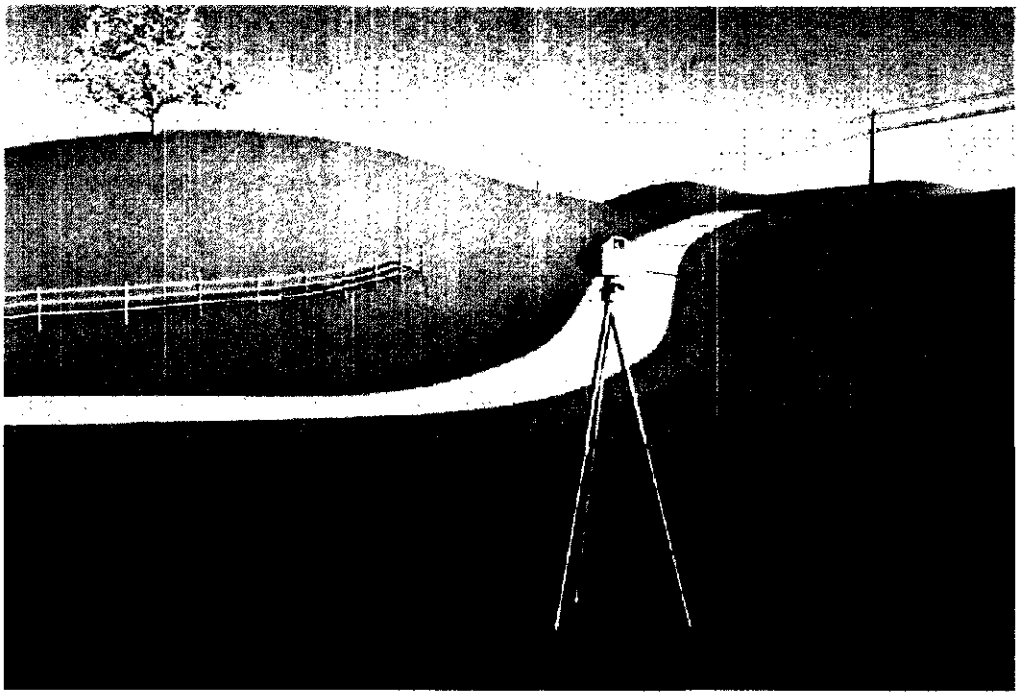
Correct Viewing of TrueView™2 Photo Simulations

- The TrueView™2 simulations when viewed at the correct height and from a distance of 19.7inches from the centre of the image completely fill your field of view with the same view you would see at the photo point position.
- The image should be displayed level at such a height to allow the viewer line of sight to be directly at the centre of the image.
- The viewer should be looking forward at the centre of the image at all times to ensure correct viewing as shown below.



METHODOLOGY

THE SITE VISIT

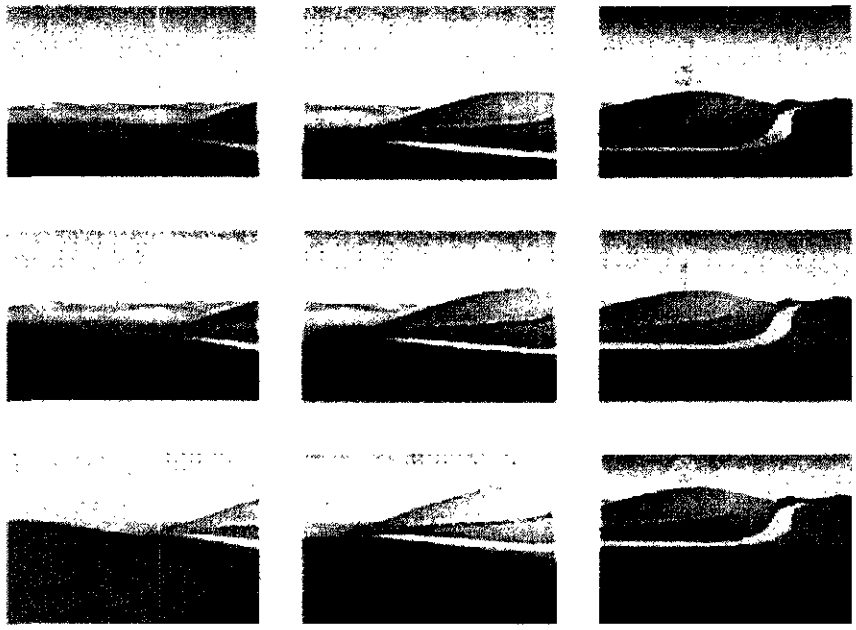


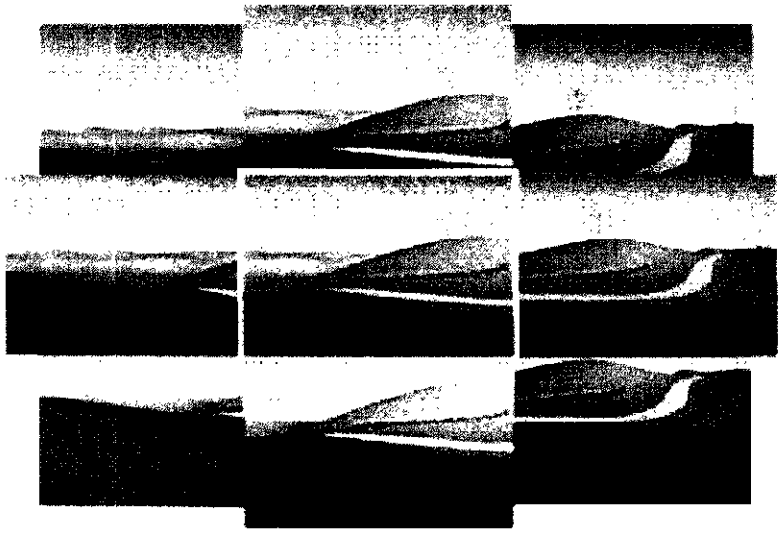
- The site visit is undertaken to take the necessary photographs and ground mark the photo point position and identify additional reference points to enable the surveyor to survey fix the exact location of the camera.

- A digital SLR 1:1 16 mega pixel camera is used to take the photography. This camera produces photographs at a resolution and clarity as good as current technology will allow when generating simulations.

METHODOLOGY

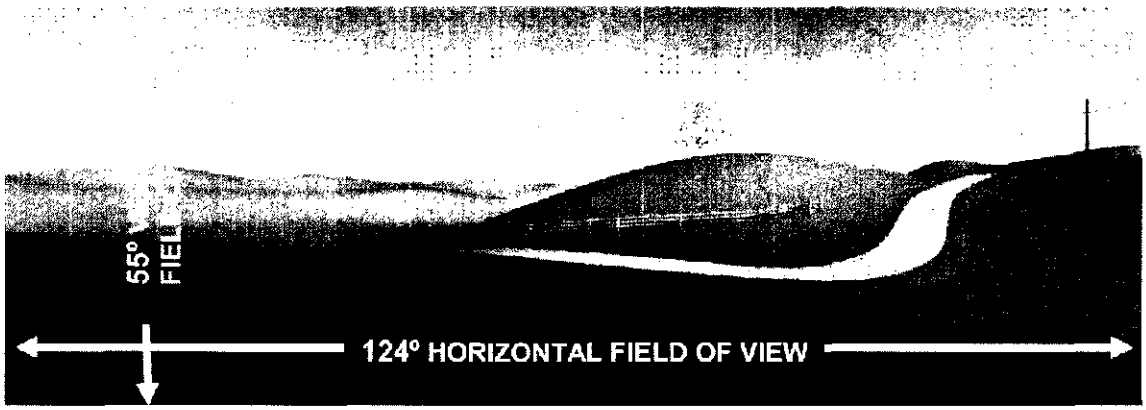
CREATING THE PRIMARY HUMAN FIELD OF VIEW IMAGE





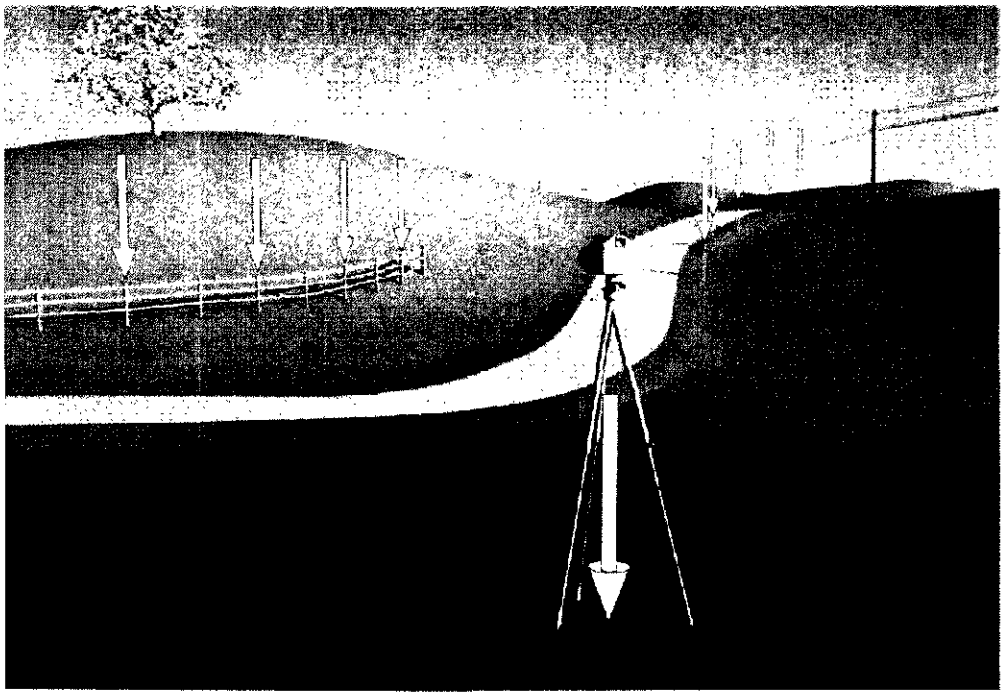
- The photographs are taken so that they overlap precisely to allow both the Primary Human Vertical and Horizontal Field of View to be recreated into a single primary human field of view image.

THE FINAL COLOUR ADJUSTED TrueView™2 PHOTOGRAPHY



- Using the middle photographs as the benchmark, each of the adjoining photographs are colour adjusted to ensure consistency throughout the image. The TrueView™2 photograph is now complete.

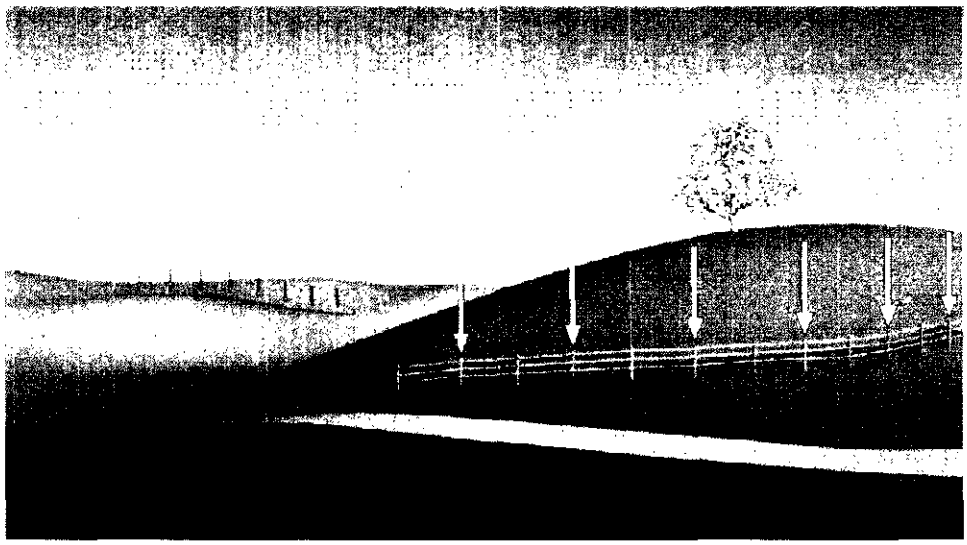
CAPTURING THE SURVEYED REFERENCE POINTS

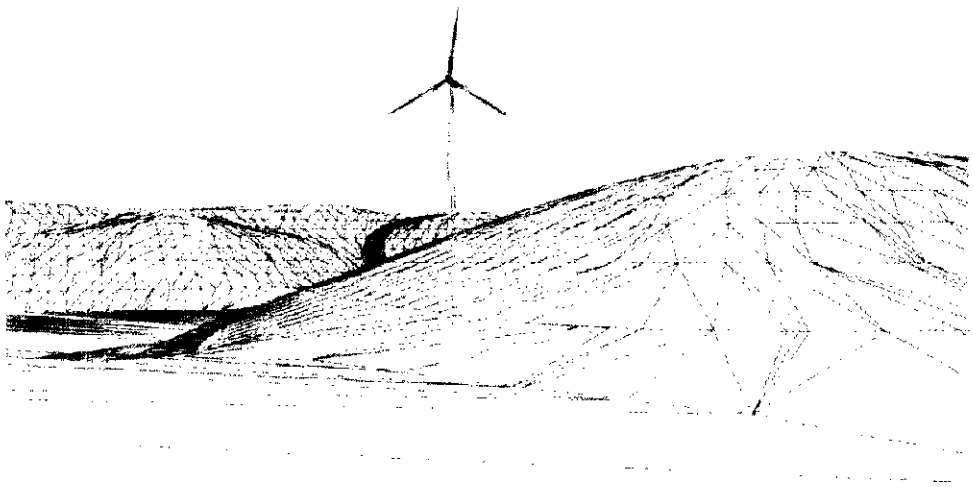


- To accurately create a TrueView™2 photo simulation the exact position of the camera is survey fixed by a surveyor.

- Additional reference points are identified during the site visit so that the 3D model can be accurately placed into the photograph. These reference points include things like fences, vegetation, houses and roads. The surveyor is directed to each of these points.

ALIGNING THE SURVEYED REFERENCE POINTS

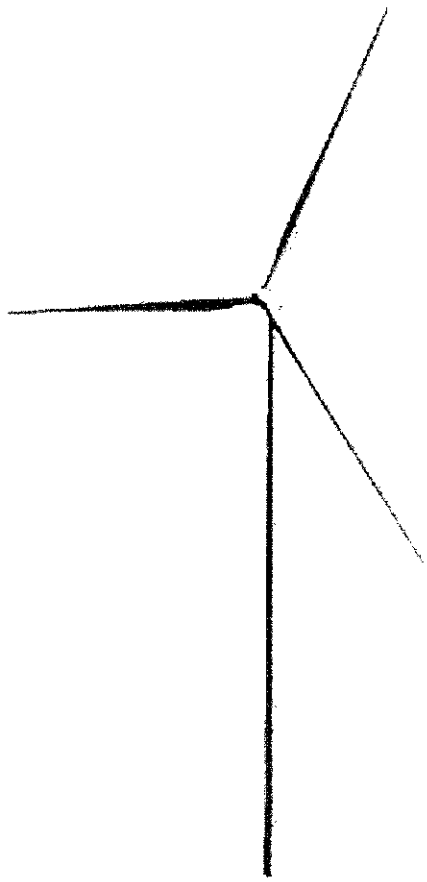




- The next step is to construct the 3D computer model. Using Autodesk® 3ds Max® 3D computer simulation software the survey fixed photo and reference points are imported into the 3D model. A "computer camera" is created to simulate the camera that captured the original photographs, including matching the focal length. The simulated "computer camera" is then positioned at the same survey coordinates as the physical photopoint positions.

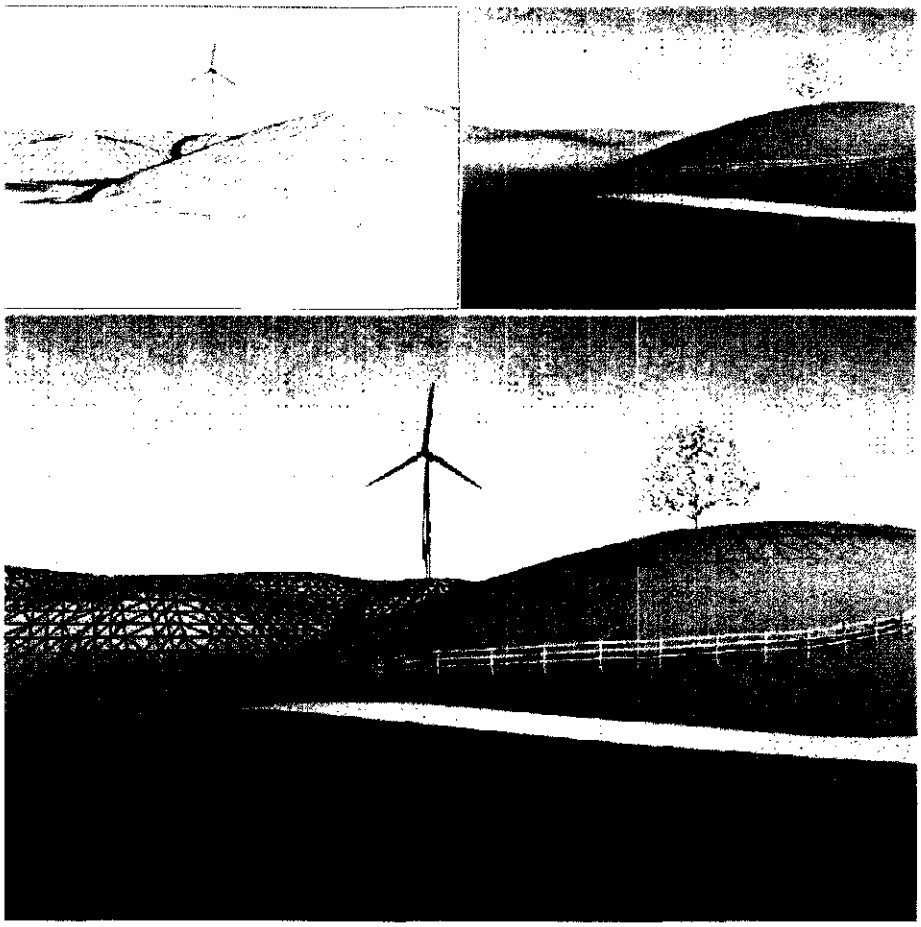
- The photographs are then incorporated into the computer model. This is done by correctly aligning the "computer camera" to match the surveyed reference points to the reference objects, and to the terrain if required.

BUILDING THE PROPOSED PROJECT IN 3D



- The proposed development is then modelled in 3D in accordance with all dimensions, site layouts, colours and textures. (See "Model Input Data" section on pages 14 – 16)

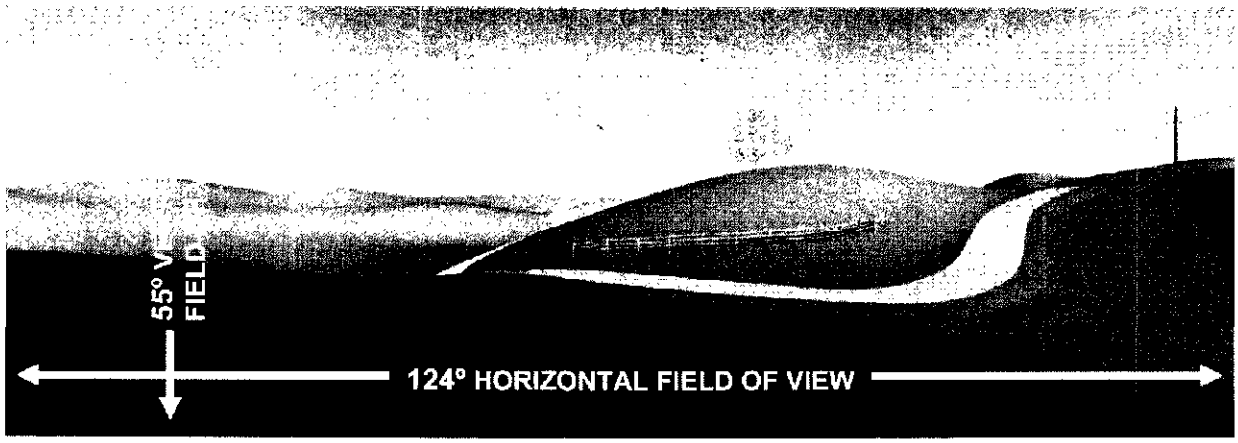
BUILDING THE PROPOSED PROJECT IN 3D



- The 3D terrain model of the site has been generated using the land contour data. The proposed development (turbines) have now been modelled in 3D and are now imported and positioned accurately into the scene.

- The simulation software allows the sun to be simulated at the precise time the original photography was captured. This ensures the lighting of the turbines as well as the shadows they cast are an accurate depiction of how the Project would appear in the photograph at the same time of day and reflecting the same climatic conditions as those experienced at the time the photograph was taken.

THE FINAL TrueView™2 SIMULATION



- In order to correctly place existing objects that are in front of the 3D model of the development these foreground objects are overlaid, from the original photograph, onto the computer generated image using photo shop software.

- Our extensive experience in researching how to accurately simulate the "Primary Human Field of View" has determined that the lens type is irrelevant when generating such simulations. The key factors are the aligning of the raw photographs in 3D, the size that the simulations are output at, and the viewing distance.

- The full size TrueView™2 simulations are printed at a size that represents the "Primary Human Field of View", being 124° horizontal field of view and 55° vertical field of view when standing 19.7inches from the centre of the image.

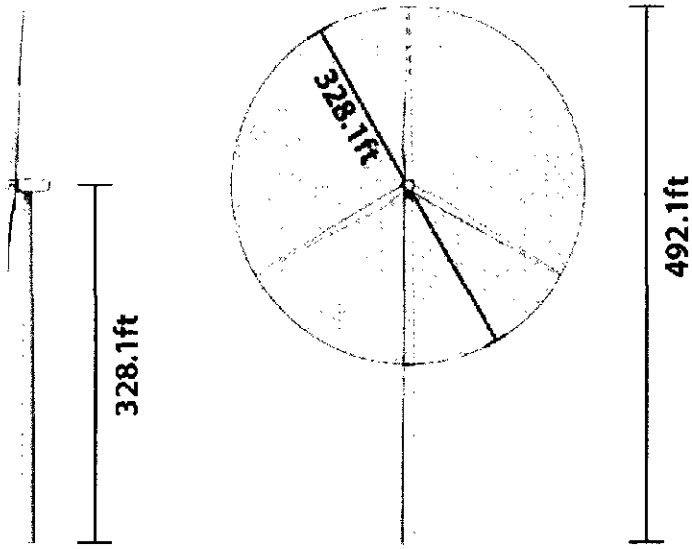
PHOTOPOINT LOCATIONS

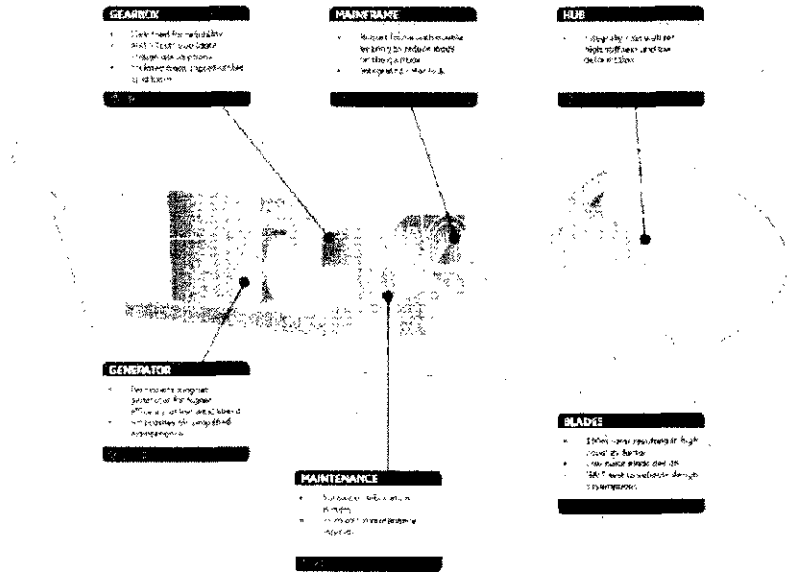
- Location map referencing the three TrueView™ 2 photo simulations.

- **View Point 04 -** Quickstep Church, TR 120
- **View Point 11 -** Farm Complex, junction CR 75 and TR 190
- **View Point 14 -** Farm Complex, CR 95 south of CR 130

MODEL INPUT DATA

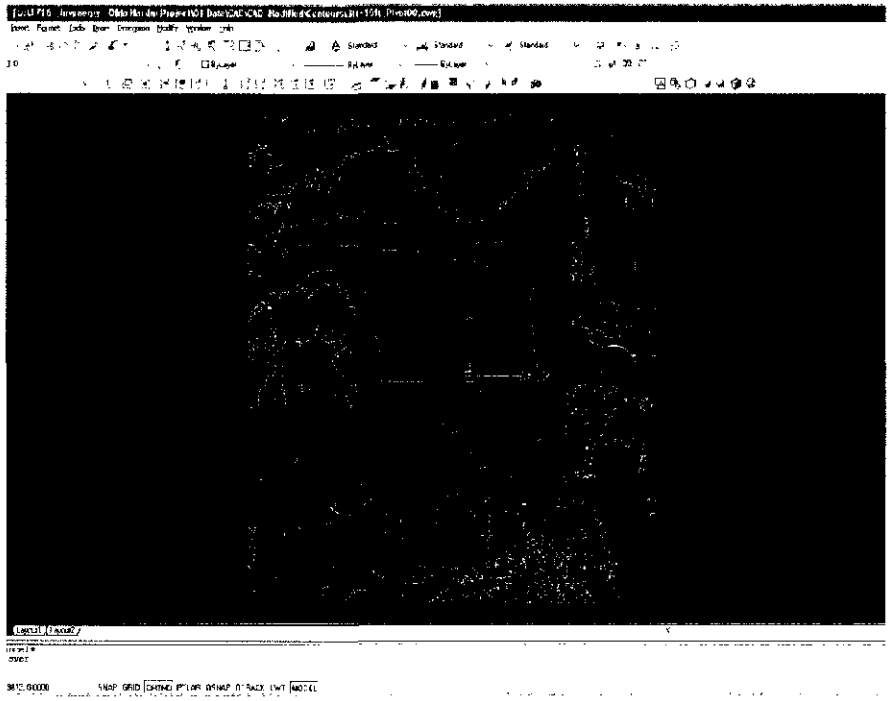
- GE 2.5mw XL Turbine. Data downloaded from GE Energy website.

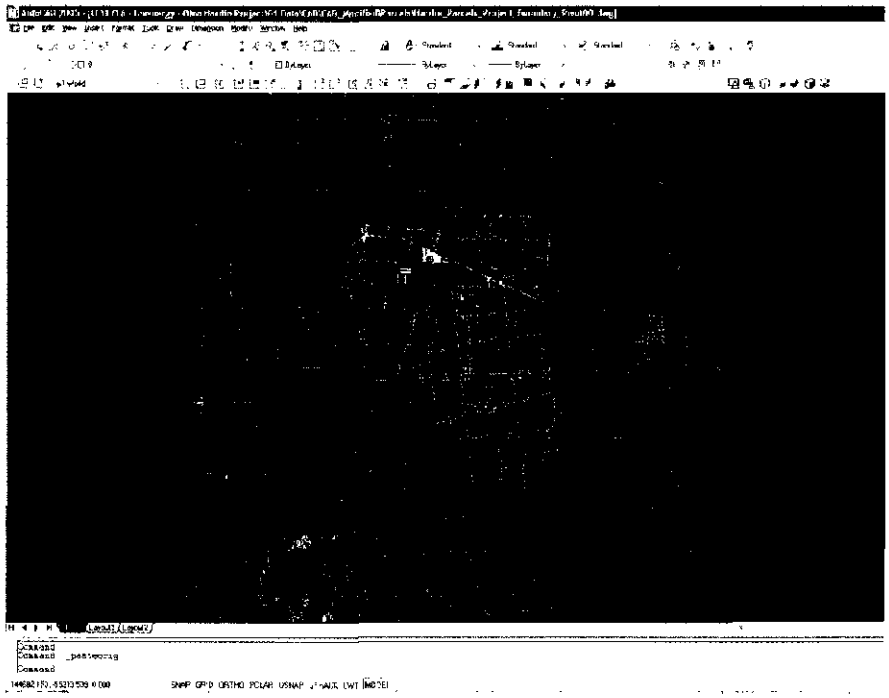




MODEL INPUT DATA

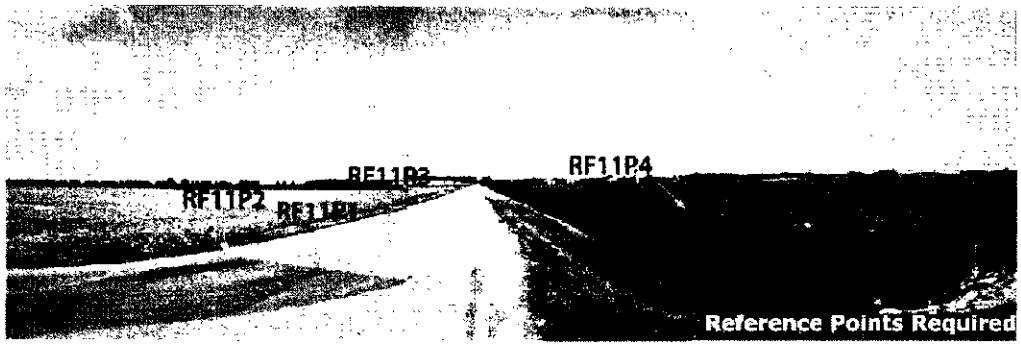
- Contour data (3ft) and turbine positions were supplied by Tim R. Mayle – *Hardin County* GIS Coordinator. Wider contour data sourced from USGS and generated using by ArgGIS and Global Mapper software.



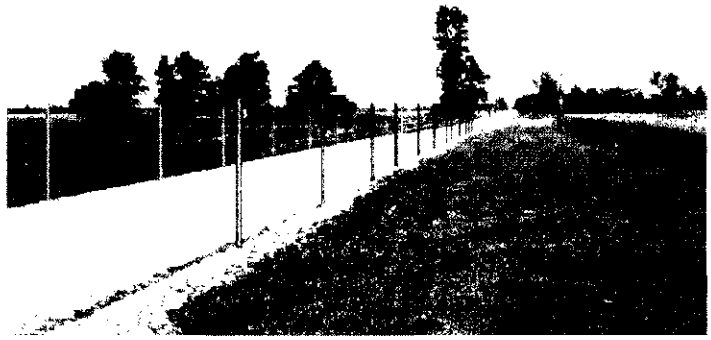


MODEL INPUT DATA

- All survey work was carried out by Attwell – Hicks, Ohio.



- Arrows indicate reference points that have been survey fixed



- Survey points accurately aligned to photograph

- Final TrueView™2 photo simulation

CAMERA LENS COMMENTARY

- In recent times throughout Asia Pacific, UK and the USA there have been many debates relating to the appropriateness of certain lens types used to generate accurate photo simulations. The following commentary outlines how the composite imagery used to generate the TrueView™2 photo simulations resolves the lens issue.

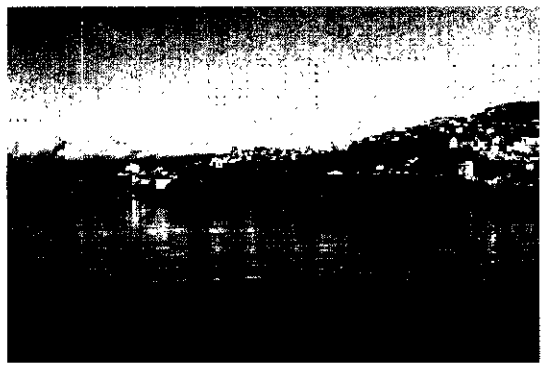
THE LENS ISSUE

1. Camera lens of different focal length create images of different fields of view. None of these fields of view are the same as the human field of view (see page 10). A camera lens does not encompass the same horizontal and vertical "degree of arc" that is captured by human binocular vision. This is why a picture taken with a "non-human" does not represent what we actually see.

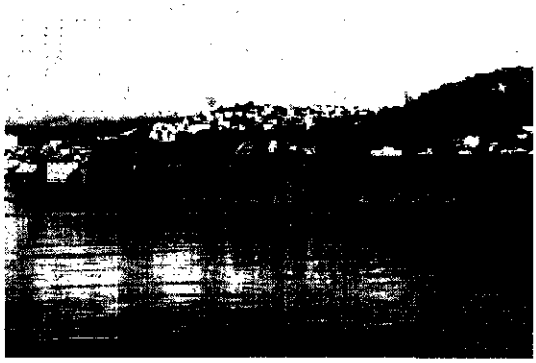
2. Look at the four photos below. The view captured with a 28mm lens looks further away than the view from the same spot taken with a 50mm lens. Standing at the same location, and using a 100mm lens, features in the picture look closer still, and with a 300mm lens, features that were far away now look much closer, and larger.

28 mm image

50 mm image



100 mm image

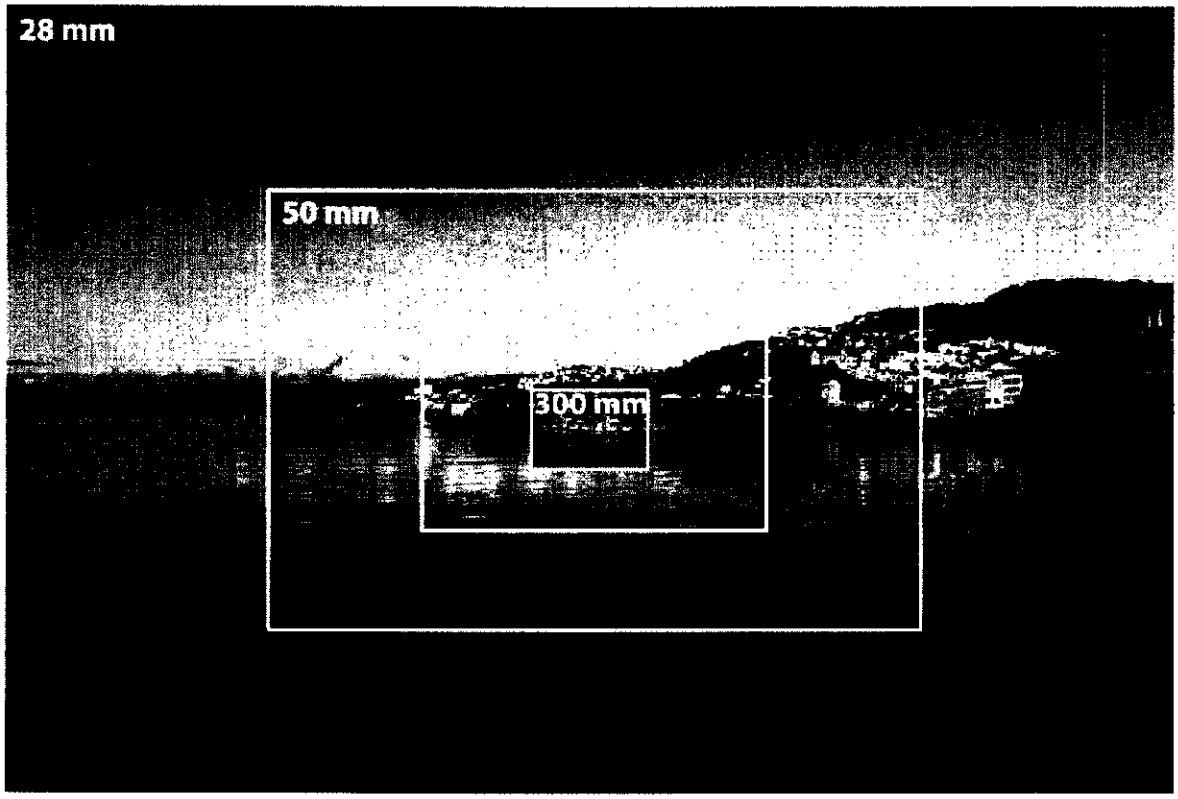


300 mm image

3. These different views are illusory, since all of the features in these photos are in reality a fixed size. Objects once built do not change in size. In reality, there is just one true view of what a person sees from any specified location.

4. To understand how illusions are created by lens size, one must understand depth of field, and how "depth of field" and "field of view" are related. As you increase the millimetre specification (or focal length) of a lens, the less field of view it incorporates – some of the view to the left and right, and above and below, is cropped out. The view is not only less wide, it is also less deep.

5. As you decrease your field of view you are decreasing the amount of visible foreground in the image, but leaving the vanishing point or distant center unaltered. It is this truncation of depth of field, which causes far objects in images to appear nearer to other physically closer objects in the scene. The image below shows the combined view when comparing 28mm, 50mm, 100mm and 300mm lenses.



6. For example, the field of view of a 50mm lens is contained *within* the field of view of a 28mm lens because a 28mm lens has a greater field of view than a 50mm lens. The 28mm image has a correspondingly greater depth of field because it incorporates more foreground image.

CAMERA LENS COMMENTARY

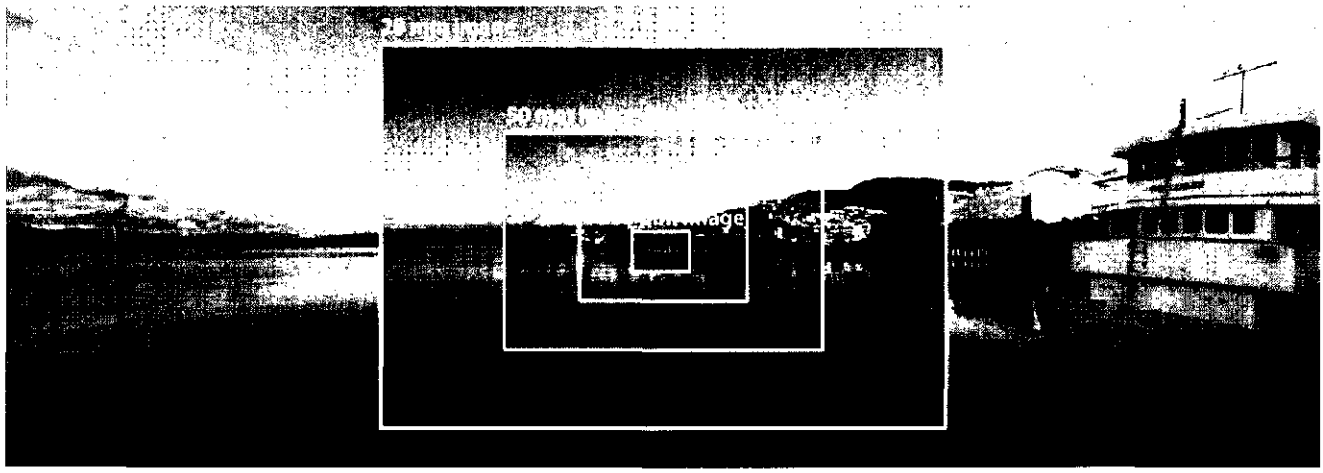
7. Photographs only represent a part of our primary field of vision. However photographs taken using a 28mm lens represent a far greater portion of our primary field of vision.

8. No camera lens duplicates the primary field of human vision. In order to be able to match exactly the field of view of the **vertical** extent of primary vision, we would need to use a camera lens of 25.933mm. (Thus, a 28mm lens is a much better starting point than a 50mm lens)

9. In order to match exactly the field of view of the **horizontal** extent of primary vision, we would need to use a camera lens of 9.571mm. However it is not practical to use a lens with a focal length of 9.571mm, as it becomes too difficult to compensate for the effects of distortion. A TrueView™2 image solves this problem.

10. Since it is not possible to take a photograph with a 9.571 mm lens, and print out that image on a flat plane, the horizontal length of the image itself must be made up of multiple images.

11. Truescape has chosen to create an image based upon a number of 28 mm images. We have selected this lens size for best accuracy and optimum efficiency in production. While it is theoretically possible to produce a similar outcome by processing a series of 50 mm, or 100 mm images, the complexity of production and the number of images required would be far greater, simply to produce the same result.



VALIDATION OF THE TRUESCAPE METHODOLOGY

1.1 I have attached below some post construction analysis of the White Hill wind farm that compared the simulations built using the constructed layout plan against the completed project. These simulations demonstrate the accuracy of the TrueView simulations. In particular, it can be seen that the size and placement of the turbines in this simulation is identical to the wind farm that was constructed. It should be noted that the turbines in the simulation seem more obvious than the actual turbines in the photograph.

1.2 The methodology by which the White Hills simulations were created is the same as that used for the simulations before the hearing today. It must be noted however, that the photography in the White Hills simulations is significantly inferior to that which was used for the simulations presented to this Hearing. Digital photography was not capable of capturing the high level of resolution now achievable, at the time the White Hills simulations were being produced.

SIMULATION OF WHITE HILL WIND FARM

ACTUAL PHOTOGRAPH OF BUILT WIND FARM

TRUESCAPE CREDENTIALS

1.3 Truescape has over 12 years experience working in the 3D Photo and Video Simulations industry. Truescape has completed a wide range of different visualisation projects from photo-simulations for simple projects to full computer generated 3D video simulations for complex projects. Truescape's client base crosses many industries, from Landscape Architecture and Engineering firms through to major New Zealand and Australian and US corporates.

1.4 Truescape adopts a team approach for project completion as each type and phase of a project calls for a different mix of specialised skill sets. This expertise crosses many disciplines including photography, engineering, architecture, surveying, landscape architecture, 3D computer modelling, evidence preparation and presenting evidence as expert witnesses. All members of our staff have either formal qualifications or have undergone professional training and have direct experience working in each these specialised areas.

1.5 Truescape simulations have been produced as evidence in forums such as the New Zealand Environment and High Courts, Australia's Victorian Civil and Administrative Tribunal and the Supreme Court. Members of Truescape's staff have presented evidence as expert witnesses in these Courts, where our work has been subjected to cross-examination and accepted as evidence.

1.6 Truescape has assisted in providing survey controlled simulations for the following Wind Farm Developments:

- 2003 – Meridian Energy's Te Apiti Farm, Council Hearing;
- 2004 – Meridian Energy's White Hill Farm, Council Hearing;
- 2004 – Southern Hydro's Dollar Wind Farm South Australia, Panel Hearing;
- 2005 – Genesis Energy's Awhitu Wind Farm, Environment Court;
- 2005 – Unison Energy's Hawkes Bay Wind Farm, Environment Court;
- 2006 – Meridian Energy's Project West Wind, Environment Court;
- 2006 – Acciona Energy's Wind Farm South Australia, Panel Hearing;
- 2007 – Invenergy, Moresville Wind Energy Park, New York; USA Permitting Hearing;

- 2008 – Bluewater Wind, Offshore Wind Farm, Maryland, USA; Permitting Hearing;
- 2008 – Bluewater Wind, Offshore Wind Farm, New Jersey, USA; Permitting Hearing
- 2008 – Meridian Energy, Project Hayes, Environment Court;
- 2008 – Hydro Tasmania, Victoria Australia, Permitting Hearing;
- 2008 – Meridian Energy, Mill Creek, Council Hearing;
- 2008 – Meridian Energy, Central Plains, Council Hearing

APPENDIX A

LARGE SCALE TRUEVIEW™SIMULATIONS

SEE LARGE SCALE HARD COPY SIMULATIONS

APPENDIX B

REDUCED SIZE TRUEVIEW™SIMULATIONS

SEE REDUCED SIZE BOOKLET

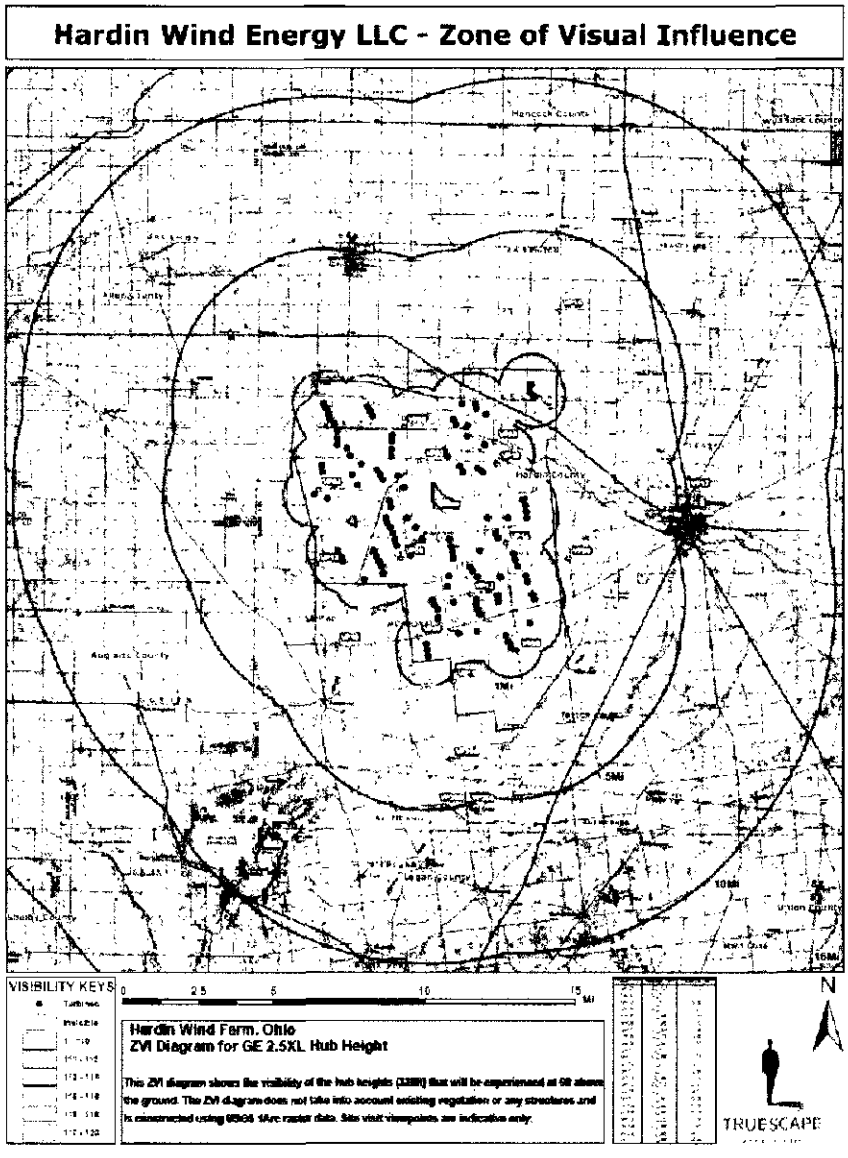
APPENDIX C

ZVI DIAGRAMS

The Zone of Visual Influence (ZVI) diagrams have been created using Arc GIS software and do not account for conditions that may block or diminish turbine visibility. This includes objects such as buildings, structures and vegetation.

The ZVI diagram below shows the visibility of the hub heights that would be experienced at 6ft above ground level.

See full size diagram in the hardcopy booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams".

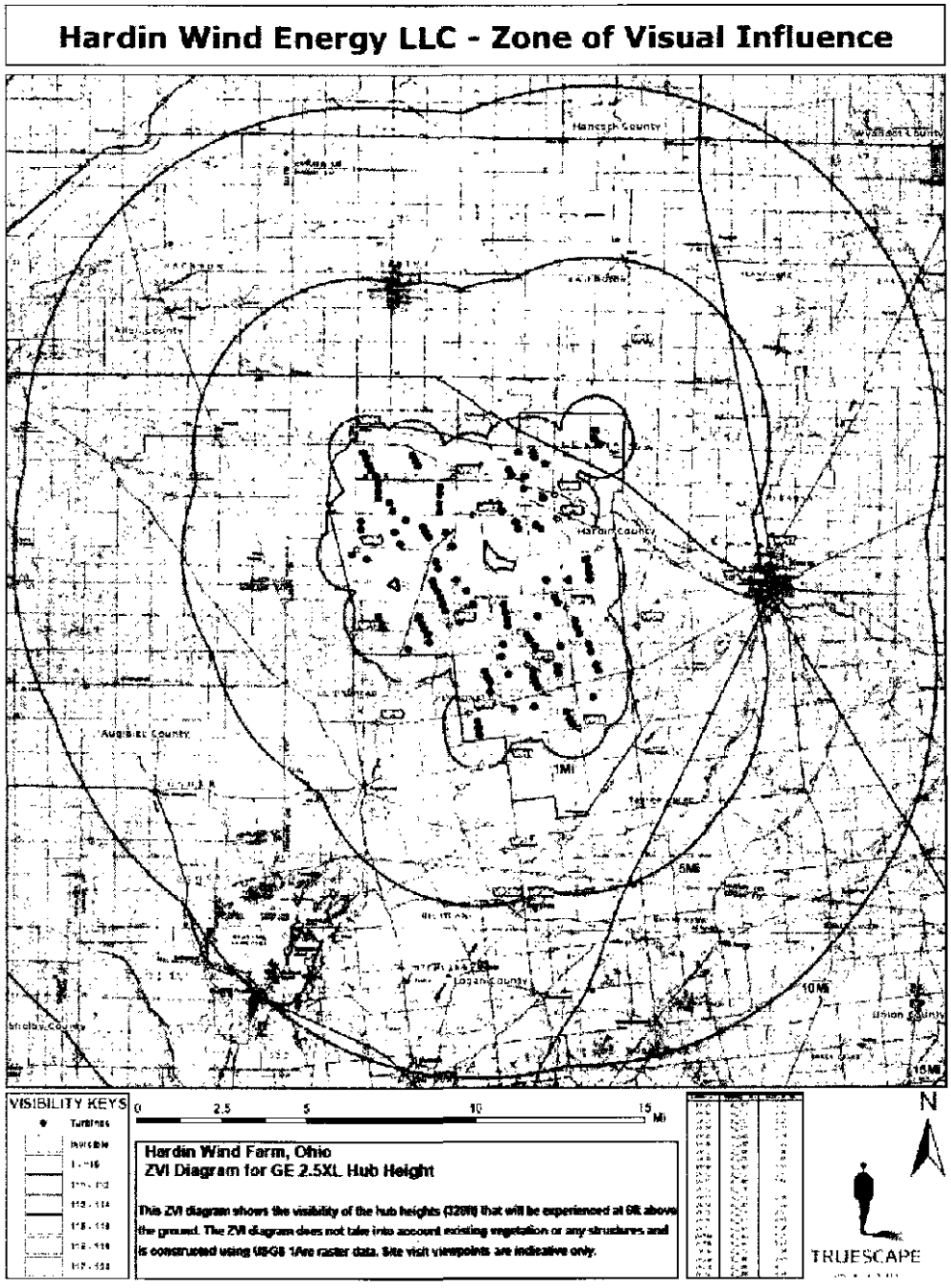


APPENDIX C

ZVI DIAGRAMS

The ZVI diagram below shows the visibility of the blade tips that would be experienced at 6ft above ground level.

See full size diagram in the hardcopy booklet entitled "Reduced Size TrueView™2 Photo Simulations and Zone of Visual Influence Diagrams".

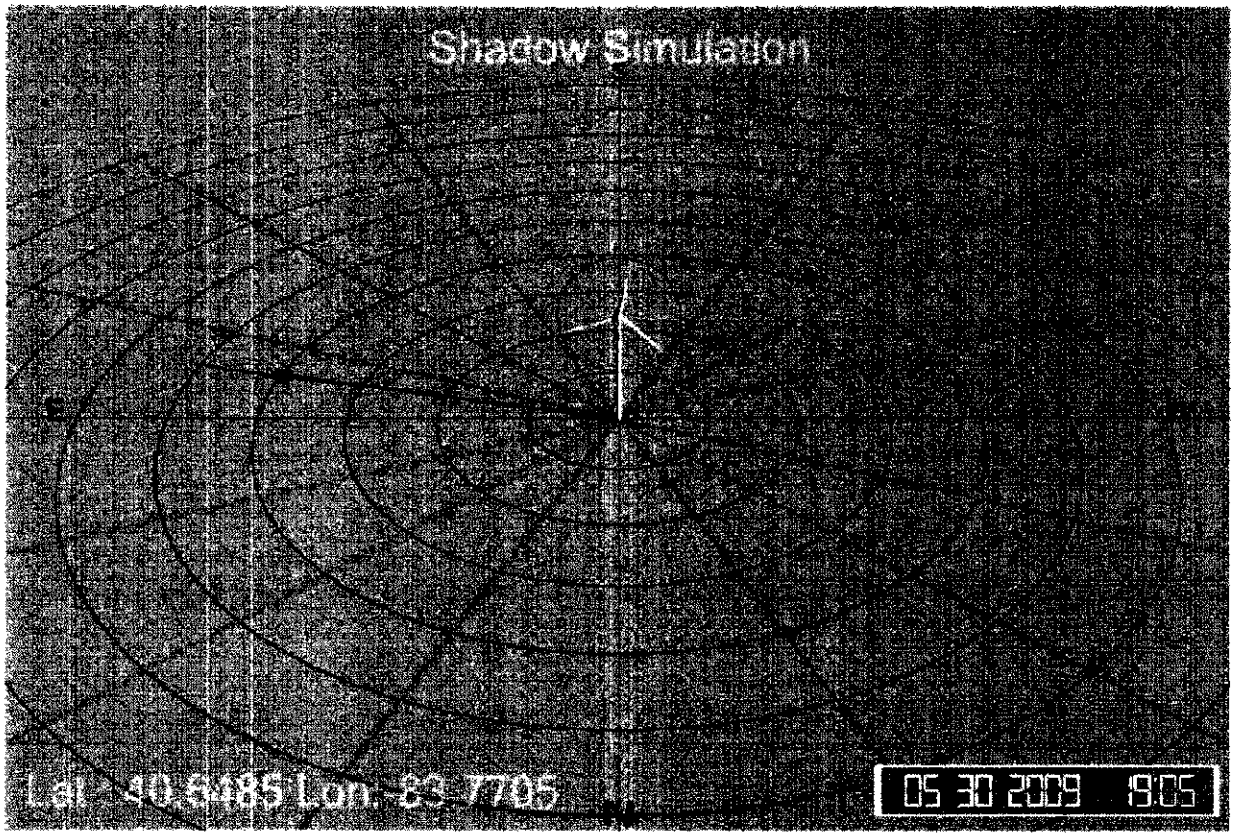


APPENDIX D

ANIMATED SHADOW SIMULATION

The animated shadow simulation communicates the length of shadow produced by each turbine during a sunny day. The animation reflects sunlight conditions on the 30th May 2009

The image below depicts a screen shot from the animated shadow simulation. The animation is provided on CD attached to this evidence.



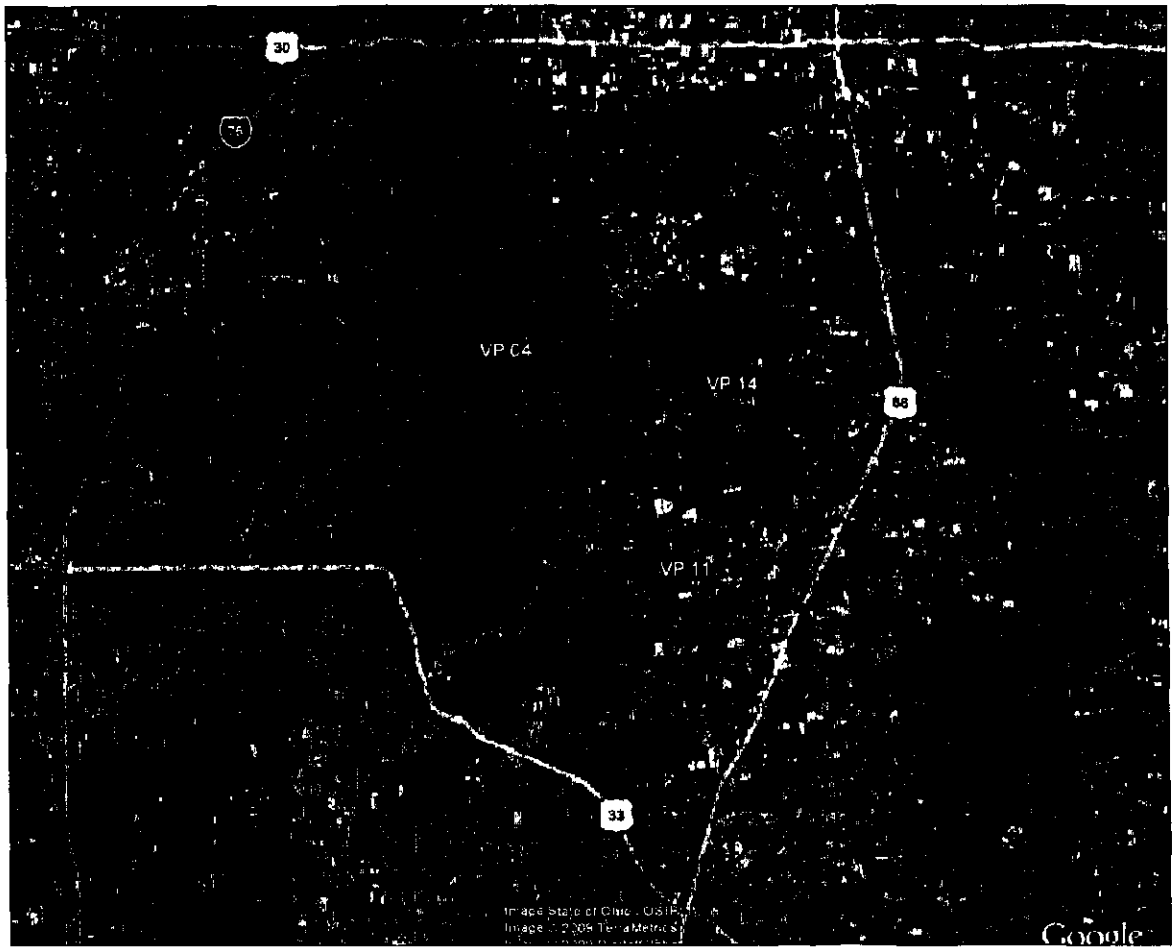
Hardin Wind Energy LLC
Hardin Wind Farm Project, Ohio

Reduced Size TrueView™2 Photosimulations
June 2009

TRUESCAPE
VISUAL REALITY

www.truescape.com

Viewpoint Locations



Hardin Wind Farm Project, Ohio

Location

VP 04 - Quickstep Church
VP 11 - Farm Complex, Jct CR 75 and TR 190
VP 14 - Farm Complex, Jct CR 95 South of CR 130

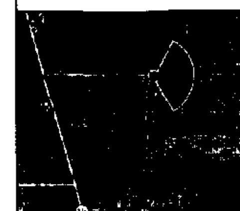
Viewpoint 04 - Quickstep Church - BEFORE

Viewpoint 04 - Quickstep Church - AFTER

hardin wind energy LLC

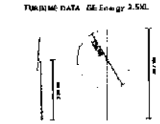
Invenergy
Ohio Hardin Project

Viewpoint No.04
Quickstep Church

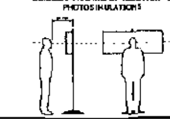


EASTING POSITION NAD83 (ft):	1866431.A
NORTHING POSITION NAD83 (ft):	864751.9
ELEVATION OF PHOTOPOINT POSITION NAVD88(ft):	984.5
HEIGHT OF CAMERA ABOVE GROUND (ft):	5.41
DATE OF PHOTOGRAPHY:	28-MAY-2009 at 05:13 pm
DISTANCE TO NEAREST TURBINE (ft):	3214
ORIENTATION OF VIEW:	82°
HORIZONTAL FIELD OF VIEW:	124°
VERTICAL FIELD OF VIEW:	55°

TURBINE DATA GE Energy 2.5XL



CORRECT VIEWING OF TRUEVIEW™2 PHOTOSIMULATIONS



NOTES:

Photopoint locations have been precision surveyed by
Arnold Hicks
30575 Bainbridge Road, Suite 100, Solon
OH 44139

Heights are above mean sea level

No part of this photosimulation shall be altered in any way.

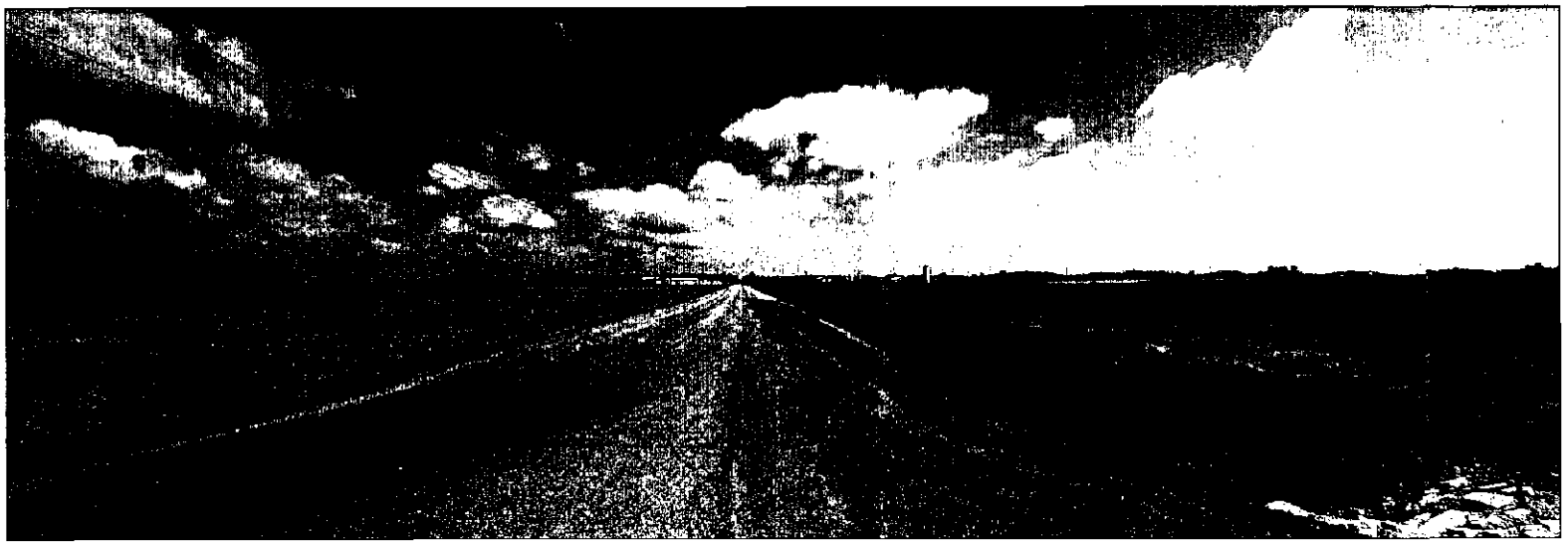
If this photosimulation is to be used for any purpose (other than your own personal use) it is to be reproduced in its entirety

PHOTOSIMULATION CREATED USING
TrueView™ 2 TECHNOLOGY
[illegible]
PROVIDED BY

TRUESCAPE
VISUAL REALITY

www.truescape.com

DATE PRINTED 19-June-2009



Viewpoint 11 - Farm Complex, Jct CR 75 and TR 190 - BEFORE

Viewpoint 11 - Farm Complex, Jct CR 75 and TR 190 - AFTER

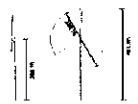
hardin wind energy LLC

Invenergy
Ohio Hardin Project

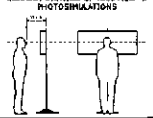
Viewpoint No.11
Farm Complex, Jct CR 75 and TR 190

EASTING POSITION NAD83 (ft):	1420053.7
NORTHING POSITION NAD83 (ft):	531807.7
ELEVATION OF PHOTOPOINT POSITION NAVD88(ft):	1068.0
HEIGHT OF CAMERA ABOVE GROUND (ft):	5.41
DATE OF PHOTOGRAPH:	28-MAY-2008 at 11:55 hrs
DISTANCE TO NEAREST TURBINE (ft):	5193
ORIENTATION OF VIEW:	350°
HORIZONTAL FIELD OF VIEW:	124°
VERTICAL FIELD OF VIEW:	89°

TURBINE DATA: GE Energy 2.5XL



CORRECT VIEWING OF TRUEVIEW™2 PHOTOSIMULATIONS



NOTES.

Photopoint locations have been precision surveyed by:
Abrell-Hicks
8575 Pembrooke Road, Suite 180, Solon
OH 44139

Heights are above mean sea level.

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PHOTOSIMULATION CREATED USING
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PATENT APPLIED FOR
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TRUESCAPE
VISUAL REALITY

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DATE PRINTED 10-June-2008

Viewpoint 14 - Farm Complex, CR 95 South of CR 130 - BEFORE

Viewpoint 14 - Farm Complex, CR 95 South of CR 130 - AFTER

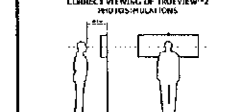
Invenergy
Ohio Hardin Project

Viewpoint No.14
Farm Complex, CR 95 South of CR 130

EASTING POSITION NAD83 (ft):	1628199.8
NORTHING POSITION NAD83 (ft):	355990.1
ELEVATION OF PHOTOPOINT POSITION NAVD88(ft):	1007.0
HEIGHT OF CAMERA ABOVE GROUND (ft):	3.41
DATE OF PHOTOGRAPH:	[illegible]-MAY-2009 at 12:45 pm
DISTANCE TO NEAREST TURBINE (ft):	[illegible]
ORIENTATION OF VIEW:	[illegible]
HORIZONTAL FIELD OF VIEW	124°
VERTICAL FIELD OF VIEW:	55°

TURBINE DATA: GE Energy 2.5xl

CORRECT VIEWING OF TRUEVIEW™2 PHOTOSIMULATIONS



NOTES:

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DATE PRINTED 19-June-2009

#U2-042 East Lima-South Kenton 138kV
Generation Interconnection

This analysis was completed to assess the reliability impact for the new generation interconnecting to the PJM system as a capacity resource.

Network Impacts

Interconnection Option #1 - East Lima-South Kenton 138kV

Local AEP Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The Invenergy project was studied as a 201 MW net capacity consistent with the interconnection application. The results are summarized below.

Normal System (2012 Summer Conditions)

- A 138 kV 600 A switch at South Kenton is overloaded to 134% of the summer normal rating of 156 MVA and 101% of the winter normal rating of 206 MVA.
- The South Kenton 138/69 transformer #1 is overloaded to 104% of the summer and winter normal rating of 41 MVA.
- The South Kenton 138/69 transformer #2 is overloaded to 118% of the summer and winter normal rating of 39 MVA.
- The entire length of 138 kV line between South Kenton and East Lima, except the portion between U1-060 and U2-042, is overloaded to more than 100% of the conductor summer normal rating of 185 MVA. The winter normal rating is not exceeded for system normal.

- Single Contingency (2012 Summer Conditions)

- The entire length of 138 kV line between South Kenton and East Lima is overloaded to more than 150% of the conductor summer emergency rating of 257 MVA for an outage on the U1-060 – West Newton 138 kV line or on the U2-042 – Lynn 138 kV line.
- A 138 kV 800 A wavetrap and risers at South Kenton station are overloaded to 197% and 162% of their summer emergency ratings of 206 MVA and 250 MVA for the outage on the U1-060 – West Newton 138 kV line.

- A 69 kV 600 A switch and 800 A wavetrap at South Kenton station are overloaded to 129% and 121% of their summer emergency ratings of 192 MVA and 205 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Nevada – Upper Sandusky 69 kV line is overloaded to 137% of the summer emergency rating of 31 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Nevada – Broken Sword 69 kV line is overloaded to 132% of the summer emergency rating of 31 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Kenton – Rockwell 69 kV line is overloaded to 145% of the summer emergency rating of 50 MVA for the outage on the U1-060 – West Newton 138 kV line.

- A 69 kV 600 A switch and 800 A wavetrap at North Waldo station are overloaded to 127% and 119% of their summer emergency ratings of 192 MVA and 205 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The North Waldo – Windfall Sw. 138 kV line is overloaded to 102% of the summer emergency rating of 192 MVA for the outage on the U1-060 – West Newton 138 kV line.

- Two 69 kV 600 A switches and risers at Kenton station are overloaded to 112% and 117% of their summer emergency ratings of 96 MVA and 92 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Kenton – Ashland Pipe 69 kV line is overloaded to 108% of the summer emergency rating of 100 MVA for the outage on the U1-060 – West Newton 138 kV line.

- A 69 kV 600 A switch at Cessna Sw. is overloaded to 110% of the summer emergency rating of 96 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Cessna Sw. – Ashland Pipe 69 kV line is overloaded to 106% of the summer emergency rating of 100 MVA for the outage on the U1-060 – West Newton 138 kV line.

- Two 69 kV 600 A switches and risers at Dunkirk station are overloaded to 109% and 116% of their summer emergency ratings of 96 MVA and 90 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The Cessna Sw. – Dunkirk 69 kV line is overloaded to 104% of the summer emergency rating of 100 MVA for the outage on the U1-060 – West Newton 138 kV line.

- Two 69 kV 600 A switches and risers at Dunkirk station are overloaded to 101% and 108% of their summer emergency ratings of 96 MVA and 90 MVA for the outage on the U1-060 – West Newton 138 kV line.

- Two 69 kV 600 A switches at Forest station are overloaded to 101% of their summer emergency rating of 90 MVA for the outage on the U1-060 – West Newton 138 kV line.

- The East Lima 138/69 transformer #3 is overloaded to 100% of the summer emergency rating of 85 MVA for the outage on the U2-042 – Lynn 138 kV line.

Please note that these affected facilities may appear in additional contingencies that are not mentioned.

Also note that there are several contributions to existing overloads that are not listed.

Multiple Contingency (2012 Summer Conditions)

- No problems identified

Short Circuit Analysis

- East Lima 138 kV circuit breakers C2 and D2 are overdutied to 100.4%, and 100.2% for the addition of the new generating facility, and would need to be replaced.

- It should be noted that this new generating facility contributes 2-3% to several 138 kV circuit breakers at East Lima and South Kenton stations.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Facility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Local Upgrades

Upgrades cost have been estimated in bulk because of the quantity of upgrades necessary. More detailed estimates will be provided in the impact study. There are other design alternatives that could be considered. More detailed analysis would need to be completed to determine if another alternative is feasible and also less expensive.

- Reconductor approximately 34 miles of 138 kV line.
  Estimated Cost (2008 Dollars): **$51,000,000**

- Reconductor approximately 28 miles of 69 kV line.

Estimated Cost (2008 Dollars): **$28,000,000**

- Replace station equipment including 3 138/69 kV transformers, switches, wavetraps and risers at various stations.
  Estimated Cost (2008 Dollars): **$6,500,000**

- Replace 138 kV circuit breakers C2 and D2 and associated equipment at East Lima station.
  Estimated Cost (2008 Dollars): **$1,000,000**

*For option 1, analysis was completed with U2-042 operating at 13% of capacity. For that condition, most of the upgrades are not necessary. However, the replacement of the 138 kV circuit breakers at East Lima is still required.

Network Impacts

The Queue Project U2-042 was studied as a 201MW (Capactiy=26MW) injection into the AEP system at a tap of the East Lima-South Kenton 138kV line. Project U2-042 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion only of the interconnection)

No problems identified

Multiple Facility Contingency
(Double Circuit Tower Line contingencies only for the full energy output. Stuck breaker and bus fault contingencies will be performed for the Impact Study)

1. **(AEP/AEP)** The U1-060-West Newton 138kV line loads from 94.03% to 177.05% (DC power flow) of its emergency rating (192MVA) for the tower line outage (AEP_TOWER43_A_T142_U2_041_B). This project contributes approximately 159.4MW to cause this thermal violation.

2. **(AEP/AEP)** The West Newton-East Lima 138kV line loads from 91.93% to 174.95% (DC power flow) of its emergency rating (192MVA) for the tower line outage (AEP_TOWER43_A_T142_U2_041_B). This project contributes approximately 159.4MW to cause this thermal violation.

Short Circuit

No problems identified..

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts", initially caused by the addition of this project generation)

1. The overload on the U1-060-West Newton 138kV circuit can be alleviated by replacing two (2) 138kV switches at West Newton and reconductoring approximately 6 miles of 138kV line between U1-060 and West Newton. The estimated cost is **$9,100,000**.

2. The overload on the West Newton-East Lima circuit can be alleviated by replacing a 138 kV 1200 A Switch, wavetrap, and two risers at East Lima and reconductoring approximately 13.4 miles of 138 kV line between West Newton and East Lima. The estimated cost is **$20,200,000.**

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

None.

Delivery of Energy Portion of Interconnection Request

(PJM also studied the delivery of the energy portion of this Interconnection Request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

3. **(AEP/AEP)** The U1-060-West Newton 138kV line loads from 102.1% to 205.2% (DC power flow) of its normal rating (156MVA) for non-contingency condition. This project contributes approximately 160.8MW to the thermal congestion.

4. **(AEP/AEP)** The West Newton-East ima 138kV line loads from 99.5% to 202.6% (DC power flow) of its normal rating (156MVA) for non-contingency condition. This project contributes approximately 160.8MW to the thermal congestion.

5. **(AEP/AEP)** The R60-Robison Park 345kV line loads from 137.7% to 139.3% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 14.5MW to the thermal congestion.

6. **(AEP/AEP)** The R60-Robison Park 345kV line loads from 101.7% to 102.8% (DC power flow) of its emergency rating (1301MVA) for the single line contingency outage (AEP21). This project contributes approximately 14.3MW to the thermal congestion.

Interconnection Option #2 - East Lima-Marysville 345kV

Local AEP Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The Invenergy project was studied as a 201 MW net capacity consistent with the interconnection application. The results are summarized below.

Normal System (2012 Summer Conditions)

- No problems identified.

Single Contingency (2012 Summer Conditions)

- No problems identified.

\
Multiple Contingency (2012 Summer Conditions)

- No problems identified.

Short Circuit Analysis

- No problems identified.

Local/Network Upgrades

- No local upgrades required

Network Impacts

The Queue Project U2-042 was studied as a 201MW (Capacity = 26MW) injection at the East Lima - Marysville 345kV lines in the AEP area. Project U2-042 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only for the full energy output. Stuck breaker and bus fault contingencies will be performed for the Impact Study)

None

Short Circuit

No problems identified..

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. **(AEP/AEP)** The Eastown Road-Rock Hill 138kV line (from bus 23137 to bus 23202 ckt 1) loads from 101.72% to 115.69% (DC power flow) of its emergency rating (184MVA) for the tower line outage (AEP_TOWER44_T142B). This project contributes approximately 25.7MW to the thermal violation.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts", initially caused by the addition of this project generation)

See list under Local/Network Upgrades.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

1. The overload on the Eastown Rd-Rock Hill 138kV circuit can be alleviated by replacing the 138 kV risers at Rock Hill station terminal.

   Estimated Cost (2008 dollars): **$75,000**

Delivery of Energy Portion of Interconnection Request

(PJM also studied the delivery of the energy portion of this Interconnection Request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

2. **(AEP/AEP)** The R60-Robison Park 345kV line (from bus 96546 to bus 22670 ckt 1) loads from 136.9% to 138.0% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 9.4MW to the thermal congestion. Previous project(s) Y41 contribute(s) to the loading by 14 MW(1.6%).

#U2-041 Delaware-Centerville 138kV
Generation Interconnection

This analysis was completed to assess the reliability impact for the new generation interconnecting to the PJM system as a capacity resource.

Local AEP Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet performance criteria in accordance with the AEP FERC Form 715. Therefore, this set of criteria was used to assess the impact of the proposed facility on the AEP System. The Invenergy project was studied as a 300 MW net energy injection consistent with the interconnection application. This project was studied with PJM projects #P55, R48, R49, S072, S073, T130, T131, T142, U1-059, U1-060, and U2-026 already in service at 100% output in the vicinity of U2-041. The interconnection project was studied at full capacity. The results are summarized below.

Option #1

(East Lima – Marysville 345 kV)

Normal System (2012 Summer Conditions)

- No problems identified

Single Contingency (2012 Summer Conditions)

- No problems identified

Multiple Contingency (2012 Summer Conditions)

- No problems identified

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Facility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Option #2

(Southwest Lima – Marysville 345 kV)

Normal System (2012 Summer Conditions)

- No problems identified.

Single Contingency (2012 Summer Conditions)

- No problems identified.

Multiple Contingency (2012 Summer Conditions)

- AEP Eastown Road – Rockhill[1] 138 kV line gets overloaded to 103% (190 MVA) of its emergency rating for an outage of the AEP East Lima – Marysville 345 kV line and AEP East Lima – Southwest Lima 345 kV line. Without the addition of U2-041 Project, the same facilities are loaded to 96% (177 MVA) of emergency rating under the same contingency.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Stability analysis was not performed as part of this Feasibility Study. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that Great Lakes will adhere to this standard.

Network Impacts

Option #1

(East Lima – Marysville 345 kV)

[1] The affected facility may appear in additional contingencies that are not mentioned.

The Queue Project U2-041 was studied as a(n) 300MW (Capacity = 39MW) injection at the East Lima – Marysville 345 kV lines in the AEP area. Project U2-041 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion only of the interconnection)

No problems identified

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

No problems identified

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

No problems identified.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request. **These are not required reliability upgrades.**

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

As a result of the aggregate energy resources in the area, the following potential congestion was identified

1. **(AEP/AEP)** The R60C-Robison Park 345kV line (from bus 96546 to bus 22670 ckt 1) loads from 135.4% to 137.7% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 20.5MW to the thermal congestion.

2. **(AEP/AEP)** The R60C-Robison Park 345kV line (from bus 96546 to bus 22670 ckt 1) loads from 100.1% to 101.7% (DC power flow) of its emergency rating (1301MVA) for the single line contingency outage (AEP21). This project contributes approximately 20.2MW to the thermal congestion.

MISO Impacts

Any impacts on the MISO transmission system will be identified in the Impact Study.

Option #2

(Southwest Lima – Marysville 345 kV)

The Queue Project U2-041 was studied as a(n) 300MW(Capacity = 39MW) injection at the SW Lima- Marysville 345 kV lines in the AEP area. Project U2-041 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

1. **(AEP/AEP)** The Eastown Road-Rock Hill 138kV line (from bus 23137 to bus 23202 ckt 1) loads from 99.50% to 104.84% (DC power flow) of its emergency rating (184MVA) for the tower line outage (AEP_TOWER42). This project contributes approximately 9.8MW to cause this thermal violation.

Short Circuit

No problems identified.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

1. The overload on the Eastown Rd-Rock Hill 138kV circuit can be alleviated by replacing the 138 kV risers at Rockhill station terminal.

   Estimated Cost (2008 dollars): **$75,000**

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under

study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request. **These are not required reliability upgrades.**

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

As a result of the aggregate energy resources in the area, the following potential congestion was identified

2. **(AEP/AEP)** The R60C-Robison Park 345kV line (from bus 96546 to bus 22670 ckt 1) loads from 135.4% to 136.9% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 14.0MW to the thermal congestion.

3. **(AEP/AEP)** The R60C-Robison Park 345kV line (from bus 96546 to bus 22670 ckt 1) loads from 100.1% to 101.2% (DC power flow) of its emergency rating (1301MVA) for the single line contingency outage (AEP21). This project contributes approximately 13.8MW to the thermal congestion.

MISO Impacts

Any impacts on the MISO transmission system will be identified in the Impact Study.

From: mittaj@pjm.com [mailto:mittaj@pjm.com]
Sent: Tuesday, April 07, 2009 8:32 AM
To: Rodriguez, Carlos
Cc: elmya@pjm.com; fedorkj@pjm.com
Subject: U2-041 - East Lima-Marysville 345kV - System Impact Study Delay Notification

SYSTEM IMPACT STUDY DELAY NOTIFICATION:

This email serves notice, as required by the PJM OAT Tariff §205.3, that the subject queue project's System Impact Study (SIS) is delayed. This delay is due to the backlog of previously queued Impact Studies that must be completed before we can complete the remaining U2 studies.

PJM continues working to address the backlog and has worked with the Stakeholders through the RPPWG to identify additional process enhancements to improve study timing. Wherever possible, PJM applies the approved cluster study methodology to expedite the issuing of the studies and will provide your results as soon as they are available.

PJM anticipates completing all U2-queue Impact Studies on or before the end of the 3rd quarter of 2009.

Please contact Al Elmy at (610) 666-8213 or elmya@pjm.com with any questions you might have.

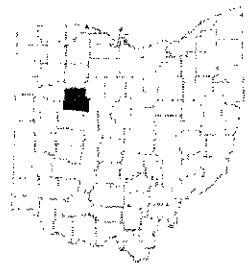
Jeannette Mittan
Interconnection Planning
610-666-3158
mittaj@pjm.com
FOR AL ELMY

Ohio County Profiles

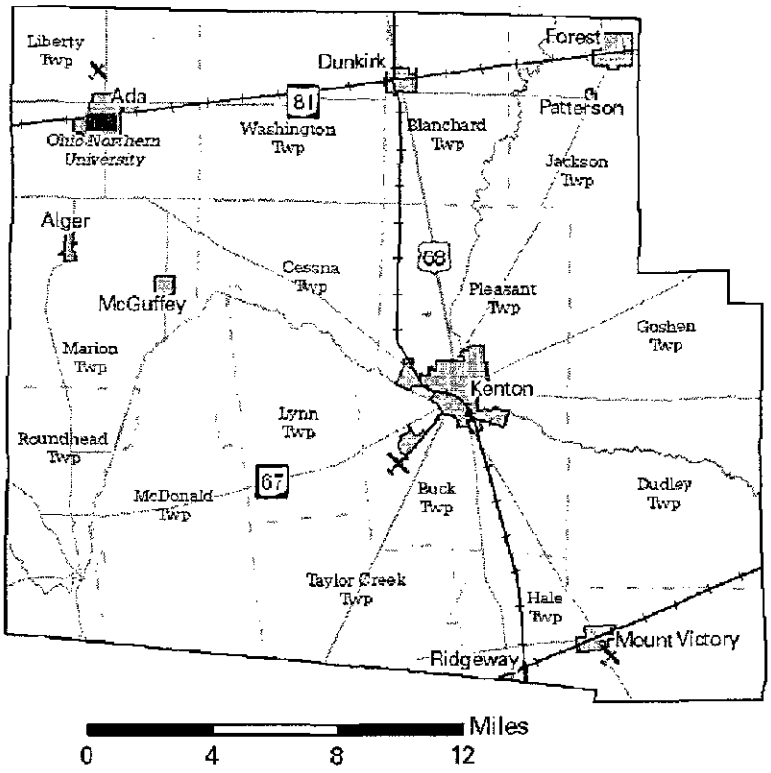
Ohio | Department of Development

Prepared by the Office of Policy, Research and Strategic Planning

Hardin County



Established: Act - April 1, 1820
2007 Population: 31,650
Land Area: 470.3 square mile
County Seat: Kenton City
Named for: Colonel John Hardin Revolutionary War



Taxes

Taxable value of real property	$382,123,810
Residential	$253,409,470
Agriculture	$72,445,900
Industrial	$17,806,040
Commercial	$38,462,400
Mineral	$0
Ohio income tax liability	$13,776,853
Average per return	$1,040.08

Land Use/Land Cover

	Percent
Urban (Residential/Commercial/Industrial/ Transportation and Urban Grasses)	4.32%
Cropland	80.00%
Pasture	6.92%
Forest	6.89%
Open Water	0.26%
Wetlands (Wooded/Herbaceous)	1.59%
Bare/Mines	0.02%

Largest Areas

	Census 2000	Est. 2007
Kenton city	8,336	8,050
Ada village	5,582	5,767
Pleasant twp UB	1,662	1,671
Liberty twp UB	1,567	1,519
Forest village	1,488	1,437
Dudley twp	1,257	1,224
Buck twp UB	1,051	1,093
Marion twp UB	1,039	999
Dunkirk village	952	942
McDonald twp	914	896

UB: Unincorporated Balance

Total Population

Census

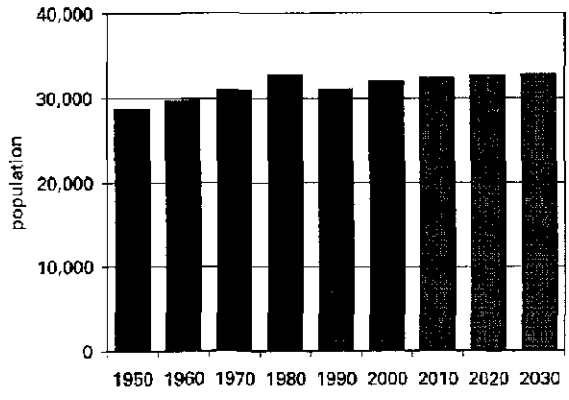
1800		1900	31,187
1810		1910	30,407
1820	22	1920	29,167
1830	210	1930	27,635
1840	4,598	1940	27,061
1850	8,251	1950	28,673
1860	13,570	1960	29,633
1870	18,714	1970	30,813
1880	27,023	1980	32,719
1890	28,939	1990	31,111
		2000	31,945

Estimated

2001	31,695
2002	31,705
2003	31,564
2004	31,924
2005	31,739
2006	31,697
2007	31,650

Projected

2010	32,450
2020	32,720
2030	32,830



Hardin County

Population by Race	Number	Percent
Total Population	31,945	100.0%
White	31,164	97.6%
African-American	229	0.7%
Native American	102	0.3%
Asian	126	0.4%
Pacific Islander	0	0.0%
Other	55	0.2%
Two or More Races	269	0.8%
Hispanic (may be of any race)	378	1.2%
Total Minority	1,026	3.2%

Educational Attainment	Number	Percent
Persons 25 years and over	19,220	100.0%
No high school diploma	3,738	19.4%
High school graduate	9,690	50.4%
Some college, no degree	2,657	13.8%
Associate degree	943	4.9%
Bachelor's degree	1,345	7.0%
Master's degree or higher	847	4.4%

Family Type by Employment Status	Number	Percent
Total Families	8,227	100.0%
Married couple, husband and wife in labor force	3,395	41.3%
Married couple, husband in labor force, wife not	1,489	18.1%
Married couple, wife in labor force, husband not	451	5.5%
Married couple, husband and wife not in labor force	1,299	15.8%
Male householder, in labor force	313	3.8%
Male householder, not in labor force	68	0.8%
Female householder, in labor force	813	9.9%
Female householder, not in labor force	399	4.8%

Household Income in 1999	Number	Percent
Total Households	11,995	100.0%
Less than $10,000	1,519	12.7%
$10,000 to $19,999	1,780	14.8%
$20,000 to $29,999	1,842	15.4%
$30,000 to $39,999	1,720	14.3%
$40,000 to $49,999	1,381	11.5%
$50,000 to $59,999	1,206	10.1%
$60,000 to $74,999	1,226	10.2%
$75,000 to $99,999	789	6.6%
$100,000 to $149,999	390	3.3%
$150,000 to $199,999	30	0.3%
$200,000 or more	112	0.9%
Median household income	$34,440	

Population by Age	Number	Percent
Total Population	31,945	100.0%
Under 6 years	2,574	8.1%
6 to 17 years	5,186	16.2%
18 to 24 years	4,965	15.5%
25 to 44 years	8,311	26.0%
45 to 64 years	6,770	21.2%
65 years and more	4,139	13.0%
Median Age	33.3	

Family Type by Presence of Own Children Under 18	Number	Percent
Total Families	8,227	100.0%
Married-couple families with own children	2,890	35.1%
Male householder, no wife present, with own children	236	2.9%
Female householder, no husband present, with own children	706	8.6%
Families with no own children	4,395	53.4%

Poverty Status in 1999 of Families By Family Type by Presence Of Related Children	Number	Percent
Total Families	8,227	100.0%
Family income above poverty level	7,497	91.1%
Family income below poverty level	730	8.9%
Married couple, with related children	232	31.8%
Male householder, no wife present, with related children	48	6.6%
Female householder, no husband present, with related children	267	36.6%
Families with no related children	183	25.1%

Ratio of Income in 1999 To Poverty Level	Number	Percent
Population for whom poverty status is determined	29,825	100.0%
Below 50% of poverty level	1,895	6.4%
50% to 99% of poverty level	2,033	6.8%
100% to 149% of poverty level	2,621	8.8%
150% to 199% of poverty level	2,954	9.9%
200% of poverty level or more	20,322	68.1%

Residence in 1995	Number	Percent
Population 5 years and over	29,860	100.0%
Same house in 1995	17,169	57.5%
Different house, same county	7,173	24.0%
Different county, same state	4,218	14.1%
Different state	1,169	3.9%
Puerto Rico or U.S. islands	0	0.0%
Foreign country	131	0.4%

Travel Time To Work	Number	Percent
Workers 16 years and over	14,390	100.0%
Less than 15 minutes	5,618	39.0%
15 to 29 minutes	3,878	26.9%
30 to 44 minutes	2,780	19.3%
45 to 59 minutes	914	6.4%
60 minutes or more	578	4.0%
Worked at home	622	4.3%
Mean travel time	21.8 minutes	

Housing Units	Number	Percent
Total housing units	12,907	100.0%
Occupied housing units	11,963	92.7%
Owner occupied	8,730	67.6%
Renter occupied	3,233	25.0%
Vacant housing units	944	7.3%

Year Structure Built	Number	Percent
Total housing units	12,907	100.0%
Built 1995 to March 2000	1,069	8.3%
Built 1990 to 1994	735	5.7%
Built 1980 to 1989	893	6.9%
Built 1970 to 1979	1,720	13.3%
Built 1960 to 1969	1,455	11.3%
Built 1950 to 1959	1,316	10.2%
Built 1940 to 1949	1,110	8.6%
Built 1939 or earlier	4,609	35.7%
Median year built	1956	

Value for Specified Owner-Occupied Housing Units	Number	Percent
Specified owner-occupied housing units	6,576	100.0%
Less than $20,000	145	2.2%
$20,000 to $39,999	660	10.0%
$40,000 to $59,999	1,312	20.0%
$60,000 to $79,999	1,719	26.1%
$80,000 to $99,999	1,274	19.4%
$100,000 to $124,999	678	10.3%
$125,000 to $149,999	339	5.2%
$150,000 to $199,999	295	4.5%
$200,000 to $249,999	84	1.3%
$250,000 to $499,999	47	0.7%
$500,000 to $999,999	16	0.2%
$1,000,000 or more	7	0.1%
Median value	$73,800	

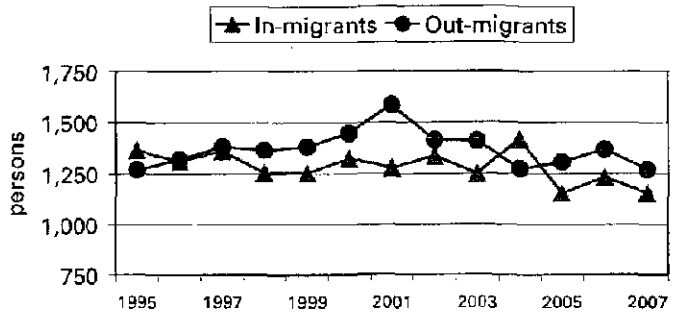
House Heating Fuel	Number	Percent
Occupied housing units	11,963	100.0%
Utility gas	5,929	49.6%
Bottled, tank or LP gas	2,775	23.2%
Electricity	2,468	20.6%
Fuel oil, kerosene, etc	338	2.8%
Coal, coke or wood	402	3.4%
Solar energy or other fuel	30	0.3%
No fuel used	21	0.2%

Gross Rent	Number	Percent
Specified renter-occupied housing units	3,091	100.0%
Less than $100	17	0.5%
$100 to $199	257	8.3%
$200 to $299	366	11.8%
$300 to $399	729	23.6%
$400 to $499	709	22.9%
$500 to $599	388	12.6%
$600 to $699	187	6.0%
$700 to $799	72	2.3%
$800 to $899	37	1.2%
$900 to $999	17	0.5%
$1,000 to $1,499	27	0.9%
$1,500 or more	11	0.4%
No cash rent	274	8.9%
Median gross rent	$405	
Median gross rent as a percentage of household income in 1999	23.6	

Selected Monthly Owner Costs for Specified Owner-Occupied Housing Units	Number	Percent
Specified owner-occupied housing units with a mortgage	4,245	100.0%
Less than $400	298	7.0%
$400 to $599	1,011	23.8%
$600 to $799	1,158	27.3%
$800 to $999	917	21.6%
$1,000 to $1,249	597	14.1%
$1,250 to $1,499	140	3.3%
$1,500 to $1,999	116	2.7%
$2,000 to $2,999	8	0.2%
$3,000 or more	0	0.0%
Median monthly owners cost	$744	
Median monthly owners cost as a percentage of household income	19.3	

Vital Statistics	Number	Rate
Births / rate per 1,000 women	377	53.3
Teen births / rate per 1,000 females 15-17	10	16.3
Deaths / rate per 100,000 population	329	1,029.2
Marriages / rate per 1,000 population	220	6.9
Divorces / rate per 1,000 population	142	4.4

Migration



Hardin County

Agriculture

Land in farms (acres)	242,000
Number of farms	820
Average size (acres)	295
Total cash receipts	$119,627,000
Per farm	$144,129

Education

Public schools	21
Students (Average Daily Membership)	5,651
Expenditures per student	$8,313
Student-teacher ratio	16.0
Graduation rate	91.6
Teachers (Full Time Equivalent)	379.8
Non-public schools	0
Students	0
4-year public universites	0
Branches	0
2-year public colleges	0
Private universities and colleges	1
Public libraries (Main / Branches)	6 / 1

Transportation

Registered motor vehicles	34,590
Passenger cars	20,103
Noncommercial trucks	7,060
Total license revenue	$955,084.83
Interstate highway miles	0.00
Turnpike miles	0.00
U.S. highway miles	21.81
State highway miles	154.18
County, township, and municipal road miles	828.49
Commercial airports	3

Voting

Number of precincts	38
Number of registered voters	17,604
Voted in 2006 election	10,005
Percent turnout	56.8%

Health Care

Physicians (MDs & DOs)	12
Registered hospitals	1
Number of beds	25
Licensed nursing homes	2
Number of beds	200
Licensed residential care	3
Number of beds	123
Adults with employer-based insurance	59.6%
Children with employer-based insurance	65.2%

State Parks, Forests, Nature Preserves, And Wildlife Areas

Facilities	2
Acreage	1,058.93

Communications

Television stations	0
Radio stations	2
Daily newspapers	1
Circulation	7,200

Crime

Total crimes reported in Uniform Crime Report	1,012

Finance

FDIC insured financial institutions (HQs)	4
Assets	$357,713
Branch offices	14
Institutions represented	9

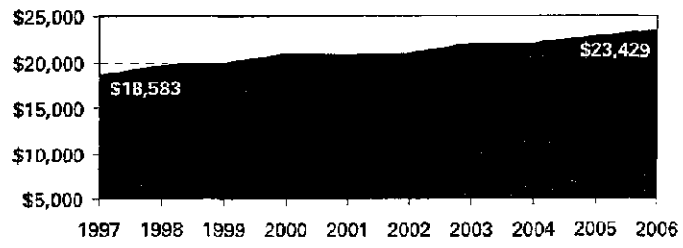
Transfer Payments

Total transfer payments	$159,441,000
Payments to individuals	$150,873,000
Retirement and disability	$67,656,000
Medical payments	$63,376,000
Income maintenance (Supplemental SSI, family assistance, food stamps, etc)	$12,391,000
Unemployment benefits	$2,639,000
Veterans benefits	$2,718,000
Federal education and training assistance	$2,013,000
Other payments to individuals	$80,000
Total personal income	$742,641,000
Depedency ratio	21.5%

Federal Expenditures

Direct expenditures or obligations	$146,450,492
Retirement and disability	$46,699,751
Other direct payments	$58,606,386
Grant awards	$27,614,502
Highway planning and construction	$1,123,561
Temporary assistance to needy families	$2,048,321
Medical assistance program	$14,403,794
Procurement contract awards	$7,801,516
Dept. of Defense	$6,448,394
Salary and wages	$5,728,337
Dept. of Defense	$231,000
Other federal assistance	$54,974,414
Direct loans	$1,230,040
Guaranteed loans	$8,749,101
Insurance	$44,995,273

Per Capita Personal Income



Hardin County

Civilian Labor Force

	2003	2004	2005	2006	2007
Civilian labor force	15,500	15,800	16,200	15,900	15,800
Employed	14,600	14,800	15,300	15,000	14,900
Unemployed	1,000	1,000	900	900	900
Unemployment rate	6.2	6.2	5.9	5.5	6.0

Establishments, Employment, and Wages by Sector: 2006

Industrial Sector	Number of Establishments	Average Employment	Total Wages	Average Weekly Wage
Private Sector	459	6,905	$205,049,408	$571
Goods-Producing	87	2,557	$93,883,130	$706
Natural Resources and Mining	13	87	$2,334,702	$516
Constuction	36	140	$3,804,383	$522
Manufacturing	38	2,330	$87,744,045	$724
Service-Providing	372	4,348	$111,166,278	$491
Trade, Transportation and Utilities	126	1,386	$36,601,267	$507
Information	9	87	$2,188,547	$483
Financial Services	42	275	$7,717,382	$539
Professional and Business Services	43	193	$3,821,786	$380
Education and Health Services	38	1,327	$48,326,230	$700
Leisure and Hospitality	54	817	$8,698,948	$204
Other Services	60	260	$3,705,672	$274
Unclassified	1	4	$106,446	$511
Federal Government		85	$3,397,400	$768
State Government		37	$1,331,038	$691
Local Government		1,590	$41,962,276	$507

Change Since 2001

Private Sector	-5.2%	-0.5%	12.2%	12.8%
Goods-Producing	-12.1%	1.0%	5.7%	4.7%
Natural Resources and Mining	62.5%	70.6%	101.4%	18.1%
Construction	-30.8%	-37.8%	-22.1%	25.2%
Manufacturing	-5.0%	3.3%	6.0%	2.7%
Service-Producing	-3.4%	-1.4%	18.4%	20.0%
Trade, Transportation and Utilities	-8.7%	-4.4%	13.6%	18.7%
Information	0.0%	14.5%	2.1%	-10.9%
Financial Services	0.0%	26.7%	48.5%	17.2%
Professional and Business Services	7.5%	1.0%	-9.0%	-10.0%
Education and Health Services	-9.5%	2.5%	23.8%	20.9%
Leisure and Hospitality	5.9%	-11.7%	11.7%	26.7%
Other Services	-6.3%	3.6%	11.9%	8.3%
Federal Government		-3.4%	9.1%	12.9%
State Government		-5.1%	-1.3%	3.9%
Local Government		1.5%	9.8%	8.1%

Business Numbers

	2003	2004	2005	2006	2007
Business starts	54	47	26	39	23
Active businesses	534	527	525	508	466

Residential Construction

	2003	2004	2005	2006	2007
Total units	38	53	39	67	36
Total valuation (000)	$3,730	$6,320	$4,598	$9,526	$5,130
Total single-unit bldgs	36	49	39	67	34
Average cost per unit	$102,372	$121,703	$117,894	$142,178	$144,276
Total multi-unit bldg units	2	4	0	0	2
Average cost per unit	$22,500	$89,250	$0	$0	$112,500

Major Employers

Ada Technologies	Mfg
Amer Grp plc/Wilson Sporting Goods	Mfg
Hardin County Government	Govt
Hardin Memorial Hospital	Serv
International Paper Co	Mfg
Kenton City Bd of Ed	Govt
Ohio Northern University	Serv
Reliance Steel&Alum/Precision Strip Inc	Mfg
Sumitomo Chemical/Durez Corp	Mfg
Sypris Solutions Inc	Mfg
Triumph Group Inc	Mfg

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Acentech
60th ANNIVERSARY | 1948 - 2008

29 June 2009

Hardin Wind Energy LLC
7564 Standish Place, Suite 123
Rockville, MD 20855

Attention: Nazre G. Adum, P.E. *** via email (nadum@invenergyllc.com) ***

Subject: Phase 1 - Acoustical Study for
Proposed Hardin Wind Farm
Hardin County, Ohio
Acentech Project No. 620456

Dear Mr. Adum:

At Hardin Wind Energy's request, Acentech developed an initial sound model to support the environmental study of the proposed 300 MW Hardin Wind Farm. Two potential plans under development for this wind farm consist of 120 GE Model 2.5xl wind turbine generators (WTGs) and 200 GE Model 1.5xle WTGs. The project area is mostly agricultural land that includes about 1250 residences located over the site and within one mile of the site boundary. This letter outlines the State of Ohio noise requirements for wind turbine projects, presents the initial sound level estimates based on model runs for the two project layout options and equipment information, and discusses community sound level criterion. Additional acoustical analysis may be conducted as part of further design work for Hardin Wind Farm.

State Noise Requirements

The Ohio Power Siting Board (OPSB) has adopted rules that implement certification requirements for wind-powered electric generation facilities. Subsection (A) Health and safety of Sec. 4906-17-08 Social and ecological data, of the rules specifically require the wind power applicant to:

(a) Describe the construction noise levels expected at the nearest property boundary. The description shall address:

- Dynamiting activities
- Operation of earth moving equipment
- Driving of piles
- Erection of structures
- Truck traffic
- Installation of equipment

(b) For each turbine, evaluate and describe the operational noise levels expected at the property boundary closest to that turbine, under both day and nighttime conditions. Evaluate and describe the cumulative operational noise levels for the wind facility at each property boundary for each property adjacent to the project area, under both day and nighttime operations. The applicant shall use generally accepted computer modeling software (developed for wind turbine

noise measurement) or similar wind turbine noise methodology, including consideration of broadband, tonal, and low-frequency noise levels.

(c) Indicate the location of any noise-sensitive areas within one mile of the proposed facility.

(d) Describe equipment and procedures to mitigate the effects of noise emissions from the proposed facility during construction and operation.

Construction Sound Estimates and Mitigation Measures

Construction of the Hardin Wind Farm is scheduled to start in early spring and continue into late fall. Initial activities (Construction Phase I) will include improvements and new construction of facility access roads; then clearing where needed, excavation, foundation, and backfill work at the WTGs and the substation. Concrete for the project will be made at temporary on-site batch plants using trucked-in materials or will be directly trucked-in from an offsite plant. Phase I activities will be followed by Phase II activities, which are comprised of erection of the WTG towers and installation of the WTGs; trenching and installation of the electrical collection system; and installation of substation equipment. Finally, prior to commercial operation, the individual equipment items and the entire facility will be tested and commissioned during Phase III.

A majority of the construction activities associated with the proposed project will be conducted during daylight hours. At times over the planned construction schedule, the construction activities will be audible to nearby residents. Any construction at the facility in the evening and nighttime is expected to be limited to relatively quiet activities and to be less noticeable than in the daytime.

The following mitigation measures will be employed during the construction phase of the project:

- Effective exhaust mufflers in proper working condition will be installed on all engine-powered construction equipment at the site. Mufflers found to be defective will be replaced promptly.

- Contractors will be required to comply with federal limits on truck noise.

- Contractors will be required to ensure that their employee and delivery vehicles are driven responsibly.

- Nighttime construction work that does occur will generally be limited to relatively quiet activities, such as welding and installing equipment, cabling, and instrumentation.

- Contractors will be required to notify the community in advance of any blasting activity.

Construction sound that may be heard off-site will vary from hour-to-hour and day-to-day in accordance with the equipment in use and the operations being performed at the site. Since the construction activity at the site will be temporary, will occur mostly in the daytime hours, and will produce sounds that are already familiar to the community, including sounds from home construction, its overall noise impact on the community beyond 1000 ft. of the nearest turbine is not expected to be significant.

Typical on-site equipment used to construct the wind farm project will include trucks, cranes, dozers, excavators, trenchers, graders, and batch plants. Representative average sound levels (equivalent sound levels, Leq) associated with this construction equipment during the workday are listed in Table 1. For example, with 2 trucks, 1 dozer, and 1 excavator operating at a WTG, the calculated equivalent sound level during the workday is 59 dBA at 1050 ft. (approximate minimum distance from a 2.5MW turbine site to nearest residence) and 61 dBA at 930 ft. (minimum distance from a 1.5MW turbine site to nearest residence). The construction sound level at the nearest property boundary will be greater than these values, depending on the actual distances from the construction activity to the boundary. Table 1 also lists the sound estimates at 600 ft. and 740 ft. from the construction equipment, which are the shortest distances from the 1.5MW and 2.5MW turbines, respectively, to the facility's property line and the sound estimates at one-half mile and one mile from the equipment. These reported sound levels are based on the results of extensive previous acoustical studies of engine-powered construction equipment.

Operation Sound Estimates and Mitigation Measures

The sound levels from the wind turbine generators at the 1253 residential locations and parcel boundaries in the community within one mile of the project site have been predicted. The project is addressing facility sound by considering the location of each turbine on the project site and by purchasing the GE 2.5xl or 1.5xle wind turbine generators, two models that incorporate the following noise control treatments into their designs:

- Noise insulation of the gearbox and generator
- Reduced-noise gearbox
- Reduced-noise nacelle
- Vibration isolation mounts
- Quieted-design rotor blades

In addition, the project will specify and purchase high-efficiency, reduced-noise transformers.

Tonal and Low-Frequency Sound

Modern turbines such as the models proposed for the Hardin site, are designed to avoid prominent tonal sound that were present in some earlier models due to the design and construction of the gearbox and nacelle. Some earlier wind turbine designs also used downwind rotors (rotors downwind of the support tower), which could produce higher levels of low frequency sound. When low frequency sound is substantially greater than the background ambient sound, it may be noticed in the community and can cause annoyance. The most significant concern of low frequency sound is that it can induce vibration in a building structure, which may result in rattling china or moving mirrors and windows. Fortunately, modern wind turbines, including the GE 2.5xl and GE 1.5xle units, incorporate the upwind rotor design, which has greatly decreased the generation of low frequency sound. Note that the slowly modulating mid-frequency broadband sound ("swish") from the rotating turbine blades should not be confused with low frequency sound.

Sound Model Description

The estimated sound levels and contours, which apply to both daytime and nighttime hours for the operating phase, were developed with the computer noise modeling program, Cadna/A. This commercial software program, which was developed by DataKustik GmbH (www.datakustik.de), is widely-accepted by the international acoustics community for the calculation of community sound levels due to industrial sources. The calculations are performed

for industrial sources according to the following international standards:

- ISO 9613-1: Acoustics - Attenuation of sound during propagation outdoors, Part 1: Calculation of the absorption of sound by the atmosphere, and

- ISO 9613-2: Acoustics - Attenuation of sound during propagation outdoors, Part 2: General method of calculation.

Inputs to the program include: source locations and associated sound power emissions, receptor locations, land topography, and meteorological conditions. The calculations account for spreading losses, atmospheric attenuation, ground effects, terrain and other barrier shielding, and reflections for the sound between each source and each receptor. For this study, the sound propagation routines and barrier calculations in the Cadna/A model are based on octave band sound pressure levels and on downwind conditions with a moderate temperature inversion. The following describes significant parameters used in the sound model:

- Turbine, project boundary, 1-mile boundary, and residence locations – the shape files with these data were owner-provided.

- Land elevation contours – the shape files with these data were owner-provided.

- GE 2.5xl Turbine data – Model GE 2.5xl with maximum A-weighted sound power level (LwA) of 104.2 dBA and hub height at 100 meters (turbine input as point source at 100m height above local terrain). Spectral values in the sound model for the GE 2.5xl unit were based on available GE 1.5sl/sle data and normalized to the overall LwA value for the GE 2.5xl unit. The turbine LwA sound levels vs. the normalized wind speeds at the standard 10m elevation are:
    - 4 m/s – 95.7 dBA
    - 5 m/s – 98.6 dBA
    - 6 m/s – 102.1 dBA
    - 7 m/s – 104.1 dBA
    - 8 m/s – 104.2 dBA
    - 9 m/s – 103.0 dBA

- GE 1.5xle Turbine data – Model GE 1.5xle with maximum A-weighted sound power level (LwA) of 104.1 dBA and hub height at 80 meters (turbine input as point source at 80m height above local terrain). Spectral values based on available GE 1.5xle data. The turbine LwA sound levels vs. the normalized wind speeds at the standard 10m elevation are:
    - 3 m/s – <96
    - 4 m/s – 97.2 dBA
    - 5 m/s – 101.5 dBA
    - 6 m/s to cut out – ≤104.1 dBA

- Meteorological conditions are 10°C (50°F) and 70%RH, moderate inversion, and all receptors downwind from turbines.

- Ground conditions – moderate soft ground with parameter G = 0.5 and spectral calculations for all sources.

- Receptor heights – 1.5m above local ground elevation.

Sound Model Results
Figures 1 through 9 present the proposed wind farm layout with the 120 GE 2.5xl turbines, project boundary, one-mile boundary from the project, the residences within the one-mile boundary, and the estimated sound level contours in 5 dBA increments. The computer shape files of the sound level contours (1 dBA increments) and an Excel file with the estimated facility sound level at each of the 1253 residences within one-mile boundary of the project site are provided in a separate transmittal. The estimates are based on the greatest sound output condition for each turbine (e.g., LwA=104.2 dBA at 8 m/s wind speed at the standard 10m elevation). Under conditions of wind speeds greater or less than 8 m/s, the estimated sound levels in the community will be lower than these reported values. Specifically, the sound will be less than the displayed values by 2 dBA for wind conditions of 6 m/s, about 5 dBA less for 5 m/s, and 8 dBA less for 4 m/s.

Figure 10 is a scatter plot that displays the estimated sound levels at the residences vs. their respective distances from the nearest turbine. Note that the level represents the sound of the entire facility and that more than just the one nearest turbine may contribute significantly to the overall sound level at a specific receptor.

Figures 11 to 20 are identical in format to Figs. 1 to 10, but present the sound estimates for the alternative project layout with 200 GE 1.5xle turbines. The estimates are based on the greatest sound output condition for each turbine (e.g., LwA=104.1 dBA at 6 m/s wind speed at the standard 10m elevation). Under conditions of wind speeds less than 6 m/s, the estimated sound levels in the community will be lower than these reported values. Specifically, the sound will be less than the displayed values by 2 dBA for wind conditions of 5 m/s, about 7 dBA less for 4 m/s, and 8 dBA less for 3 m/s.

The estimated sound levels produced only by the wind farm range at the residences within the one-mile boundary of the project from 20 dBA to 46 dBA for the GE 2.5xl layout site and from 23 dBA to 47 dBA with the GE 1.5xle layout. These levels apply to both daytime and nighttime hours. Although the turbines will be heard at community locations at times during turbine operation and quieter ambient sound levels, the WTG sound emissions will be less under conditions of reduced wind speeds, including the times below the minimum cut-off wind speed when the turbine does not operate.

Noise Impact Assessment
Turbine Construction
The majority of the construction activities associated with the project will be conducted during the daylight hours, and the sound levels will vary over time, depending on the equipment in use and the operations being performed at the site. The temporary noise associated with construction of the project will be similar to the noise produced during farming operations, and during excavation, grading, and steel erection activities at many other mid-size and home building projects. To minimize construction noise, it is suggested that the project employ best management practices such as turning off engines when not in use, maintaining equipment in

good working order with effective exhaust mufflers on all engine-powered construction equipment, and minimizing the use of heavy equipment to daytime hours at the site.

Turbine Operation
The project will be available to operate 24-hours per day and seven days per week. The findings of our study indicate that routine operation of the wind farm will produce from 20 dBA to 47 dBA at the community residences within one mile-boundary from the project site. No State or local noise standards are available for comparison to the project levels. However, the estimated project levels of 20 dBA to 47 dBA are less than the steady 48 dBA sound level that is associated with the USEPA Noise Guideline and FERC Criterion with an Ldn sound level of 55 dBA.

The project levels are also compared to an average ambient sound level (Leq) of 45 dBA, which the New York State Department of Environmental Conservation (NYDEC) Policy has identified as representative of rural agricultural areas. The NYDEC policy seeks to limit increases in the community sound levels due to a project to 6 dBA above the existing ambient levels, which results in a total level of 51 dBA for an ambient level 45 dBA. Based on an average ambient sound level (Leq) of 45 dBA for a rural agricultural area such as Hardin County, and an upper turbine sound level of 47 dBA at the nearest residences, the project would result in an average sound level (Leq) to 49 dBA (total of ambient and turbine sound) at the nearest community residences, which is an increase of 4 dBA over the ambient level.

To address turbine operation sound, the project could consider adopting the 48 dBA sound level associated with the USEPA Noise Guideline as an upper level goal for the turbine sound at the nearest residences during this initial phase of project planning.

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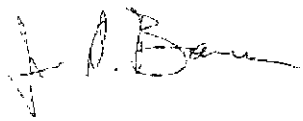
Sincerely,



James D. Barnes
Acentech Incorporated

Figures 1-20
Table 3
Appendix A
Data files with sound contours (provided separately)
Data file with sound levels at residences (provided separately)

Figure 1.
Aerial Photograph Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+), Site Boundary (black line) and 1-mile Boundary (red line).

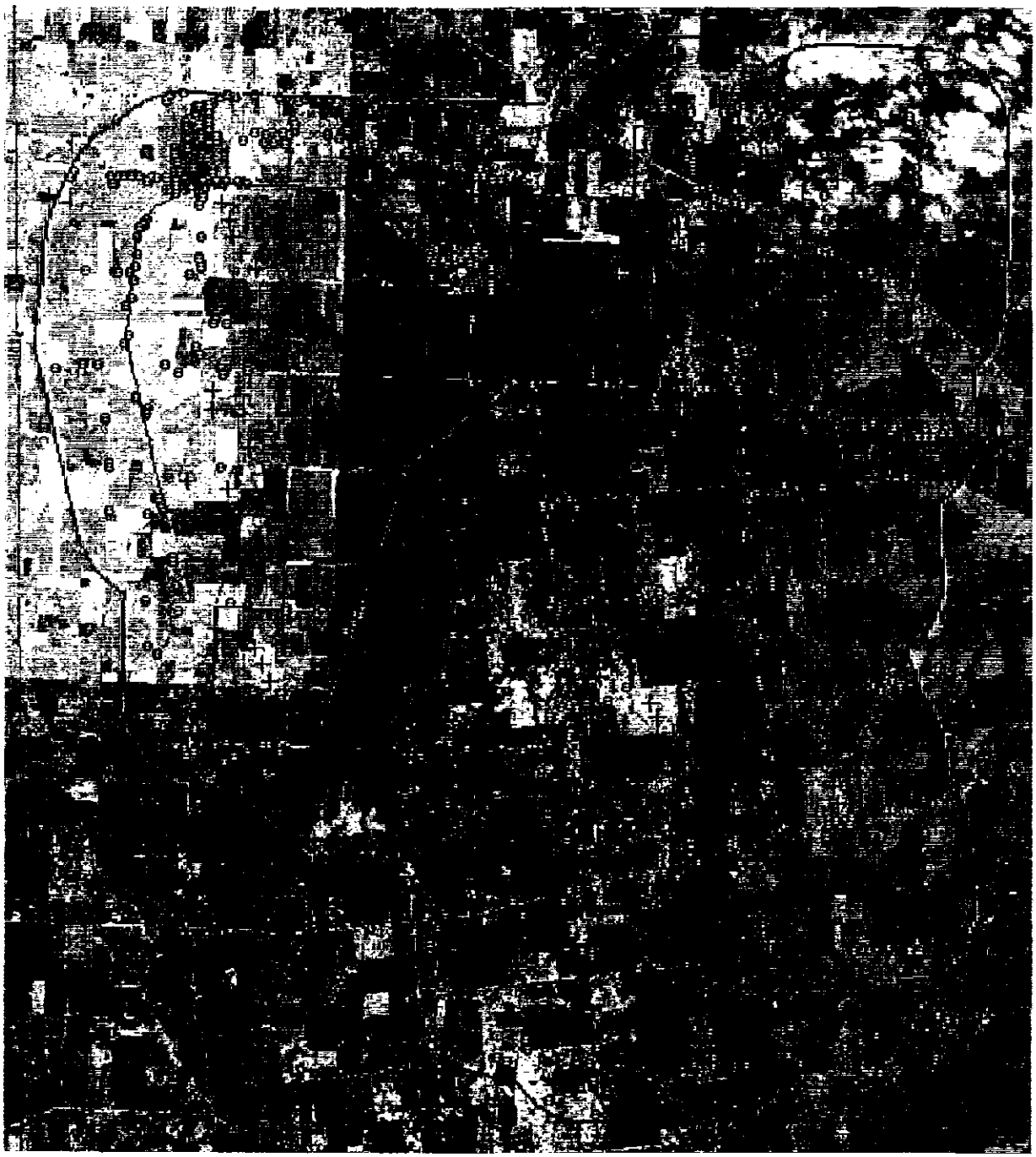


Figure 2.
Map Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+), Site Boundary (black line), and 1-mile Boundary (red line).

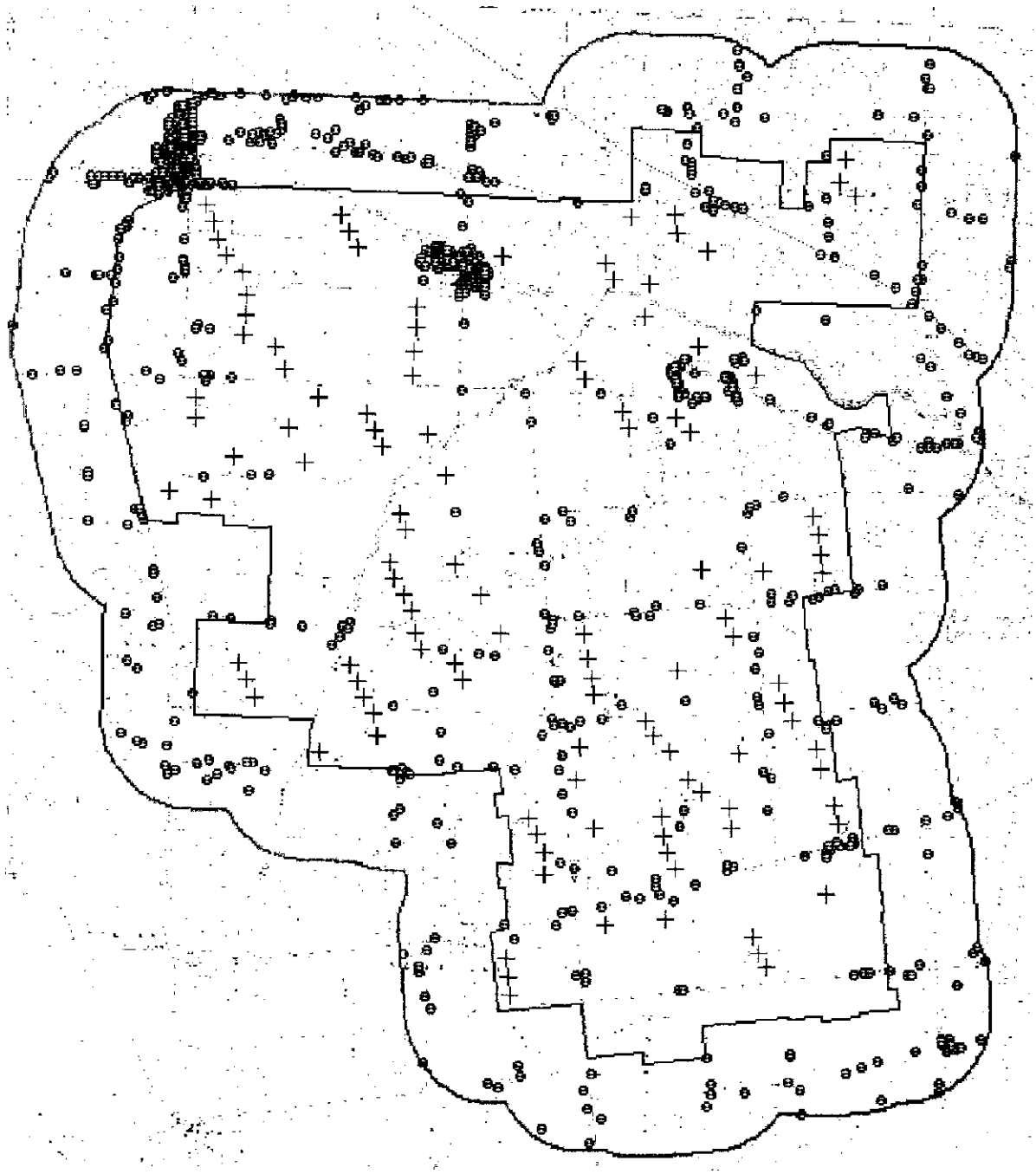


Figure 3.
Map Showing Residences (O) and Project Site with Potential Turbine GE 2.5xl Locations (+) and Turbine Sound Level Contours.

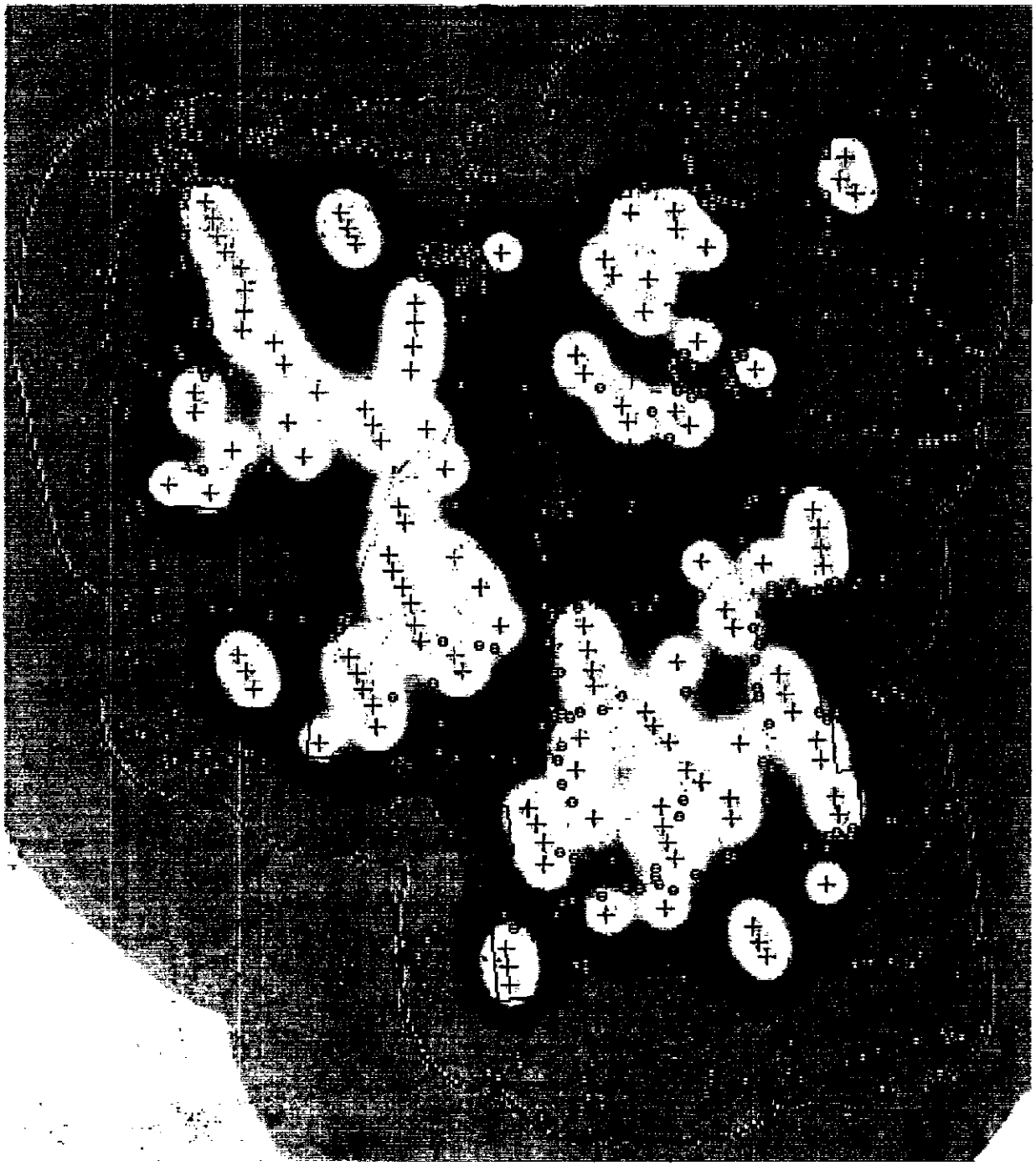


Figure 4.
Map Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level Contours.

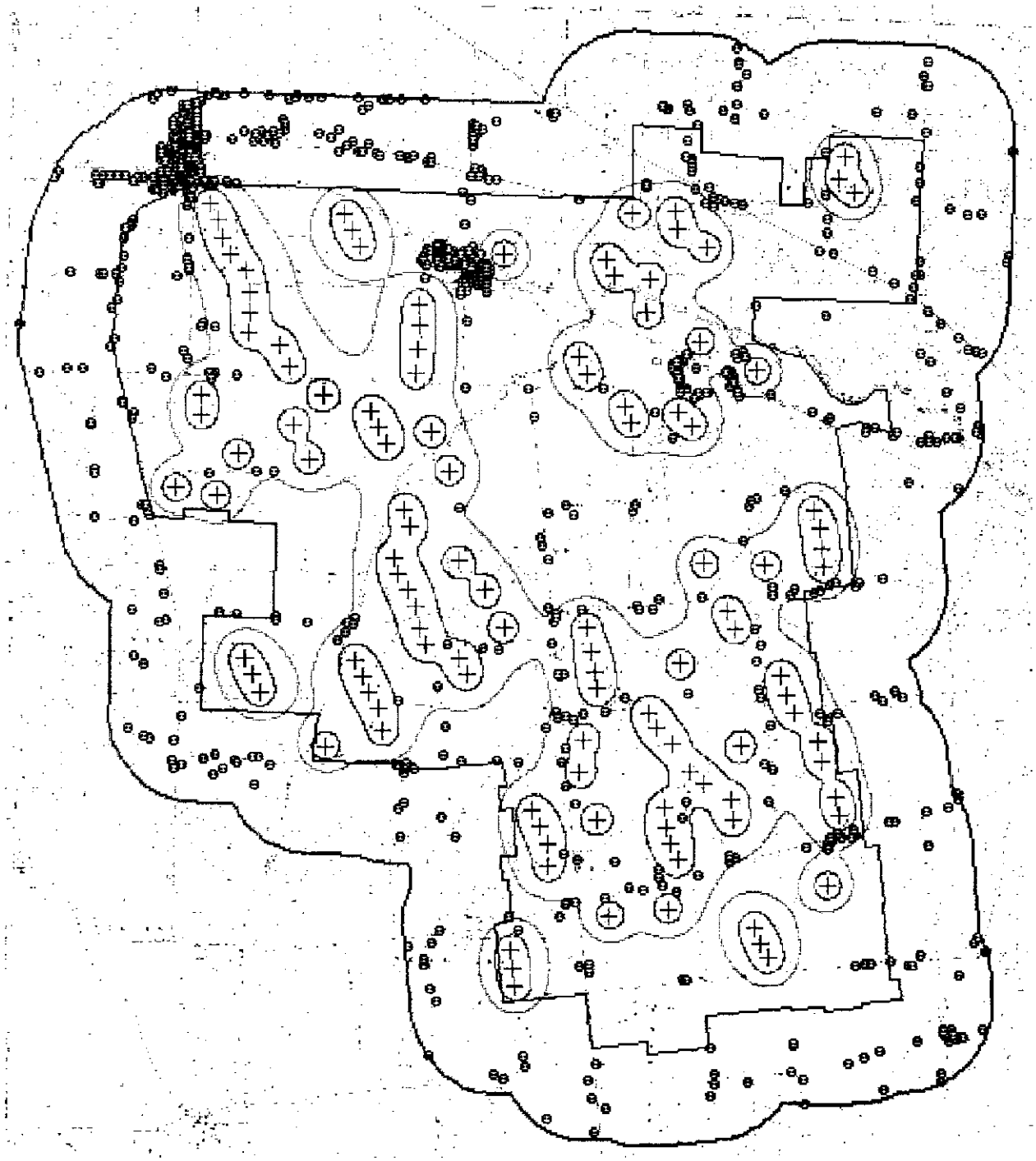


Figure 5.
Project Layout Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level (dBA) Contours.

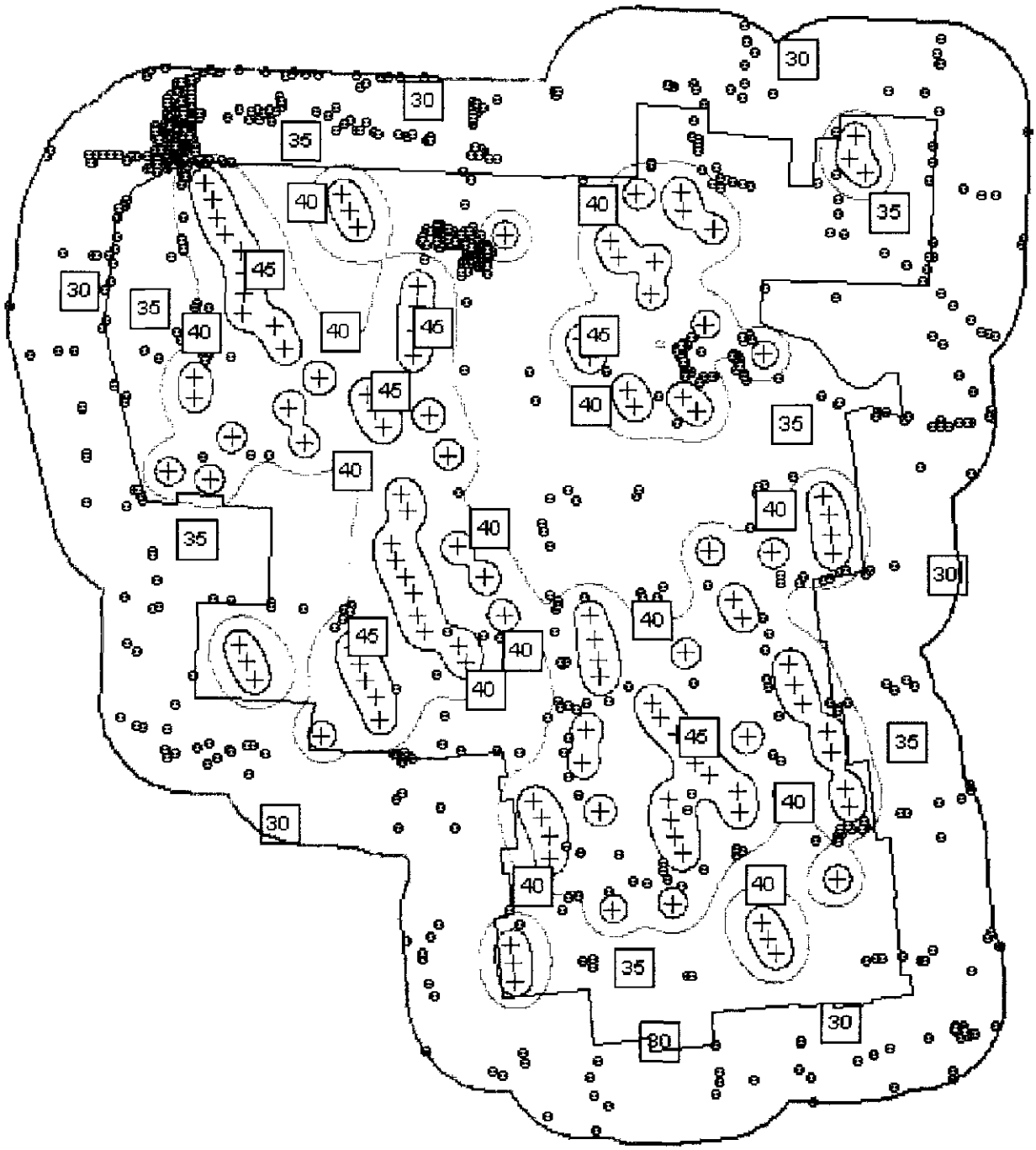


Figure 6.
NE Quadrant of Project Layout Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level (dBA) Contours.

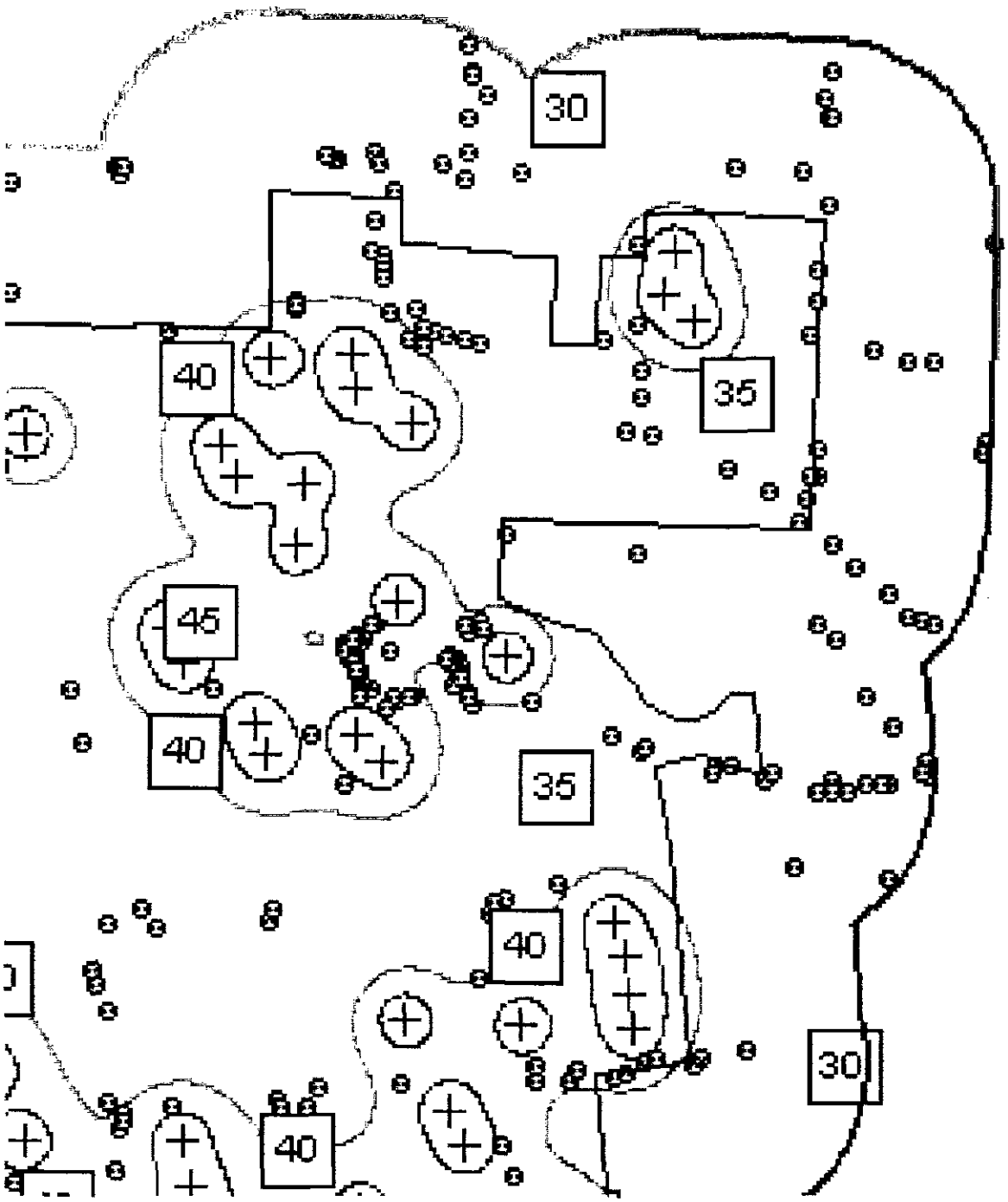


Figure 7.
NW Quadrant of Project Layout Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level (dBA) Contours.

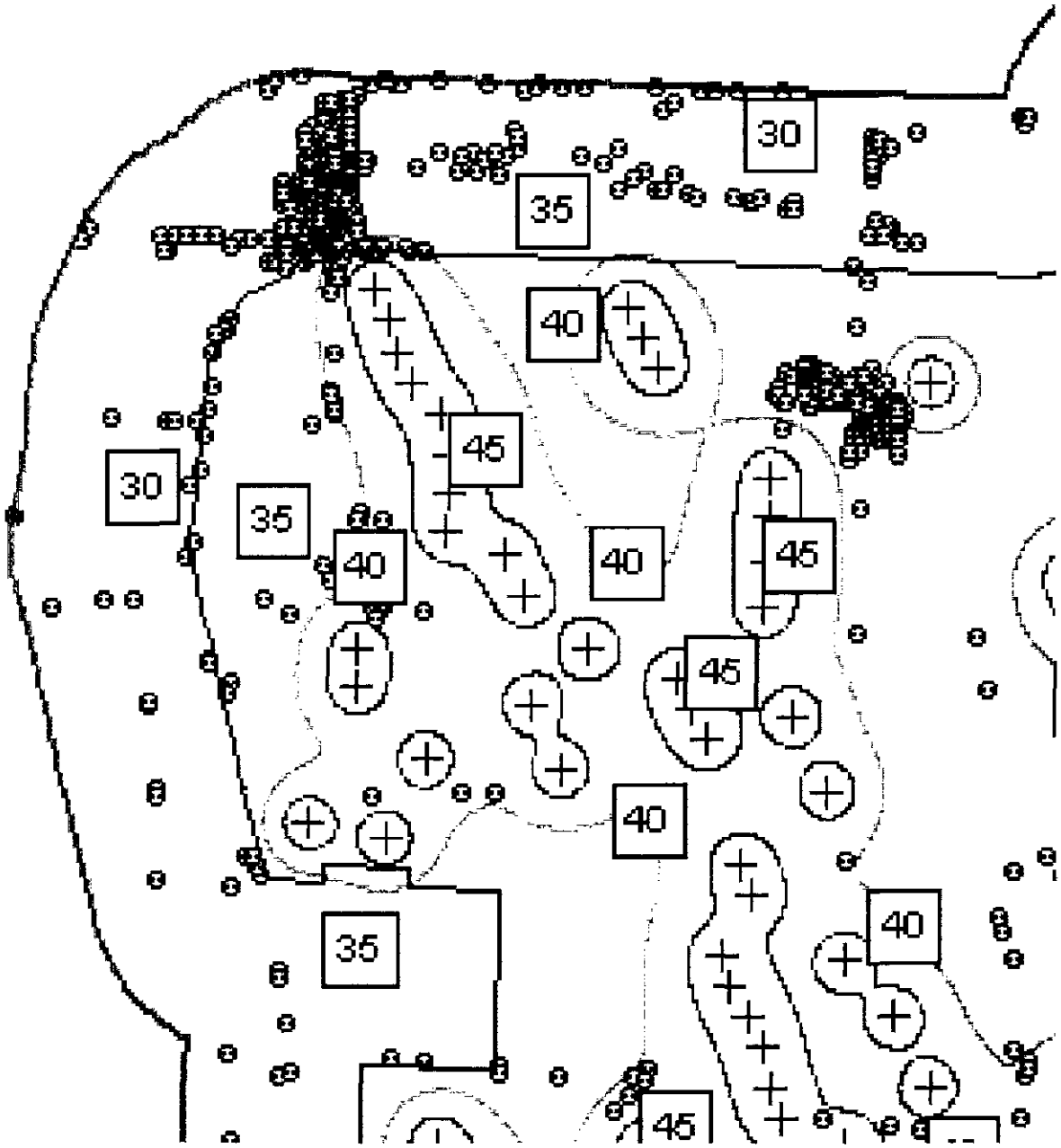


Figure 8.
SW Quadrant of Project Layout Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level (dBA) Contours.

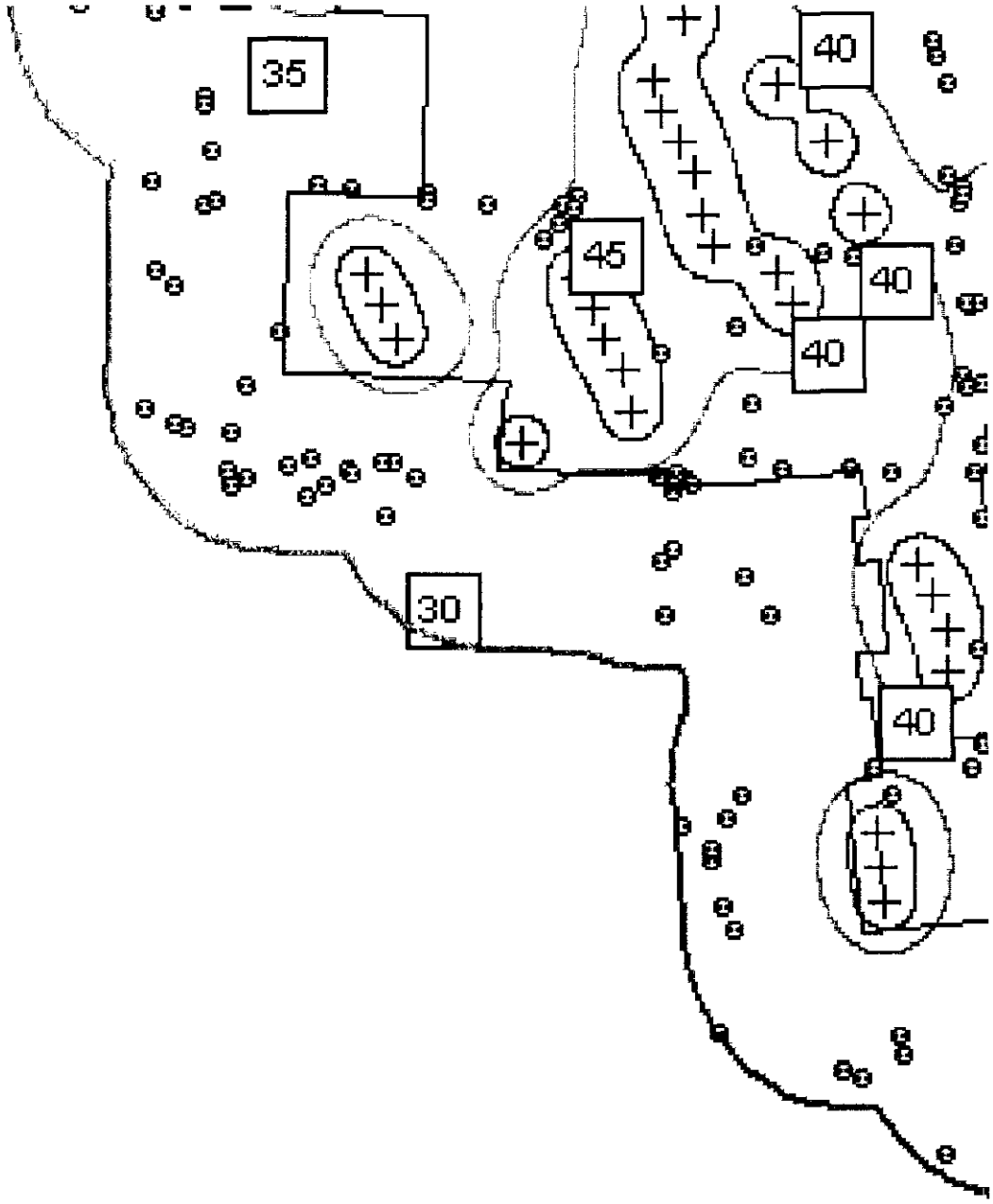


Figure 9.
SE Quadrant of Project Layout Showing Residences (O) and Project Site with Potential GE 2.5xl Turbine Locations (+) and Turbine Sound Level (dBA) Contours.

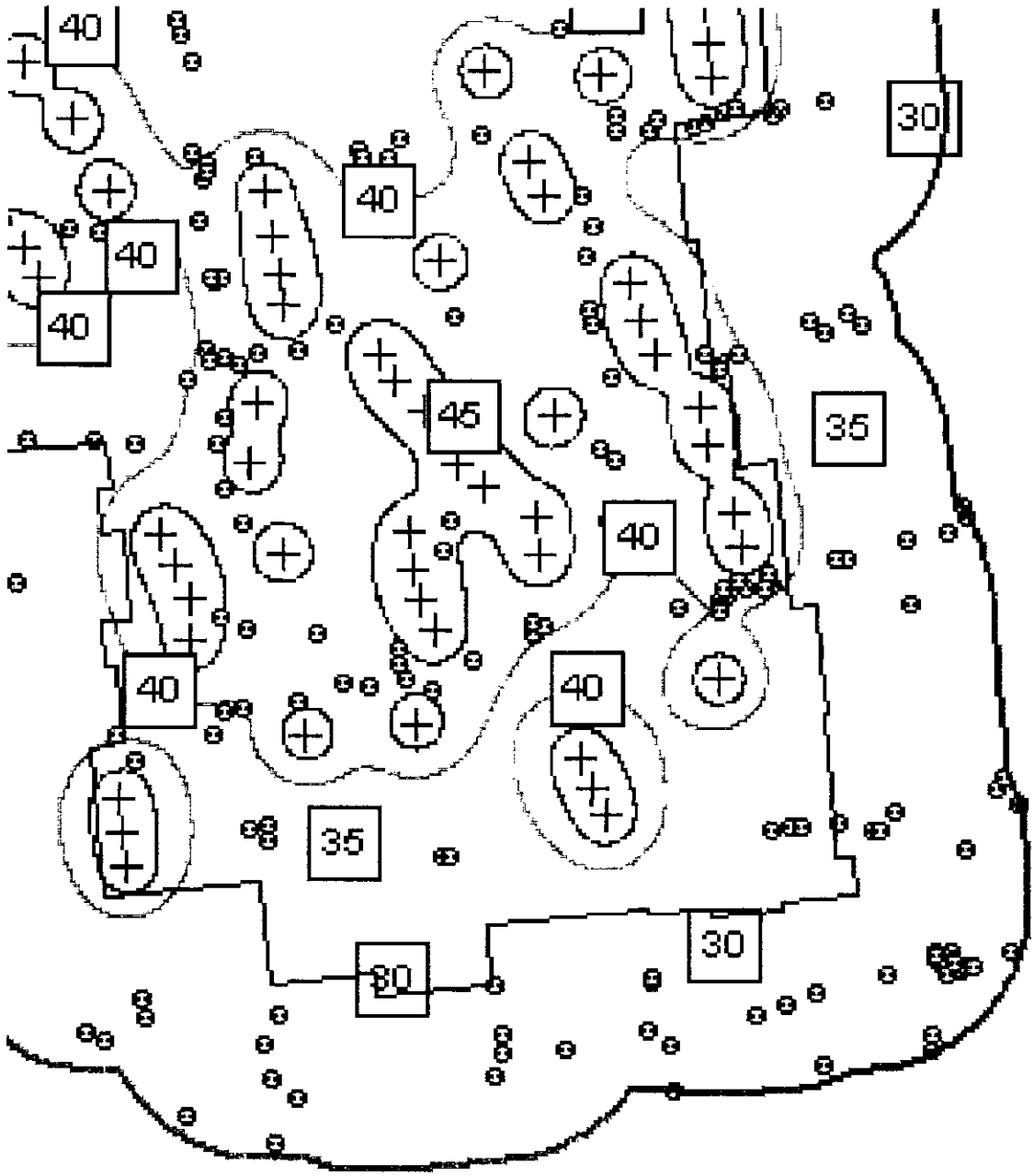


Figure 10.
Scatter Plot of Estimated Overall Turbine Facility Sound Levels (dBA) vs. Distances (ft) to Nearest Turbine for Residences within One Mile Boundary of Project Site. (operating condition at maximum sound output for each GE 2.5xl turbine, i.e., A-Weighted sound power level of 104.2 dBA with 8 m/s wind speed at 10m height)

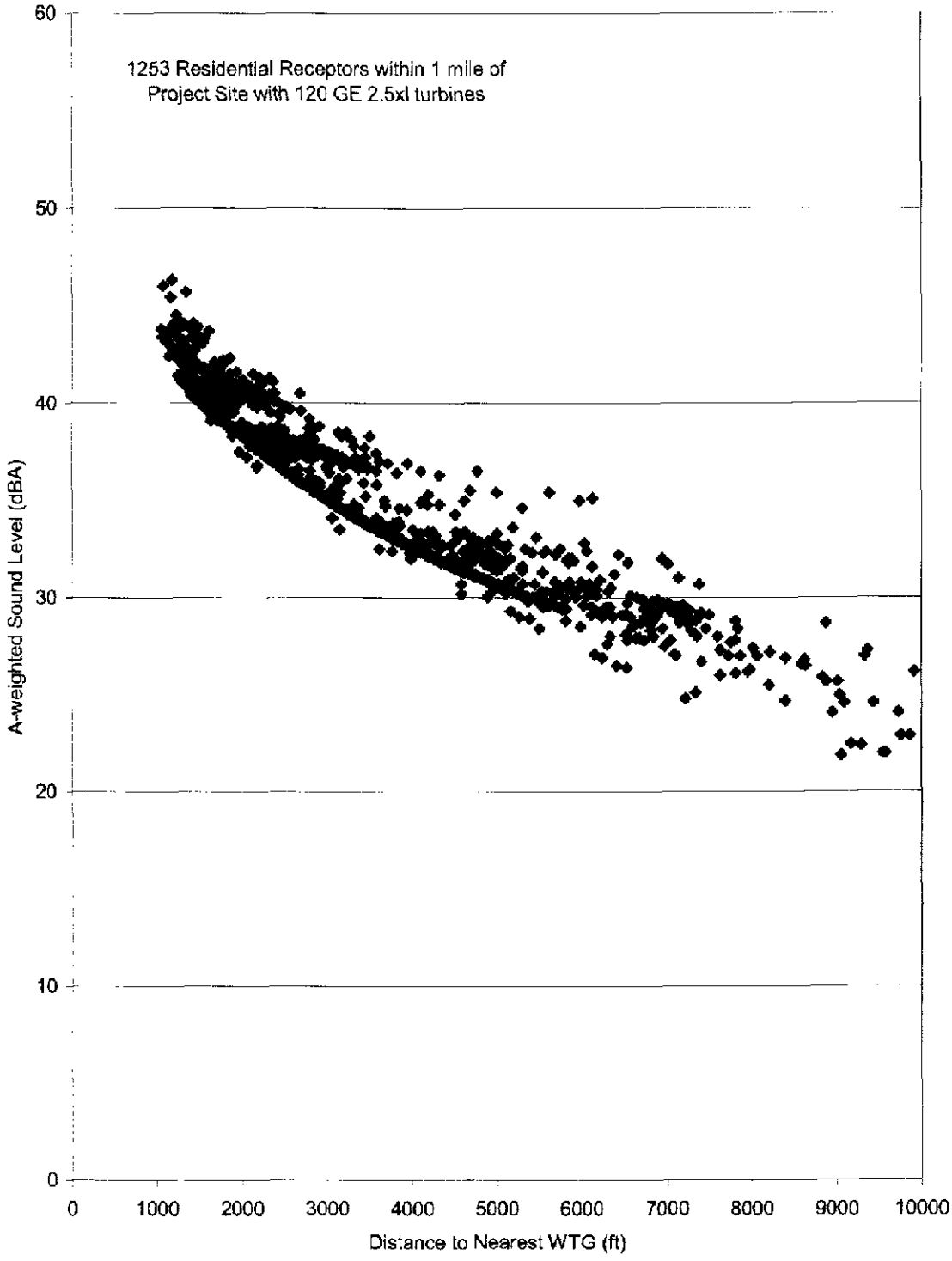


Figure 11.
Aerial Photograph Showing Residences (O) and Project Site with Potential GE 1.5xle Turbine Locations (+), Site Boundary (black line) and 1-mile Boundary (red line).

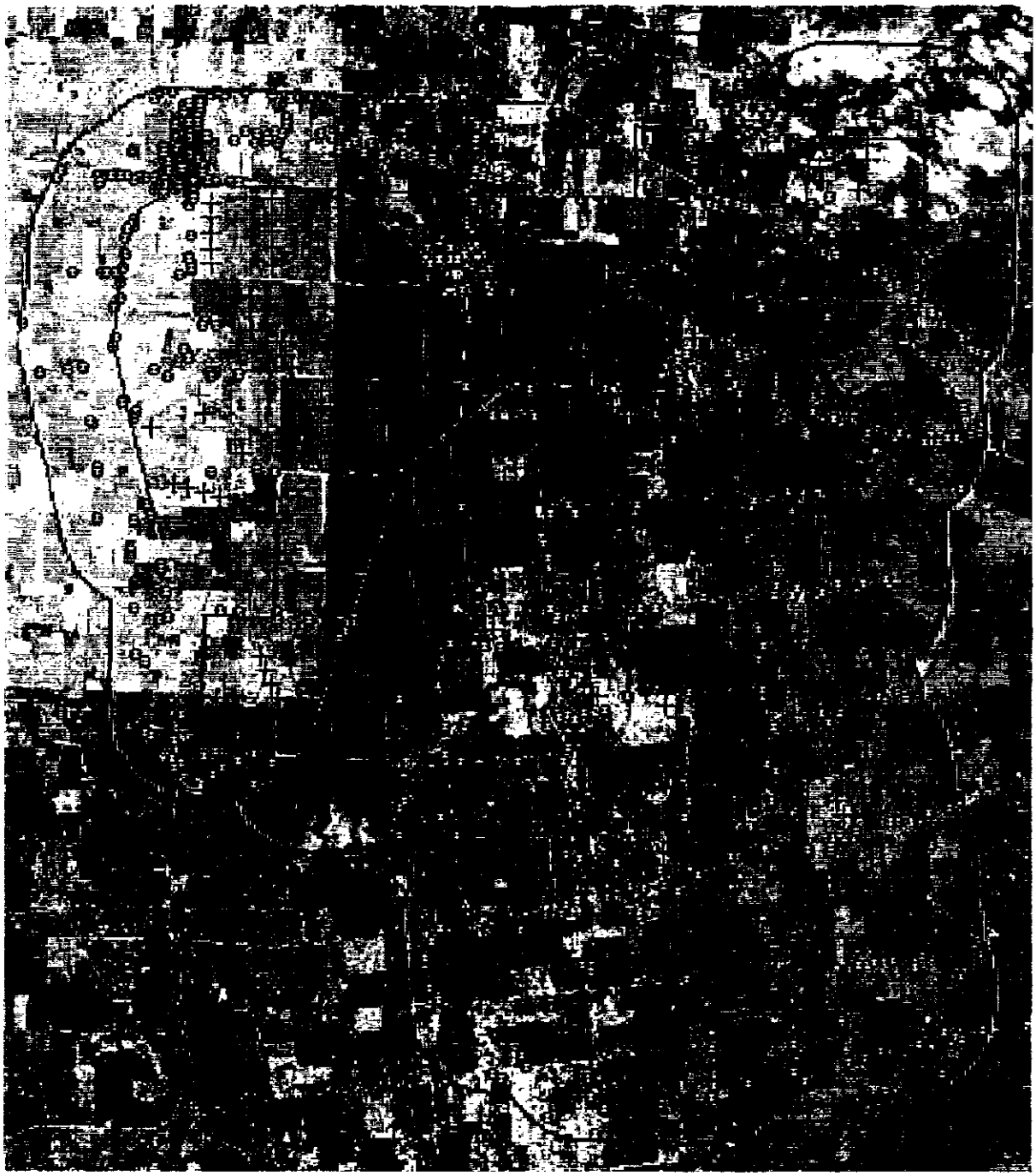


Figure 12.
Map Showing Residences (O) and Project Site with Potential GE 1.5xle Turbine Locations (+), Site Boundary (black line), and 1-mile Boundary (red line).