DOWNINGTOWN AREA SCHOOL DISTRICT

SUMMARY REPORT
DUE DILIGENCE INVESTIGATIONS

SIEMENS PROPERTY
UWCHLAN TOWNSHIP,
CHESTER COUNTY, PENNSYLVANIA

ISSUED: MAY 25, 2006
NAVE NEWELL NO: 2006-010.02

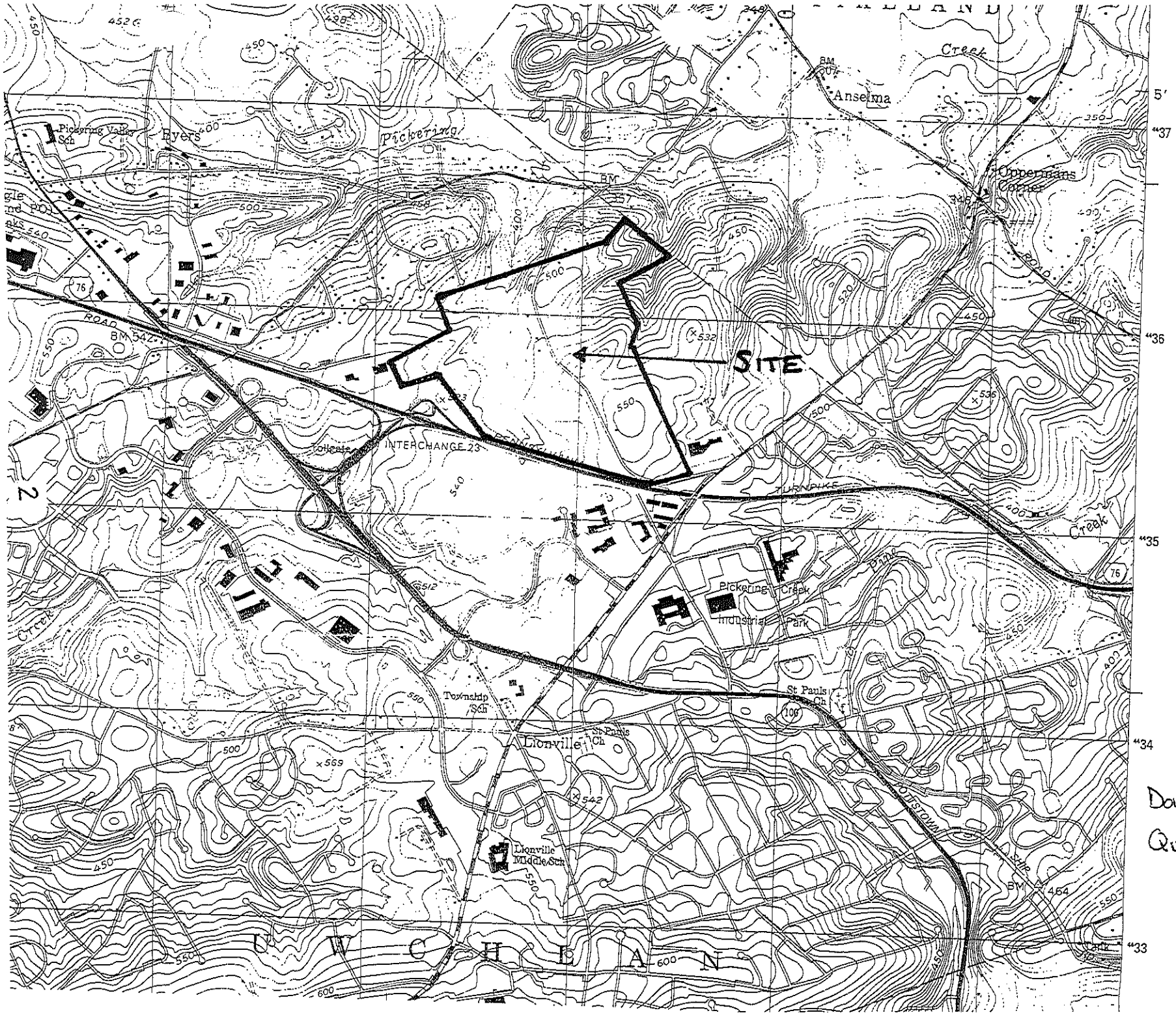
Nave Newell
Where Ideas Get Down To Earth.

TABLE OF CONTENTS

SUMMARY REPORT- DUE DILIGENCE INVESTIGATIONS

SIEMENS PROPERTY, UWCHLAN TOWNSHIP

II. LOCATION MAPS

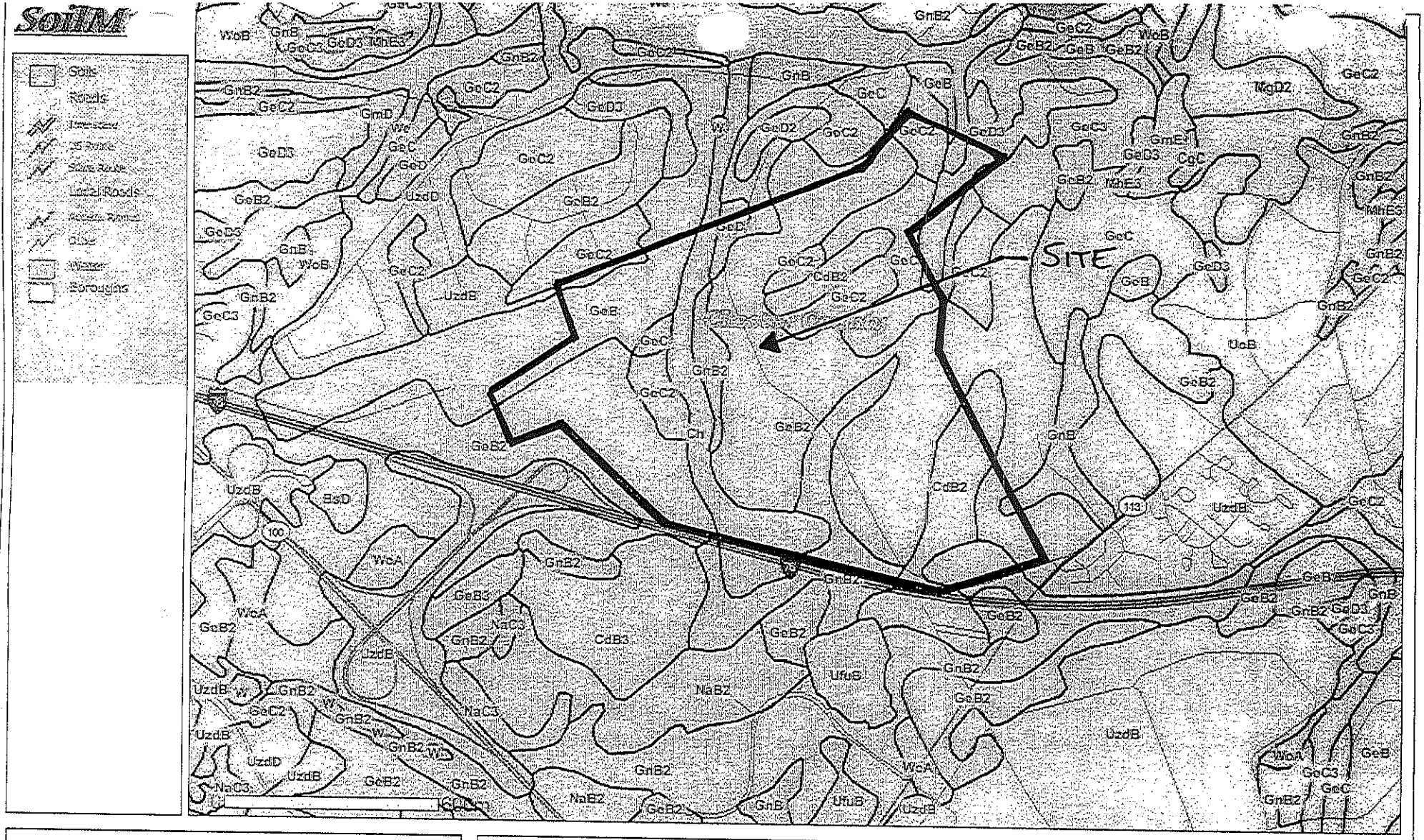


DOWNINGTOWN, PA

QUADRANGLE

1" = 2000'

SoilMap



Map Scale 1:16863, 1 inch = 1405 feet
Created by SoilMap, 5/18/2006 9:23:56 AM

Soil maps are subject to change and may be copied without permission. Enlarging the maps may cause misunderstanding of the detail of mapping. Help in using soil surveys is available from the local office of the NRCS.

Cooperative Extension
Geospatial Technology Program

2006-010.02

Soils

III. Summary

Location and Site Description

The Siemens Property is comprised of five parcels along Lionville Station Road and consists of approximately 240 acres in Uwchlan Township, Chester County, Pennsylvania. The site consists of three vacant residential properties; two of these properties are designated as "Class I Historic Resources" by the Uwchlan Township Historical Commission. The remainder of the site contains open farm fields, some wooded areas, and Lionville Station Road running north through the site from the intersection with Route 113 to the intersection with Byers Road. The site is bound on the east by the Matthews Farm, on the south by the Pennsylvania Turnpike, on the west by commercial and residential properties, and on the north by residential properties.

A conceptual Sketch Plan by Diseroad, Wolff, Kelly, Clough, Bucher, Inc. (DWKCB) was utilized as a basis for the investigatory studies and to approximate field testing.

A review of the property's Title Report, from LandAmerica Commonwealth, dated March 7, 2006, revealed three encroachments on the property. The first encroachment is a 75-foot wide Texas Eastern Transmission Corporation Pipeline Easement, located along the northeastern edge of the property. The second encroachment on the property is the Public Right-of-Way for Lionville Station Road. The third encroachment is rights granted to Philadelphia Electric Company to maintain, renew, add to, relocate and remove such facilities including poles, wires, anchor guys, and appurtenances immediately outside the eastern side of the public right-of-way for Lionville Station Road.

Zoning

The Uwchlan Township Zoning Map shows the Siemens Property as zoned **PIC**, Planned Industrial Commercial, and **R-R**, Rural Residential. The majority of the site is zoned **PIC**, with approximately 15-acres, in the northeastern portion of the site, zoned **R-R**. (Please see the following page for the Zoning Map)

Educational uses are not permitted within the **PIC** zoning district By-Right or by Conditional Use or Special Exception. However, educational uses are allowed by Special Exception within the following:

R-A- Rural Agricultural District
R-1- Low Density Residential District
R-2- Medium Density Residential District
R-R- Rural Residential District

In order for a school to be constructed on site, it will be necessary to obtain a use approval from the Township. Use approval could be sought through a use variance before the Zoning Hearing Board so to permit an educational use on lands zoned PIC. In the alternate, the School District might consider submitting an ordinance amendment to the Board of Supervisors, pursuant to Article 8 of the Zoning Ordinance, proposing that an Educational Use be permitted within the district as a Conditional Use. This alternative keeps all Township action before the Board of Supervisors and might have some procedural advantages. Another alternative would be for the School District to seek a re-zoning of the property to one of the Residential Districts noted above, and as concurrently as practical, seek Special Exception before the Zoning Hearing Board for approval of the 'education use' pursuant to Article 9 of the Ordinance.

Regardless of the selected alternate, securing use approval for an 'educational use' on the property will be timely and cumbersome as it will require either a 'use variance' before the Zoning Hearing Board or discretionary action by the Board of Supervisors when considering either a zoning text amendment or a residential re-zoning of the property.

Natural Features, Topography, and Soils

The Siemens Property consists of agricultural fields, wooded areas, wetland areas, and an unnamed tributary to Pickering Creek. The unnamed tributary flows in a northerly direction along the western portion of the site, and is classified by the Pennsylvania Department of Environmental Protection as "High Quality." This classification by PaDEP subjects all applications and plans submitted to PaDEP and the Chester County Conservation District to be reviewed under intensive scrutiny. These reviewing agencies will require extra protection to be provided during construction activities to minimize disturbance to any wetlands or Waters of the Commonwealth.

Three wetland areas have been delineated in the field by Del Val Soil and Environmental Consultants, completed on April 19, 2006. Two of the wetland areas are located on the western portion of the site. The third wetland area is located in the northeastern portion of the site. As part of the site investigations and studies, a floodplain was not calculated for the unnamed tributary to Pickering Creek. The Uwchlan Township Zoning Ordinance contains a provision for a riparian setback and buffer area 50-feet generally parallel to the edge of any permanent or intermittent stream, creek, 100-year floodplain, or wetland.

A calculated 100-year floodplain for the unnamed tributary and the riparian buffer should be taken into account when developing sketches for the school campus.

The site can be described as moderately to gently sloping in the uplands and gently sloping to nearly level in the wetlands corridor. The site slopes generally to the northwest. The site contains steep slope areas, with most of the steep slopes located in the northeastern portion of the site. The steep slope areas are protected by Township Ordinance and provide limitations to onsite sewage disposal areas. The steep slope areas will need to be delineated from a current survey base plan.

The site soils, as described in the Chester County Soils map, are silt loam with moderate permeability rates and moderate to gentle slopes. These soil types typically are well drained with moderate infiltration rates. Since the subject property has been historically utilized as farmland, RT Environmental recommends the collection of surface soil samples. These samples would be analyzed for the presence of pesticides, arsenic, and lead, to determine if the past farming operations have impacted the property's soils. The impact to the site soils are in relation to excavation. Testing is recommended to determine if excavated materials meet PaDEP Fill Policy Criteria and Limits. RT Environmental recommends no materials be moved offsite, or redeposited onsite, unless it is confirmed that constituents of concern in soils meet the applicable limits.

Bog Turtle Evaluations

As part of the Siemens Property site investigations, Gian L. Rocco was contracted by the Downingtown Area School District to perform a Phase I Bog Turtle Habitat Evaluation, and then subsequently a Phase II and III Bog Turtle Survey based upon the presence of onsite habitat. Mr. Rocco performed the Phase I study on April 20 & 21, 2006 and found habit suitable to bog turtles. The Phase II & III studies were started on April 29, 2006, but have not been completed at the time this report was developed. To date, Mr. Rocco has not found any evidence of bog turtles onsite. Mr. Rocco has stated he would be able to issue a preliminary report by the end of June 2006 and a final report by the beginning of August 2006.

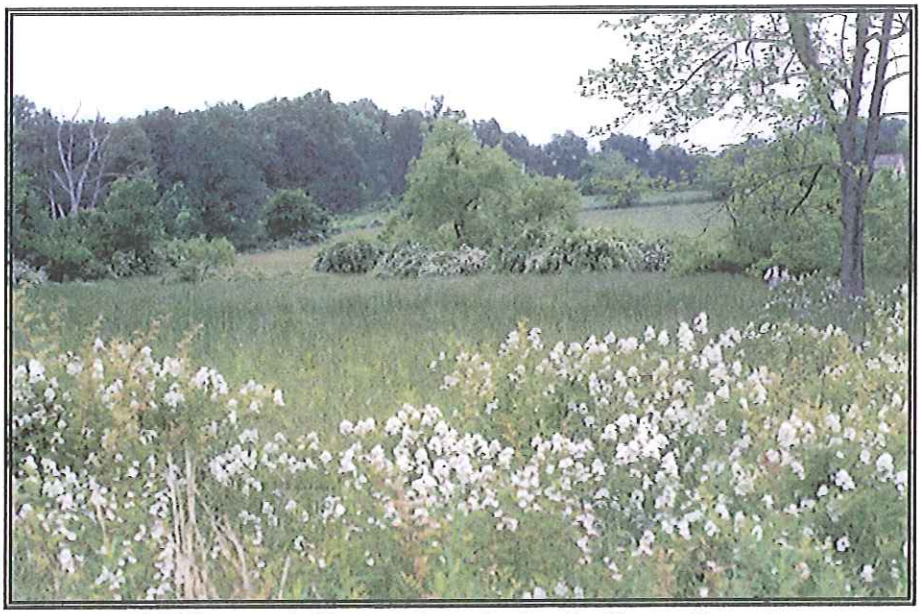
Based upon the timing of the current bog turtle study, this summary report takes into account the results of Bog Turtle Evaluations and Studies previously completed by Herpetological Associates in 2001 and by Trident Environmental Consultants in June 2005.

The Herpetological Associates Bog Turtle Habitat Evaluation and Survey, submitted July 28, 2001, concluded there was some suitable bog turtle habitat in wetlands located on the western portion of the site. However, despite extensive searches of the potential habitat, no bog turtles or evidence of them were found.

The Trident Environmental Consultants Bog Turtle Habitat Suitability Assessment, dated April 2005, and Bog Turtle Survey and Inventory Report, dated June 2005, concluded that based upon the field investigation, there is potential species habitat for the bog turtle present on the Siemens Property. Emergent vegetation, soft soils, and hydrology characteristics are conducive to bog turtle habitats in the western portion of the property. Once again, intensive field surveys and sampling regime failed to reveal any bog turtles onsite, nor any turtle tracks, runs, egg shells, or sunning beds.

HA File No. 2001.46

Results of a Bog Turtle (*Clemmys muhlenbergii*) Habitat Evaluation and Survey at the Siemens Property, Upper Uwchlan Township, Chester County, Pennsylvania



Multiflora rose in bloom at the wetland on the Siemens Property.

Submitted July 28, 2001

To

Siemens Medical Solutions Health Services Corporation
51 Valley Stream Parkway
Malvern, Pennsylvania 19355-1406

By

Robert T. Zappalorti, Michael E. Torocco, and Tessa Bickhart

Herpetological Associates, Inc.
Plant and Wildlife Consultants
575 Toms River Road
Jackson, New Jersey 08527

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

In response to the proposed development of the Siemens Property in Upper Uwchlan Township, Chester County, Pennsylvania by the Siemens Medical Solutions Health Services Corporation, Herpetological Associates, Inc. (hereafter HA) was contracted to conduct an initial Phase I bog turtle (*Clemmys muhlenbergii*) habitat evaluation. Based on the results of the Phase I survey, the need for a Phase II survey for the presence or absence of bog turtles would be determined.

Some potential habitat was found on the study area. Based on the habitat observations, Phase II surveys were initiated. The results of the habitat evaluation and the presence or absence survey are presented in this report.

MATERIALS AND METHODS

LOCATION OF THE SURVEY SITE

The Siemens Property is located in Upper Uwchlan Township, Chester County, Pennsylvania (**Figures 1 and 2**). The site is bordered to the south by the Pennsylvania Turnpike, including the Downingtown Exit 23 toll plaza. Bisecting the property is Lionville Station Road. All surveyed wetlands on the site lie to the west of Lionville Station Road. A residential housing development borders the northen edge of the property, and the Matthews farm borders the eastern edge. Most of the Siemens property consists of agricultural fields and is grazed by cattle.

SURVEYORS

The following persons were present during some or all surveys at the Cherry property: Robert T. Zappalorti, Tessa Bickhart, Michael Torocco, and Dave Schneider.

HABITAT EVALUATION METHODS

The suitability of the wetland as bog turtle habitat was determined by evaluating existing habitat components at the survey sites. Both the biotic and abiotic components were considered in our evaluation. Hydrology, substrate, and indicator plant species were used to judge the habitat for bog turtle presence (Zappalorti, 1976; Chase et al,1989). The wetland sites were then compared with recently confirmed bog turtle habitat located elsewhere in eastern Pennsylvania (Zappalorti, Drake, and Torocco 1998; Zappalorti, Drake, Sykes, Pasquini 1998). In order to standardize the results of the bog turtle portion of the habitat evaluation, each wetland was given a numerical score or rank using the Z-Scale of 1 to 5 (**Table 1**).

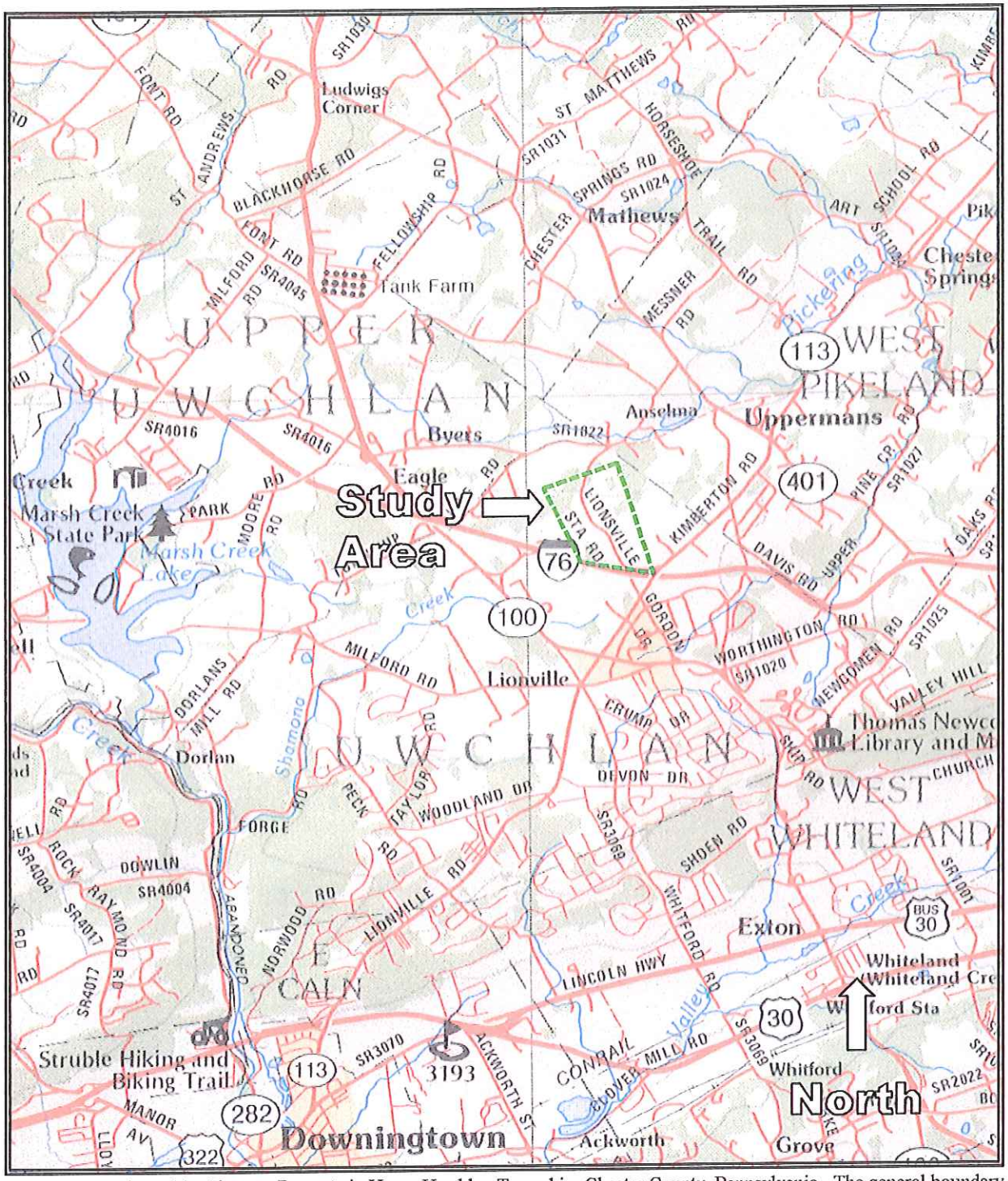


Figure 1. Location of the Siemens Property in Upper Uwchlan Township, Chester County, Pennsylvania. The general boundary of the study area is indicated by the green dashed polygon. Source: Pennsylvania Atlas & Gazetteer, 1999; Herpetological Associates, Inc., 2001.

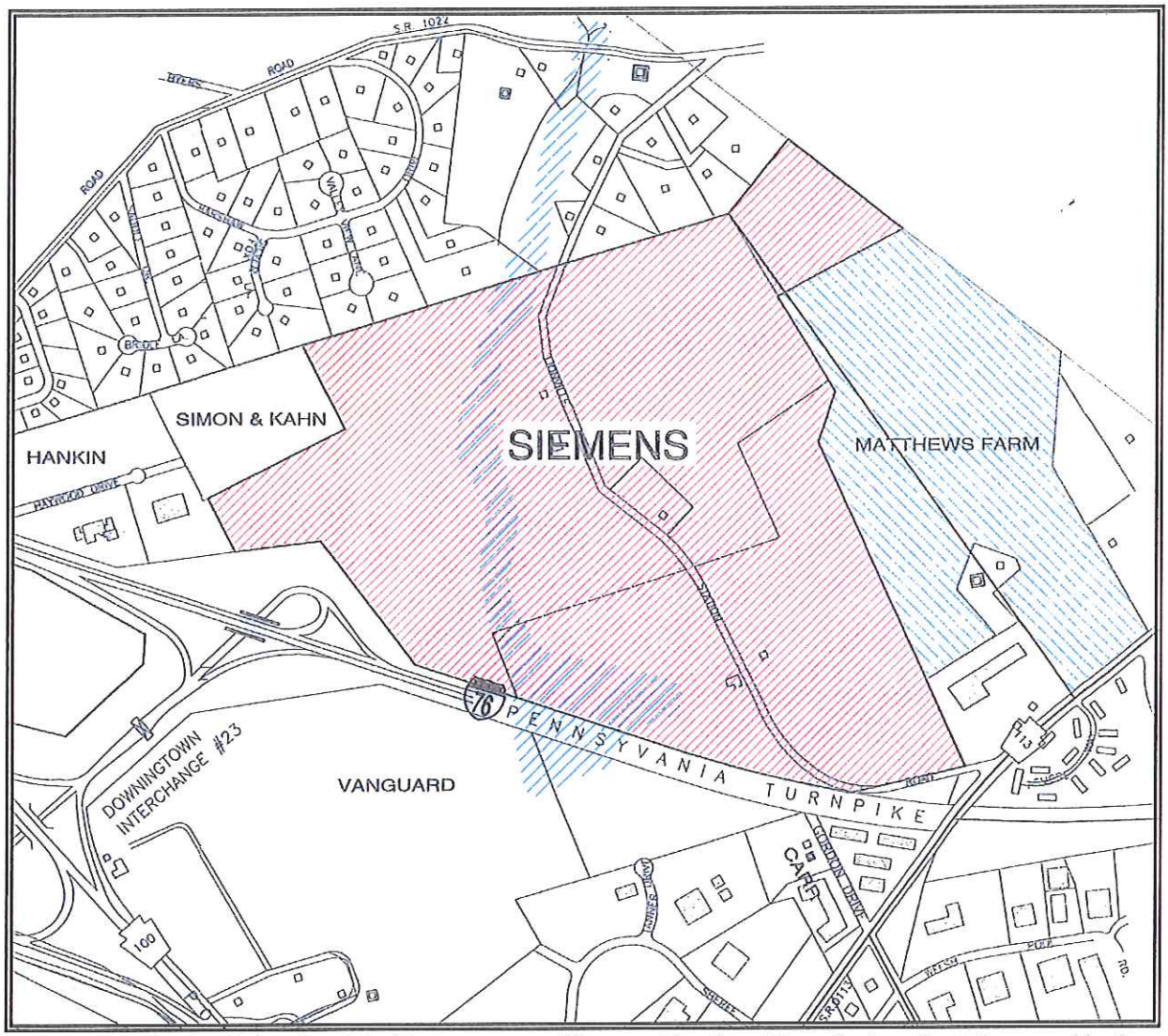


Figure 2. Map showing the location of the Siemens property. The general location of the wetlands on the study area and land use surrounding the study area are shown. Source: Cee Jay Frederick Associates.

It is obvious that some of these habitat ranks are not mutually exclusive. However, for simplicity, each observed wetland was given a number that best represented the existing conditions of the area as bog turtle habitat. For example, any wetland that lacked one of these three features; spring fed seeps, deep muddy substrate, and/or typical indicator vegetative species, was ranked only as a **1** or **2**. Those wetlands that contained all three habitat characteristics were ranked as a **3** or **4**. If bog turtles were found in the wetland habitat, it received a rank of **5**. This ranking is provided so that state (PF&BC) and federal (USF&WS) review agencies may gain a better understanding of HA's rationale as to the perceived value of the wetland areas surveyed based upon HA's 30 years of bog turtle experience.

Table 1: Standardized Wetland Rankings for Bog Turtles (Z-Scale).

Rank	Definition of Ranking
1	Not suitable for bog turtles
1.5	Unsuitable too marginal for bog turtles
2	Marginal for bog turtles
2.5	Marginal to potential for bog turtles
3	Potential habitat for bog turtles
3.5	Potential to ideal habitat for bog turtles
4	Ideal habitat for bog turtles
4.5	Ideal habitat combined with historical occurrence of bog turtles
5	Bog turtles found/confirmed at the surveyed wetland study site.

Source: Herpetological Associates, Inc.

HA has two criteria for judging the value of existing conditions and suitability of available wetland habitat for the Federally listed bog turtle. These include:

1. *Structure of Available Habitat.* HA considered both the biotic and abiotic components of this habitat. Vegetative types and communities, hydrological conditions, topography, soil characteristics, and land use patterns in the surrounding terrestrial habitat were used to evaluate the subject wetlands. These are good indicators of bog turtle presence and they are used to determine the possible occurrence of this turtle species within a particular wetland survey area (Zappalorti 1976; Chase, Dixon, Gates, Jacobs and Taylor,1989; Zappalorti, Drake, and Torocco 1998).

2. *Physical Evidence of Bog Turtles.* Physical signs include road killed specimens, footprints or turtle trails on muddy areas, eggs in nest cavities, hatched egg shells, and bones, shells, or skulls of deceased individuals (Zappalorti 1976; Ernst, Lovich, and Barbour 1994; Herman 1994; Zappalorti, Drake, and Torocco 1998). Natural Heritage Program records, historic sightings, or recent bog turtle records are also pertinent information.

BOG TURTLE SEARCH METHODS

Bog turtles inhabit unpolluted, open, *Sphagnum* bogs and wet meadows with a soft, deep muddy substrate. Their habitat is usually vegetated with various sedge grass tussocks, cattail, jewelweed, skunk cabbage, and alder (Calved 1978; Zappalorti et al 1978, 1979; Herman 1994). Most searching for this species is done by a team of experienced herpetologists in a systematic fashion. This consists of walking through a wetland and carefully looking for basking turtles in shallow, muddy water; atop or amid tussock grasses; and in or on dead/decaying plant debris. Wooden sticks (broom handles) are used to move sedge grass and other vegetation aside and to probe into soft mud in search of hidden turtles. Additionally, shallow water and the muddy substrate may be searched by muddling, or feeling around in the mud by hand (Ernst and Bury 1977).

Two standard sampling methods for reptiles and amphibians were used to survey the sites in this study: random opportunistic sampling (ROS), which examines an entire site, including both high and low potential areas; and time-constrained searching (TCS), which focuses on highly potential habitats within a site. ROS was used primarily during the initial surveys, enabling HA to observe all habitats on the site and determine the locations of any highly potential habitats. TCS was used in later surveys, after highly productive bog turtle areas were found within a site. Details of these two methods follow.

ROS (*Random Opportunistic Sampling*). A relatively simple method for the trained herpetologist, ROS can be employed while other sampling techniques are being performed on the study site. It involves searching all areas of a site, whether they show potential habitat for the bog turtle or not. This allows for the identification of highly suitable habitat patches within a site. All herptiles encountered are recorded to supplement the species list generated by other field methods. This method is effective if there are no time constraints on the survey and more detailed follow-up surveys will be performed. Qualitative impressions can be developed as to the relative abundance and habitat use of certain species (Campbell and Christman 1982; Karns 1986).

TCS (*Time-constrained Searching*). The TCS method is most effective when searching for very secretive forms of wildlife (e.g., bog turtles). A specific habitat, such as cattail swamp, open *Carex* marsh, or spring-fed meadow, is selected, and an experienced team of 3 or 4 persons conducts an intensive timed search within it. Depending on the number of times an area is to be searched, all individual reptiles and amphibians encountered may be uniquely marked to avoid counting animals twice or to obtain a population estimate. Spatial boundaries for each search are limited to the selected habitat. During times of the year when target species are known to congregate in particular habitats (e.g., nesting area, stream, spring) for some aspect of their life history (e.g., egg laying, hibernating), TCS is highly productive and superior to other types of surveys. Time limits ensure that each habitat is adequately, but not excessively, examined. This method allows a quantitative comparison of species richness, relative abundance, and habitat use between habitats (Campbell and Christman 1982; Karns 1986).

RESULTS

HABITAT EVALUATION

The habitat evaluation was conducted on May 29, 2001. All wetlands on the 240 acre study area were examined. The majority of the wetland area consisted of a heavily canopied stream corridor, which did not possess any of the characteristics necessary to support bog turtles. Several areas along the flood plain of the stream had an open canopy, but generally lacked suitable hydrology and/or soils to support bog turtles. Typical trees along the stream corridor included tulip poplar, red maple, black willow, and shagbark hickory.

One area was found to have potential for the bog turtle. This area was located at the northern end of the site. It was bordered to the east by the stream (**Figure 3**), to the north by a large tree line, and to the west an plowed agricultural field. The agricultural field was separated from the bog by a hedgerow of multiflora rose (**Figure 4**). Vegetation in the bog consisted largely of various sedge species, skunk cabbage, soft rush, and some red maple. This area had an open canopy, a soft, muddy substrate, indicator plants, and appeared spring fed. Several small rivulets had visible surface water flow (**Figure 5**). A wet sedge meadow adjoined this habitat, forming an area approximately two acres in size with potential bog turtle habitat. Due to the quality of the habitat, this area on the Siemens property was given a **Z-Scale rank of 3**. This habitat ranking indicates that a Phase II bog turtle survey is required to determine presence or absence.

BOG TURTLE SURVEY

Bog turtle surveys were conducted on May 29, June 6, June 12, and June 15, 2001. Because the habitat evaluation fell within the window when bog turtle surveys can be conducted (April 15-June 15), the initial habitat evaluation also doubled as the first day of bog turtle surveys. Despite extensive surveys, no bog turtles were found on the Siemens property. A summary of survey dates is presented in **Table 2**.

Although the habitat appeared suitable to support bog turtles, the results of the Phase II surveys indicate that no bog turtles are present on the study site. It is unlikely that further surveys will yield a bog turtle. Numerous snapping turtles and other wildlife were found in the area.

WILDLIFE OBSERVED

May 29, 2001: bullfrog, green frog, northern red salamander, snapping turtle, painted turtle, red-wing blackbird, racoon (tracks), deer (tracks, scat).
June 6, 2001: green frog, snapping turtle.
June 12, 2001: green frog, song sparrow, goldfinch.
June 15, 2001: green frog.

Figure 3. The main stream running through the Siemens property is visible in the foreground of the photograph. This stream marked the eastern edge of the potential bog turtle habitat. The wet sedge/rush meadow is evident in the center of the photograph.

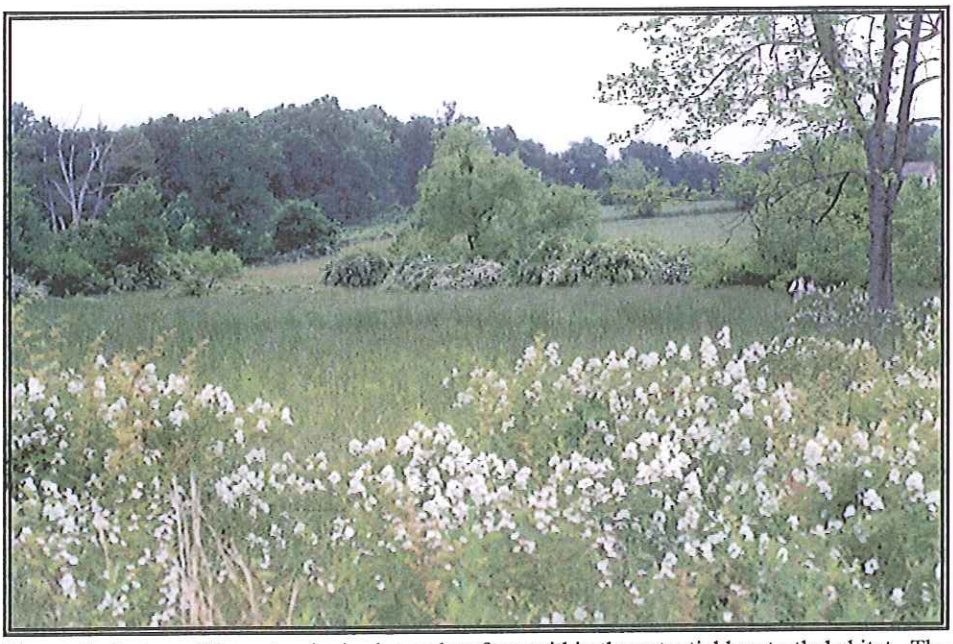


Figure 4. A view of the wet sedge/rush meadow from within the potential bog turtle habitat. The stream, although not visible here, is in the center of the photograph flowing from right to left. It is bordered by several shrub species and multiflora rose. The forest edge marks the northern boundary of the potential bog turtle habitat. Multiflora rose in bloom is visible in the foreground.

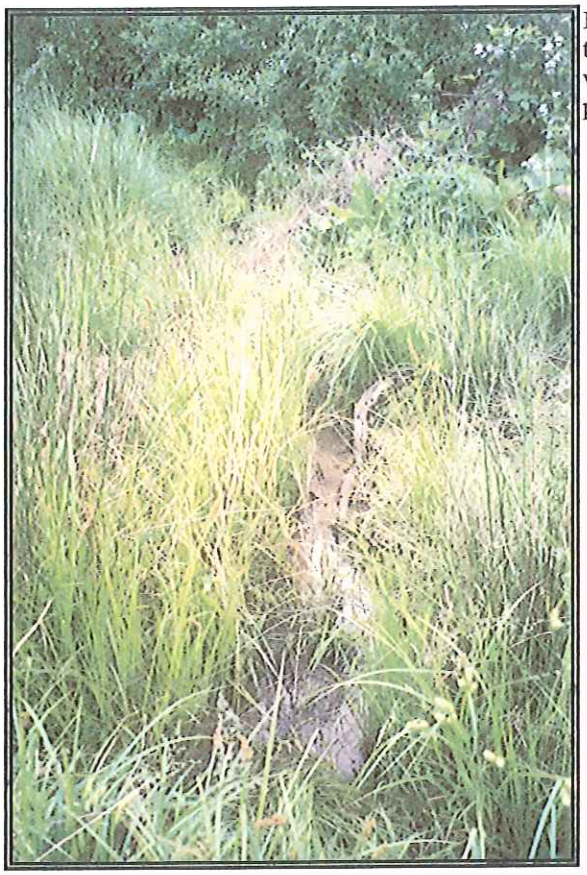


Figure 5. One of the main rivulets in the seep-fed portion of the bog. Several small rivulets were found in this area, each with some slow surface flow. Microhabitats such as this provided some of the most potential habitat on the study area.

Figure 6. HA staff person Tessa Bickhart holding one of the snapping turtles that was captured on the study area.

Table 2. Summary of Phase II surveys at the Siemens Property.

Survey Date	5/29/01	6/6/01	6/12/01	6/15/01
Time In	0830	1000	0815	1030
No. of Surveyors	2	4	1	1
Person-hours	12	6	6	6
Ambient Temp	25.0°C	26.9°C	28.3°C	25.6°C
Ambient Relative Humidity	41%	52%	67%	72%
Surface Temp	30.0°C	27.8°C	23.0°C	25.0°C
Cloud Cover	40-80%	90%	80%	0%
Wind Speed	≤5 mph	≤5 mph	0 mph	≤5 mph
Results of Bog Turtle Survey	None found	None found	None found	None found

SUMMARY AND CONCLUSIONS

Surveys were conducted at the Siemens Property on May 29, June 6, June 12, and June 15, 2001. Some suitable bog turtle habitat was found on the study site that includes stream side wet sedge meadow and an adjoining spring-fed wet field. Despite extensive searches of this potential habitat on the Siemens Property, no bog turtles, or evidence of them were found. The remainder of the wetlands on the study site were examined during the habitat evaluation, but because they consist primarily of a hardwood stream corridor, they were not surveyed intensively. Based on the habitat suitability of the wetlands, extra effort was expended to find some sign of bog turtles during the survey period, however none were found and it is unlikely that bog turtles inhabit the Siemens property.

Respectfully Submitted,

HERPETOLOGICAL ASSOCIATES, INC.

Bog Turtle (*Clemmys muhlenbergii*)

LITERATURE CITED AND OTHER REFERENCES

In addition to the literature cited, this list includes other publications concerned specifically with the bog turtle (Clemmys muhlenbergii) or with amphibians and reptiles in general. Those who wish to learn more about bog turtles in Pennsylvania, New Jersey, or throughout the eastern United States may find these publications or papers of interest.

Anderson, J.D. 1976. The status of the tiger salamander, *Ambystoma tigrinum*, blue-spotted salamander, *Ambystoma laterale*, Tremblay's salamander, *Ambystoma tremblayi*, gray treefrog, *Hyla versicolor* and *Hyla chrysoscelis*, Pine Barrens treefrog, *Hyla andersonii*, and bog turtle, *Clemmys muhlenbergii*, in New Jersey. Special report to the Nongame and Endangered Species Project, mimeographed, pp. 1-7.

Arndt, R.G. 1977. Notes on the natural history of the bog turtle, *Clemmys muhlenbergii,* in Delaware. Chesapeake Science, 18(1), pp. 67-76.

Arndt, R.G. 1986. Notes on the Bog Turtle, *Clemmys muhlenbergii*, in Warren County, New Jersey. Bulletin Maryland Herpetological Society, Vol. 22, No. 2, p. 56.

Barton, A.J. 1957. Our knowledge of the bog turtle, *Clemmys muhlenbergii*, further augmented. M.S. thesis, University of Pittsburgh, PA, p. 75.

Barton, A.J. and J.W. Price, Sr. 1955. Our knowledge of the bog turtle, *Clemmys muhlenbergii*, surveyed and augmented. Copeia(3), pp. 159-165.

Bloomer, T.J. and D. Bloomer. 1973. New Jersey Bog Turtle...Destined to Extinction? Bulletin New York Herpetological. Society, 9(3-4) p. 8-12.

Bury, R.B. 1979. Review of the ecology and conservation of the bog turtle, *Clemmys muhlenbergii*. U.S. Department of Interior, Fish and Wildlife Service, Special Scientific Report No. 219, p. 1-9.

Bury, R.B. and C.H. Ernst. 1977. *Clemmys muhlenbergii*. Cat. Am. Amphibians and Reptiles, p. 203, 1-203.2, p. 204, 1-204-2.

Campbell, H.W. and S.P. Christman. 1982. Field techniques for herpetofaunal community analysis in herpetological communities. Ed. by Norman J. Scott, Jr., U.S. Dept. of the Interior, Fish and Wildlife Service. Wildlife Research Report No. 13, pp. 193-200.

Chase, J.D., K.R. Dixon, J.E. Gates, D. Jacobs and G.J. Taylor. 1989. Habitat characteristics, population size, and home range of the bog turtle, *Clemmys muhlenbergii*, in Maryland. Journal of Herpetology, 23(4):356-362.

Congdon, J.D., A.E. Dunham and R.C. Van Loben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoiea blandingii*): Implications for conservation and management of long-lived organisms. Conservation Biology, 7(4):826-833.

Eckler, J.T., A.R. Breisch and J.L. Behler. 1990. Radio telemetry techniques applied to the bog turtle (*Clemmys muhlenbergii* Schoepff 1801). *In* Mitchell, R.S., C.J. Sheviak, and D.J. Leopold, Eds. Ecosystem management: Rare species and significant habitats, 69-70. Bulletin No. 471, New York State Museum, Proc. 15th Annual Natural Areas Conference.

Ernst, C.H. 1992. Personal communication. George Mason University, Fairfax, Virginia 22030

Ernst, C.H. and R.W. Barbour. 1989. Turtles of the World. Smithsonian Institution Press, Washington, D.C. 313 pp.

Ernst, C.H., R.W. Barbour and M.F. Hershey. 1974. A new coding system for hard shelled turtles. Trans. Kentucky Acad. Sci. 35:27-28.

Ernst, C.H. and R.B. Bury. 1977. *Clemmys muhlenbergii.* Catalog of American Amphibians and Reptiles. SSAR, 204:1-2.

Ernst, C.H., J.E. Lovich and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington and London. 578 pp.

Ernst, C.H., J.E. Lovich, R.T. Zappalorti, and Herman, D.W. 1996. Geographic Variation in Growth and Sexual Size Dimorphism of Bog Turtles (*Clemmys muhlenbergii*). In Press - American Midland Naturalist.

Ernst, C.H., R.T. Zappalorti, and J.E. Lovich. 1989. Overwintering sites and thermal relations of hibernating bog turtles, *Clemmys muhlenbergii. Copeia* 1989(3), pp. 761-764.

Farrell, R. 1995 - 1999. Herpetological Associates, Inc. staff. Personal communication.

Gibbons, J.W. 1986. Movement patterns among turtle populations: Applicability to management of the desert tortoise. Herpetologica 42:104-113.

Gibbons, J.W. 1990a. Sex ratios and their significance among turtle populations. *In* Life History and Ecology of the Slider Turtles. (*Ed.*) Smithsonian Institution Press, Washington, D.C., London. pp. 171-182.

Gibbons, J.W. 1990b. Life history and ecology of the slider turtle. Smithsonian Institution Press, Washington, D.C., London. 368 pp.

Gist, D.H. and J.M. Jones. 1989. Sperm storage within the oviduct of turtles. J. Morphol. 199:379-384.

Herman, D.W. 1994. The bog turtle, *Clemmys muhlenbergii*, in North Carolina: An action plan for its conservation and management. Zoo Atlanta, Department of Herpetology, Atlanta, Georgia. 144 pp. *Submitted to* The North Carolina Wildlife Resources Commission, Contract No. 93 SG 06.

Holub, R.J. and T.J. Bloomer. 1977. The bog turtle, *Clemmys muhlenbergii* - A natural history. Herp. Bull. New York Herpetological. Soc. 13:9-23.

Karns, D.R. 1986. Field herpetology methods for the study of amphibians and reptiles in Minnesota. Published in cooperation with the Nongame Wildlife Program of the Minnesota Dept. of Natural Resources. James Ford Bell Museum of Natural History, Univ. of Minnesota, Occasional Paper No. 18.

Kiviat, E. 1978. Bog turtle habitat ecology. Bull. Chicago Herpetological. Society 13:29-42.

Krebs, C.J. 1989. Ecological Methodology. University of British Columbia. Harper Collins Publishers, Chapter 2.

Lovich, J.E., D.W. Herman and K.M. Fahey. 1992. Seasonal activity and movements of bog turtles (*Clemmys muhlenbergii*) in North Carolina. Copeia 1992:1107-1111.

Morreale, S.J., J.W. Gibbons and J.D. Congdon. 1984. Significance of activity and movements in the yellow-bellied slider turtle (*Pseudemys scripta*). Canadian J. Zool. 62:1038-1042.

Nemuras, K.T. 1967. Notes on the natural history of *Clemmys muhlenbergii*. Bulletin of the Maryland Herpetological Society 3:80-96.

Paukstis, G.L. and F.J. Janzen, 1990. Sex determination in reptiles: Summary of effects of constant temperatures of incubation on sex ratios of offspring. Smithsonian Herpetological Information Service, No. 83.

Ryan, J.J. 1981. A record size female and egg clutch for the bog turtle, *Clemmys muhlenbergii*. Bull. Maryland Herpetological Society, pp. 102-106.

Tuberville, T.D. and V.J. Burke. 1994. Do flag markers attract turtle nest predators? Journal of Herpetology 28(4):514-516.

Vogt, R.C. 1994. Temperature controlled sex determination as a tool for turtle conservation. Chelonian Conservation and Biology. 1(2):159-162.

Zappalorti, R.T. 1976. The Amateur Zoologist's Guide to Turtles and Crocodilians. Harrisburg, Pa., Stackpole Books. pp. 122-139.

Zappalorti, R.T. 1978-79. An updated progress report on the distribution and locality records of New Jersey's Endangered and Threatened reptiles and amphibians. For NJDEP, E&NSP, Vol. 10, Herpetological Associates, Inc., Parts 1-4. pp. 198.

Zappalorti, R.T. 1975-2001. Personal field and laboratory observations. Herpetological Associates, Inc. N.J.

Zappalorti, R.T. and R.F. Farrell. 1980. An ecological study of the bog turtle, *Clemmys muhlenbergii* (Schoepff, Reptilia, Testudines, Emydidae), in New Jersey, Part III. Unpublished progress report submitted to NJDEP. HA File No. 81.12, pp. 1-36.

Zappalorti, R.T. and R. Farrell. 1989. A habitat evaluation and updated bog turtle survey of known colonies and locations throughout New Jersey. Report to NJDEP, E&NSP. Herpetological Associates, Inc. pp. 1-100.

Zappalorti, R.T. and R.F. Farrell. 1985. Progress report on an experimental bog turtle management program in Monmouth County, New Jersey, Part II. Unpublished Report submitted to Endangered and Nongame Species Program, Division of Fish, Game and Wildlife, NJDEP. HA File No. 84.02.

Zappalorti, R.T. and E.W. Johnson. 1980. Additional updated locality and distribution records of endangered and threatened herptiles in New Jersey, Third Supplement. Unpublished report submitted to the NJDEP, HA File No. 81.15, pp. 55-68.

Zappalorti R.T. and E.W. Johnson. 1981. Proposed management plans for endangered and threatened amphibians and reptiles in New Jersey. Unpublished report submitted to the NJDEP, HA File No. 81.12, pp. 12-15.

Zappalorti, R.T. and G. Rocco. 1992. An intensive collection program and habitat evaluation to determine the population status of the bog turtle (*Clemmys muhlenbergii*) at the Nature Conservancy's Preserve in Lancaster, Pennsylvania, HA File No. 91.01, pp. 1-41.

Zappalorti, R.T. and G. Rocco. 1993. Surveys, habitat evaluations and ecological studies of the bog turtle (*Clemmys muhlenbergii*) in Chester and Lancaster Counties, Pennsylvania with recommendations on its conservation and management, HA File No. 93.08, pp. 1-71.

Zappalorti, R.T., G. Rocco, and P. J. Drake. 1995. Results of a two phase bog turtle (*Clemmys muhlenbergii*) study within the Cocalico Creek Drainage Basin in Lancaster County, Pennsylvania, with special notes on nesting. Unpublished report submitted to The Nature Conservancy. HA File No. 94.18 & 94.19, pp. 1-84.

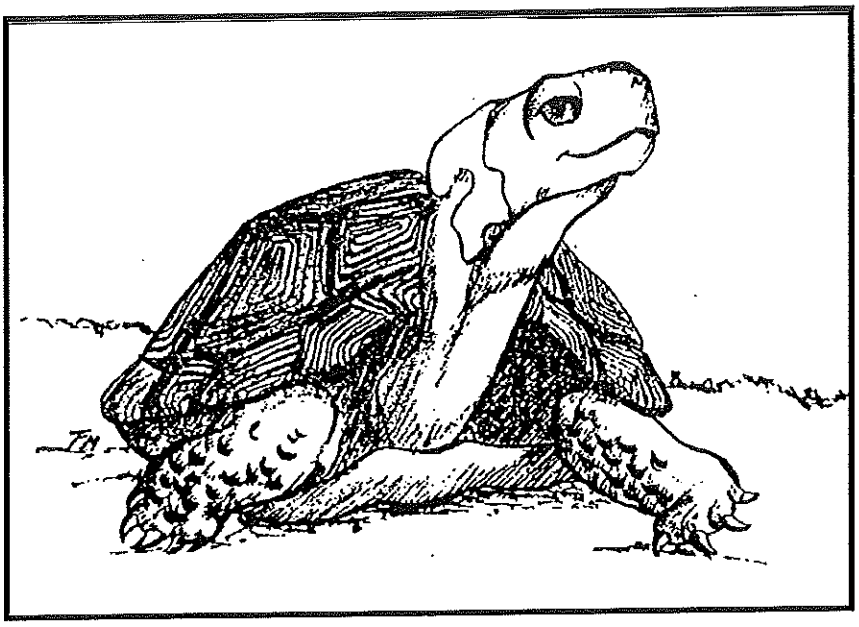
Zappalorti, R.T., M.E. Torocco, and P.J. Drake. 1995. Results of bog turtle (*Clemmys muhlenbergii*) surveys and habitat evaluations conducted in eastern Pennsylvania during May and June, 1995. Unpublished report submitted to The Nature Conservancy. HA File No. 95.05, pp. 1-40.

Zappalorti, R.T. and E. Zanelli. 1978. The status and distribution of the bog turtle, *Clemmys muhlenbergii,* in New Jersey, Part I. Unpublished progress report submitted to NJDEP, pp. 1-58.

Zappalorti, R.T., E. Zanelli, and R.J. Farrell. 1979. The ecology and distribution of the bog turtle, *Clemmys muhlenbergii* (Schoepff), in New Jersey, Part II. Unpublished progress report submitted to NJDEP. HA File No. 79.02, pp. 1-38.

Bog Turtle (*Clemmys muhlenbergii*)

Results of a Bog Turtle Habitat Evaluation and Survey at the Siemens Property



Herpetological Associates, Inc.

Plant and Wildlife Consultants

575 Toms River Road (Route 571), Jackson, New Jersey 08527

732-833-8600

RESULTS OF A BOG TURTLE (*Glyptemys muhlenbergii*) SURVEY AT THE SIEMENS TRACT, UWCHLAN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA

Prepared

for

Gilbert C. Lappano
Downingtown Area School District
122 Wallace Avenue
Downingtown, PA 19335

on
December 2006

by

Gian L. Rocco
509 Orlando Ave, State College, PA 16803
voice/fax: 814.237.2313
e-mail: gxr124@psu.edu

INTRODUCTION

On March 30, 2006, Gian L. Rocco (GLR) was commissioned by Downingtown Area School District (DASD) to perform a Phase 2 bog turtle (*Glyptemys muhlenbergii*) study at the Siemens Tract, Uwchlan Township, Chester County, PA.

The bog turtle is a federally threatened and Pennsylvania endangered species (Figure 1). Both federal and commonwealth regulations prohibit its take, capture, or sale. Its habitat is similarly protected by the Endangered Species Act (ESA), Pennsylvania Department of Environmental Protection (PA DEP) regulations related to wetlands of Exceptional Value and the Fish and Boat Code, Pennsylvania Fish and Boat Commission (PFBC).

A survey to determine the presence of the bog turtle, also known as a "Phase 2" survey, is required when development activities within the geographic range of the species threaten wetlands containing potential habitat. Thus, evaluating wetland suitability for the bog turtle is the first step towards assessing the potential for such risks; establishing presence or probable absence follows. The bog turtle occurs in Chester Co. as well as in the general vicinity of the property.

The objectives of this study were to provide, (1) an independent evaluation of all wetland areas in the property as potential bog turtle habitat, and (2) perform an intensive search of on-site wetlands to ascertain bog turtle presence. The report presents the findings of these tasks.

METHODS

The bog turtle habitat evaluation was performed in accordance with US Fish and Wildlife Service (USFWS)[1] and PA FBC bog turtle survey guidelines. A copy of the guidelines and related information is included in Appendix 1.

The bog turtle has an affinity for shallow, spring-fed wetlands that have mucky substrates and emergent or scrubby vegetation. Wetlands in the study area were assessed as habitat for the bog turtle by evaluating how soils, hydrology, and vegetation matched the above generalized wetland attributes. Conditions related to hydrology and substrates are key factors in determining the outcome of the habitat evaluation. The narrative that follows is a brief, general description of bog turtle habitat; it is included here for non-specialists.

The availability of deeper, penetrable substrates is a key bog turtle habitat component. Burrowing in soft substrates allows this small turtle to evade predators and protects submerged individuals against temperature extremes. Tunnels draining subterranean rivulets or made by small burrowing animals also serve as primary habitat and shelter. Thus, the ability to move and seek shelter below the surface is vital to the species survival.

---

[1] USFWS. 2006. Guidelines for Bog Turtle Surveys. pp 1-8

Water temperatures at suspected springs and seeps were measured with an infrared thermometer. Soil depth was estimated to the nearest inch by examining mud level on the boot or pole. Only dominant vegetation types were noted. Brown (1979), Knobel (1980), and Newcomb (1977) aided plant identification. Opportunistic searches for the target species and their signs were also conducted during the examination.

In the office, GPS-tagged digital photos were indexed to the project area by the software GPS-link (www.geospatialexperts.com). During the indexing process, the location data in each image file were used by GPS-link to find corresponding maps from Terraserver USA, an online mapping website (http://terraserver-usa.com). The output of the indexing process, included in the attached CD, allows viewing of photos and their corresponding locations easily and interactively. GPS-link also creates a GIS-compatible file containing photo locations and data needed for their mapping.

Arcmap ver. 8 was used for mapping and examination of GIS coverages relevant to the ecology of the bog turtle (topography, surface geology, soils, etc). Coverages examined for this report were obtained from PASDA (www.pasda.psu.edu). The point file created from the photo location data aided the mapping of designated survey areas (DSA), tracts within the larger on-site stream and wetland complex containing potential habitat and most likely to be occupied by the bog turtle. Polygons representing DSAs were constructed using XTools Pro, a popular extension for ArcMap GIS also used to compute area, perimeter and other shape attributes.

Panoramic photos indexed to the study area can be viewed from the attached CD. The CD is equipped with Autorun. No special software is required. Please consult the instructions page at the back of the report to initiate the web browser-based virtual tour if the autorun feature fails.

Survey to Determine Bog Turtle Presence

Standard Phase 2 Survey

Both random opportunistic and intensive area-constrained searches were implemented in suitable habitat as well as in adjacent wetland areas during bog turtle surveys. The first method entails looking for bog turtles in all potential habitats within the project area. Searching is focused in the best places within suitable habitat. This allows quick, efficient coverage of large project areas and is particularly effective when employed by experienced bog turtle surveyors. Intensive area-constrained searches are typically conducted in smaller target areas that may also include non-suitable wetland habitat. Unlike the former method, however, searches are systematic, thorough, and very intensive within the area of interest. Teams of 1 - 4 surveyors conducted the field work. All surveys were supervised by at least one Qualified Biologist (QB).

FWS and PFBC bog turtle survey guidelines are quite specific (Appendix 1). The most important aspect of this protocol is the amount of search effort required and its computation. In general, the methodology requires a minimum of 4 visits and a survey effort ranging from 4 - 6 person-hrs per per visit per acre of potential habitat. The amount of potential habitat present is determined by the size of the Designated Survey Area (DSA). Thus, the number of wetland areas containing

Most of the wetlands bordering the main tributary coincide with Chewacla (Ch) soils, a mapping unit not listed as a hydric soil. Glenelg channery silt loam (GeB2 and Ge*) underlie most of the on site uplands and borders portions of the Eastern Tributary. Glenelg is a mapping unit found in moderately deep to well-drained soils, developed in material weathered mostly from granite, gneiss and mica schist. It is typically observed on slopes with a grade of 3-8%. A narrow strip of Glenville (Gn*) soils borders the Chewacla soils to the northeast. Glenville silt loam (GnB2) is a mapping unit with hydric inclusions. Glenville soils are deep, moderately well drained found in uplands and developed in material weathered from granite, schist and gneiss. Hydric soils named Wehadkee (We) underlie the Eastern Tributary as it exits the site.

Wetland delineation identified wetlands bordering all three tributaries. Del Val Soils completed the wetland delineation on August 21-22, 2000 and identified a total of approximately 26 acres in various cover types (Appendix 2).

Potential bog turtle habitat was encountered at several locations along the Main Tributary but none along the Northern or Eastern tributaries. Follows is a description of the Lower, Mid-Trunk, and Upper Designated Survey Areas (DSAs) bordering the Main Tributary as well as the northern and eastern tributaries (Figure 5 and 6):

Lower DSA

The Lower DSA was located to the west of the Main Tributary, in the northern portion of the property. The stone spring house visible at photo location 22 (see enclosed CD) was considered its southernmost terminus, whereas the northeast-trending ridge, near where the main tributary exits the site, was its northernmost limit. Steeper terrain to the north, in particular, and to the east of the tributary channel, hindered wetland formation. A large emergent tract occupied the center of the Lower DSA. Dense, oftentimes impenetrable woody vegetation, bordered the marsh on almost all compass points. Mature, deciduous woodlands bordered the northern edge. The area of the Lower DSA was estimated by GIS to be 3.91 acres.

Hydrology in the Lower DSA turned out to be very ephemeral, except where fed by the main tributary or any one of the many larger rivulets. The emergent portion was the driest from the first visit, and became drier over the course of the study. There was little hydrologic heterogeneity in the marsh itself. The surface lacked inundation almost throughout. When present, saturation was only several inches deep. Moisture was evidently confined to a shallow subsurface layer. No burrows or subterranean cavities were noted in the marsh. Rivulets mostly traversed through brushy, woody vegetation along the southern and northern edge of the marsh. Rivulets varied in their flow. Some were barely flowing and consisted of shallow pools interrupted by mud-flats. Larger channels connected to the stream or fed by small springs and/or seepages were usually found in the southern and northern ends of this DSA. The northern portion of the DSA, below the mature woodlands, contained larger spring-fed seeps and channels.

Deeper, softer, soupy substrates, as might be deducted from the latter description of hydrology, were almost exclusively found in rivulets and some spring-fed channels. Substrates in these linear habitats were in some locations, deep to the knee or thigh. Elsewhere, substrates lacked the

Mature hardwoods shaded most of the upper DSA. Understory vegetation was absent or sparse and where present, consisted largely of spicebush (*Lindera benzoin*) and *Smilax* spp. Skunk cabbage and jewelweed, as might be expected, were the predominant forbs. The upper DSA was considered potential bog turtle habitat because of its heterogeneity and availability of conditions sought by this species. The upper DSA was estimated by GIS to be 4.07 acres. This area included uplands bordering the various riparian wetlands and seepages and is probably a generous estimate.

Riparian wetlands bordering the Eastern and Northern Tributary were not considered potential bog turtle habitat. The Northern Tributary was the least suited in this respect. A small sandy-bottomed seep covered by less than 4" of muck and vegetated almost entirely by skunk cabbage and jewelweed was not considered potential bog turtle habitat. This area, covering less than 0.01 acres, is identified in Figures 5-6 as the Eastern Tributary Seep and corresponds to photo locations 63 and 64. The surrounding and immediate tributary channels and streamside wetlands bordering the Eastern and Northern Tributary, unlike in the Upper DSA, did not warrant Phase 2 surveying or trapping.

Bog Turtle Survey Design and Rationale

There are approximately 26 acres of Federally Regulated Wetlands on the property (Appendix 2). The Lower DSA was estimated to be approximately 4 acres, the Mid-Trunk < 1 acre, and the Upper DSA, 4 acres, for a total of under 10 acres. The Lower DSA was considered the most suitable as potential bog turtle habitat. The Mid-Trunk DSA was also considered potential nesting habitat. The upper DSA was considered suitable for summer forays and potential overwintering habitat. Given the above, a Phase 2 survey effort of 150-160 person-hours was deemed sufficient to meet survey guidelines (10 acres * 4 person/hrs * 4 visits). Trapping, if necessary, was anticipated to require between 100 - 125 traps (20 traps * 4-5 hectares).

Results of the Bog Turtle Survey

Standard Phase 2 Survey

The site and target wetlands were visited from April 20 to June 10, 2006, on 8 different days (April 20, 29, May 10,17,25,30, and June 6,10), a sampling period spanning 51 days. A minimum of 167.0 (decimal) person-hours were spent sampling the 3 DSAs bordering the Main Tributary (Table 2). Some of this time was spent investigating the Eastern Tributary on 4 different occasions. Teams consisted of 1- 6 persons (mean 4.25). Search effort ranged from 12 - 35.75 person-hrs per visit (mean 20.88). Hours spent on site by FT(s) checking traps when not accompanied by a Qualified Biologist (QB) are not included. Depending the number of individuals chcking traps, FT(s) spent between 1- 3 hrs on site. Effort expended for the Phase 2 portion of this study was not tracked by individual DSA because all survey areas were close and in the same tributary-wetland complex.

No bog turtles, or signs of their presence, such as shells or tracks resembling *Glyptemys*, were found during the study. While conducting the bog turtle searches, 11 species of amphibians and

Table 1. Bog turtle habitat evaluation at the Lower and Mid-Trunk DSA, Siemens Tract, Uwchland Township, Chester County, PA.

Attribute	Main Tributary Lower DSA	Main Tributary Mid-trunk DSA
Location (decimal degrees)	N 40.07150° W 075.66133° Photo location 14	N 40.06933° W 075.66083° Photo location 30
Size (acres)	3.912 acres	1.039 acres
Type (PEM, PSS, PFO)	45% PEM, 35% PSS, 20% PSS/PFO	90% PEM, 10% PSS
Visually Dominant Vegetation (in decreasing order of occurrence)	*Simplocarpus foetidus, Impatiens capensis, Carex stricta, Leerzia oryzoides, Solidago spp., Rosa multiflora, Rosa palustris, Alnus rugosa*	*Simplocarpus foetidus, Impatiens capensis, Smilax spp., Lindera benzoin, Acer rubrum, Liriodendron tulipifera, Hamamelis virginiana*
Soil Depth	mostly shallow and confined to upper 4-6"; deeper pockets (12") in the vicinity of the tributary and rivulets	Deeper substrates throughout with some pockets to the thigh.
Hydrology	Shallow, seepage-fed and spring-fed; ephemeral in upper tussock sedge area.	Seepage fed, persistent.
Water Depth (in wetlands)	Generally shallow (<2") deeper pools along tributary.	Mostly shallow (<2") deeper pools in main tributary channel.
Comments	short hydroperiod, ephemeral in some areas particularly to west of pond.	Ideal hydrology and substrates in PFO; appeared persistent/perennial despite dry weather.
Potential Bog Turtle Habitat?	Yes	Yes

Table 3. Summary of bog turtle surveys at Wetland 1, Siemens Property, Uwchlan Township, Chester County, PA on April - June, 2006.

Date	Time	Surveyors	Search Effort (in hours, by surveyor)	Total Search Effort (person-hrs)	Weather - Usually recorded 0.5 - 1 hr after arrival AT: Ambient Temperature in °F ST: Substrate Temperature in °F CV: Cloud Cover, percent	Bog Turtles Found (Y/N)
April 20	7:30 a - 12:00 p	B.S. Fiegel J.T. Hite B.K. Armstrong G.L. Rocco	4.5 4.5 4.5 4.5	18	AT: 75; CV: 0%	N
April 29	9:30 a - 1:30 p	B.S. Fiegel J.T. Hite T.K. Shrout	4 4 4	12	AT: 60; ST: 71; CV: 0%	N
May 10	10:00 a - 12:30 p 1:00 p - 2:30 p	B.S. Fiegel T.K. Shrout J.D. Cocco	4 4 4	12	AT: 71; ST: 89; CV: 10%	N
May 17	1:40 p - 14:40 p	B.S. Fiegel T.K. Shrout J.D. Cocco B.A. Smith	3 3 3 3	12		N
May 25	9:00 a - 12:00 p 12:15 p - 5:15 p	B.S. Fiegel T. Strickland J.D. Cocco B.A. Smith T.K. Shrout G.L. Rocco	6.5 5.75 5.75 8 5 5	35.75	AT: 68; ST: 88; CV: 30%	N

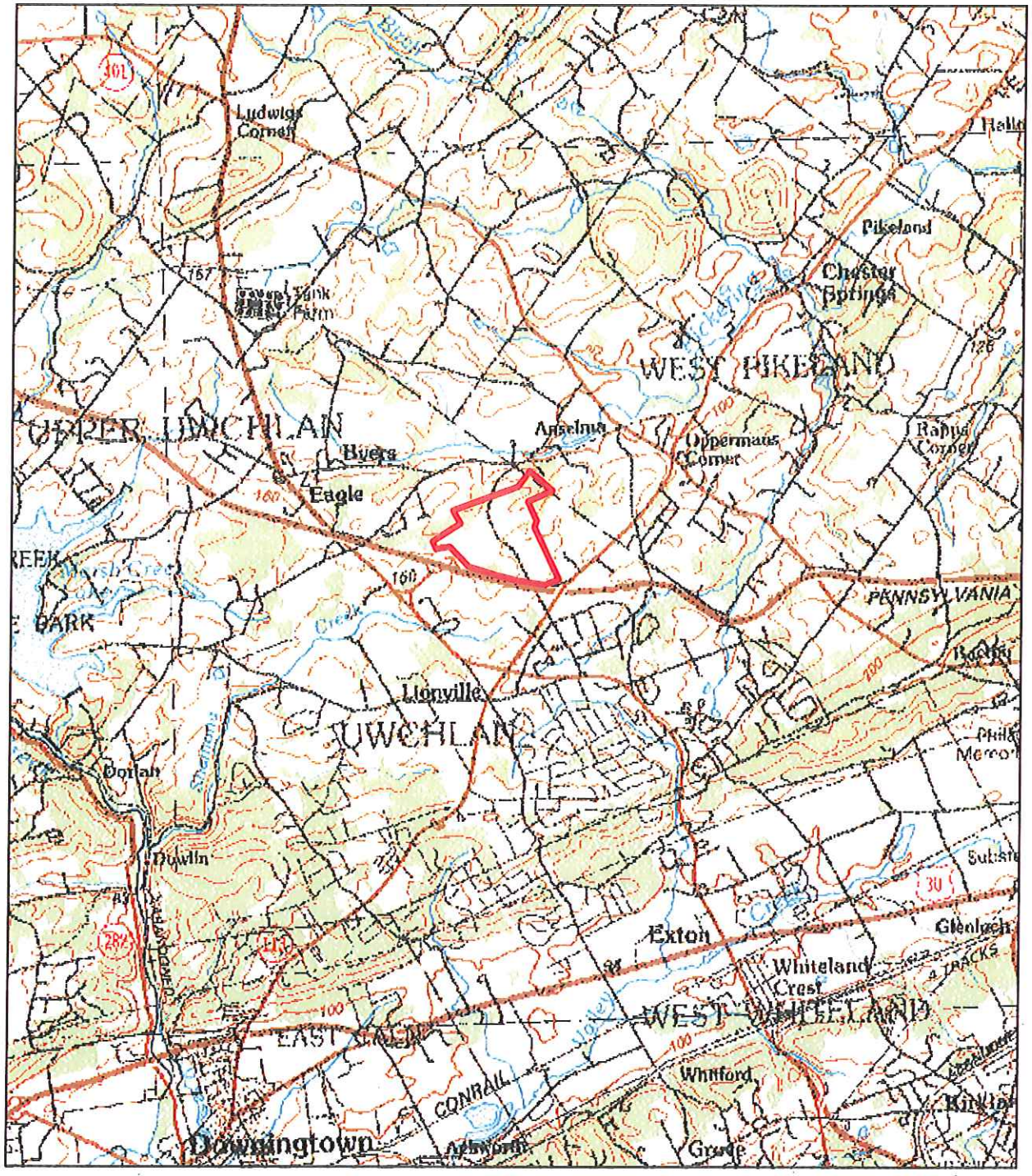
Table 4. Summary of amphibians and reptiles sighted at the Siemens Property, Uwchlan Township, Chester County, PA on April - June, 2006.

Common Name	Scientific Name	Abundance or Location During Survey
Salamanders, 5 species		
N. two-lined	*Eurycea b. bislineata*	abundant along stream
Slimy Salamander	*Plethodon g. glutinosus*	under woody debris
Red-backed Salamander	*Plethodon cinereus*	under woody debris
N. Dusky Salamander	*Desmognathus f. fuscus*	along stream
Northern red	*Pseudotriton r. ruber*	along stream
Frogs and toads, 3 species		
Green frog	*Rana clamitans melanota*	observed in all wetlands
Pickerel frog	*Rana palustris*	along stream
Eastern American toad	*Bufo a. americanus*	wooded tract, Upper DSA
Snakes, 1 species		
E. Garter Snake	*Thamnophis s. sirtalis*	adults in emergent areas and in stream
Turtles, 2 species		
Eastern Box turtle	*Terrapene c. carolina*	Adult in emergent area
Snapping turtle	*Chelydra s. serpentina*	Several 10-13" specimens in mucky areas, several hatchlings in rivulets
Total No. of species = **11**		

MAPS AND FIGURES

All photos are by GLR unless otherwise indicated.
Please do not duplicate without permission.

Figure 1. **A** Adult bog turtle from Lancaster County, PA. **B** Hatchling bog turtle with spent egg shells on tussock sedge nest, Lancaster Co., PA. **C** Typical bog turtle habitat showing spring-fed rivulet, muddy flats, tussock sedge, and skunk cabbage. Chester Co., PA.



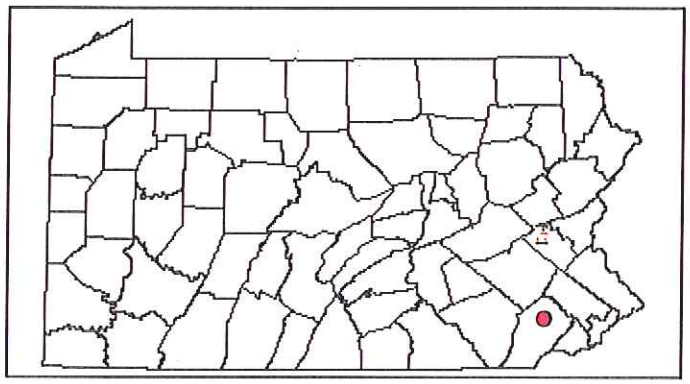


Figure 2. Portion of USGS quadrangle showing the approximate location and boundary of the Siemens Tract, Uwchlan Township, Chester County, Pennsylvania.

Source: 1:100 000 Reading, USGS Quadrangle

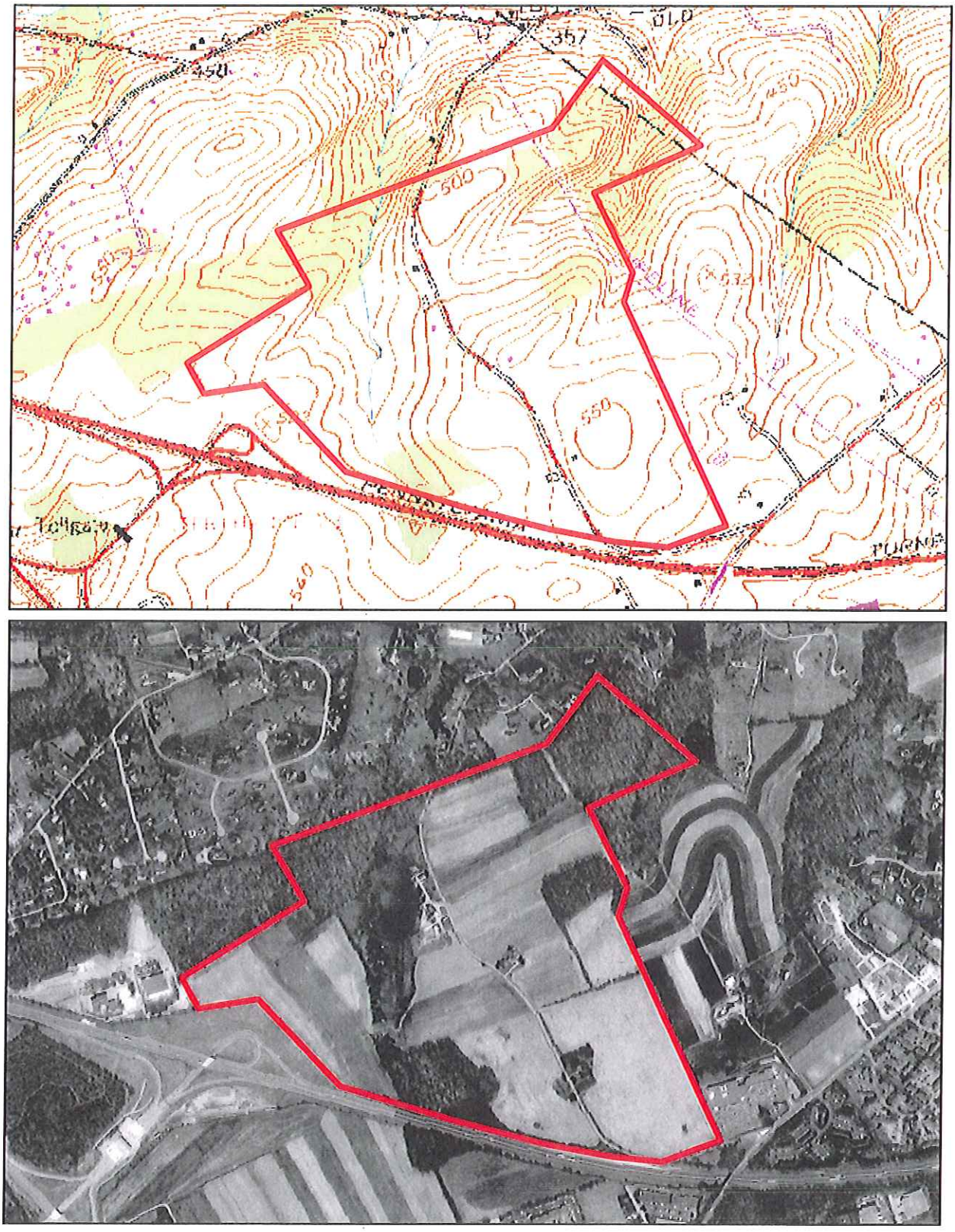


Figure 3. Portion of USGS topographic (a) and digital ortho quarter (b) quadrangles showing the approximate location and boundary of the Siemens Tract, Uwchlan Township, Chester County, Pennsylvania.

Source: 1:24 000 Downington Quadrangle

N

m

0 200 400 800

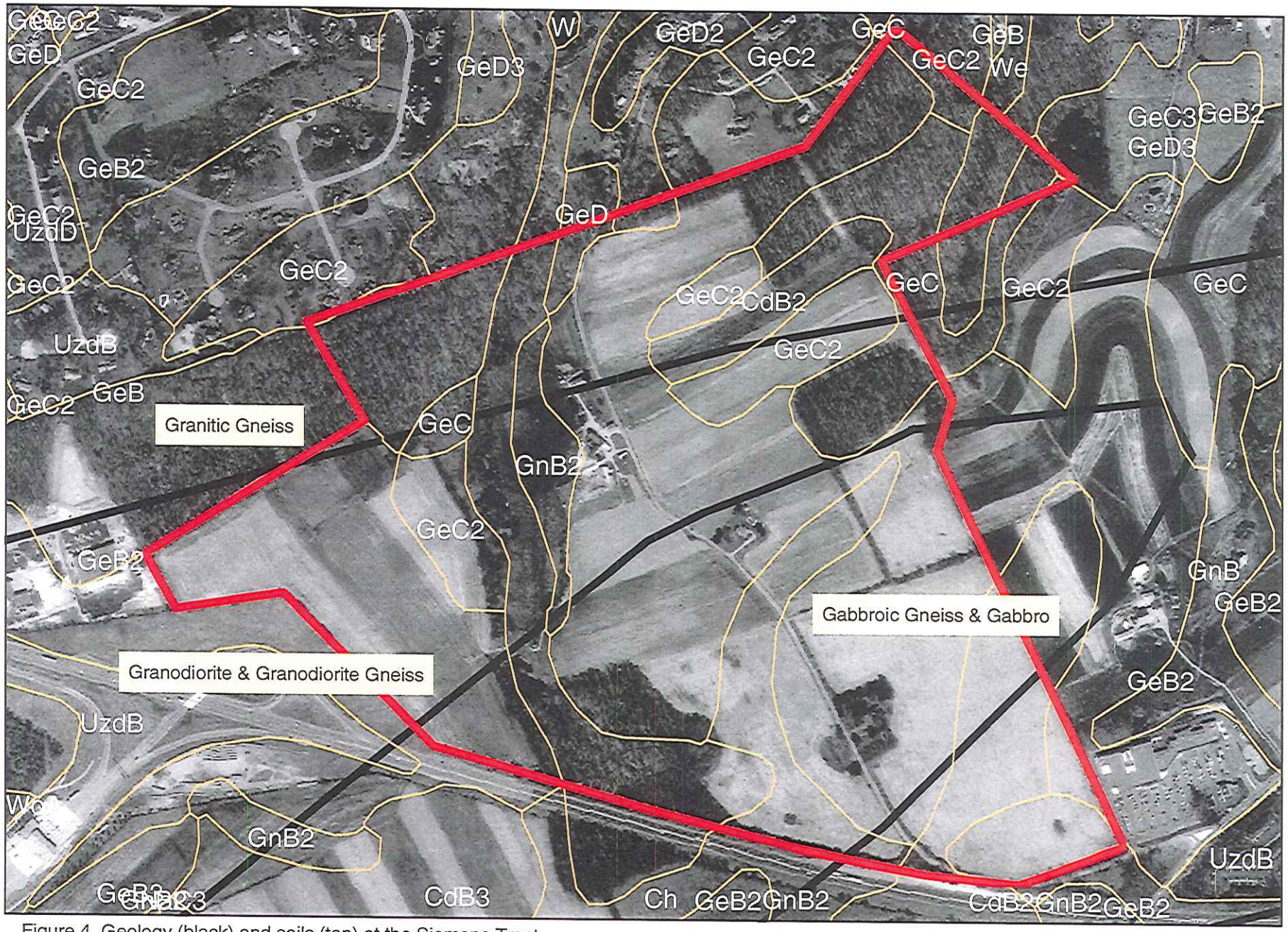


Figure 4. Geology (black) and soils (tan) at the Siemens Tract.

Source: Soils based on USDA/NRCS Soil Survey
Geology based on USGS Surface Geology, 1994

0 125 250 500 m

N

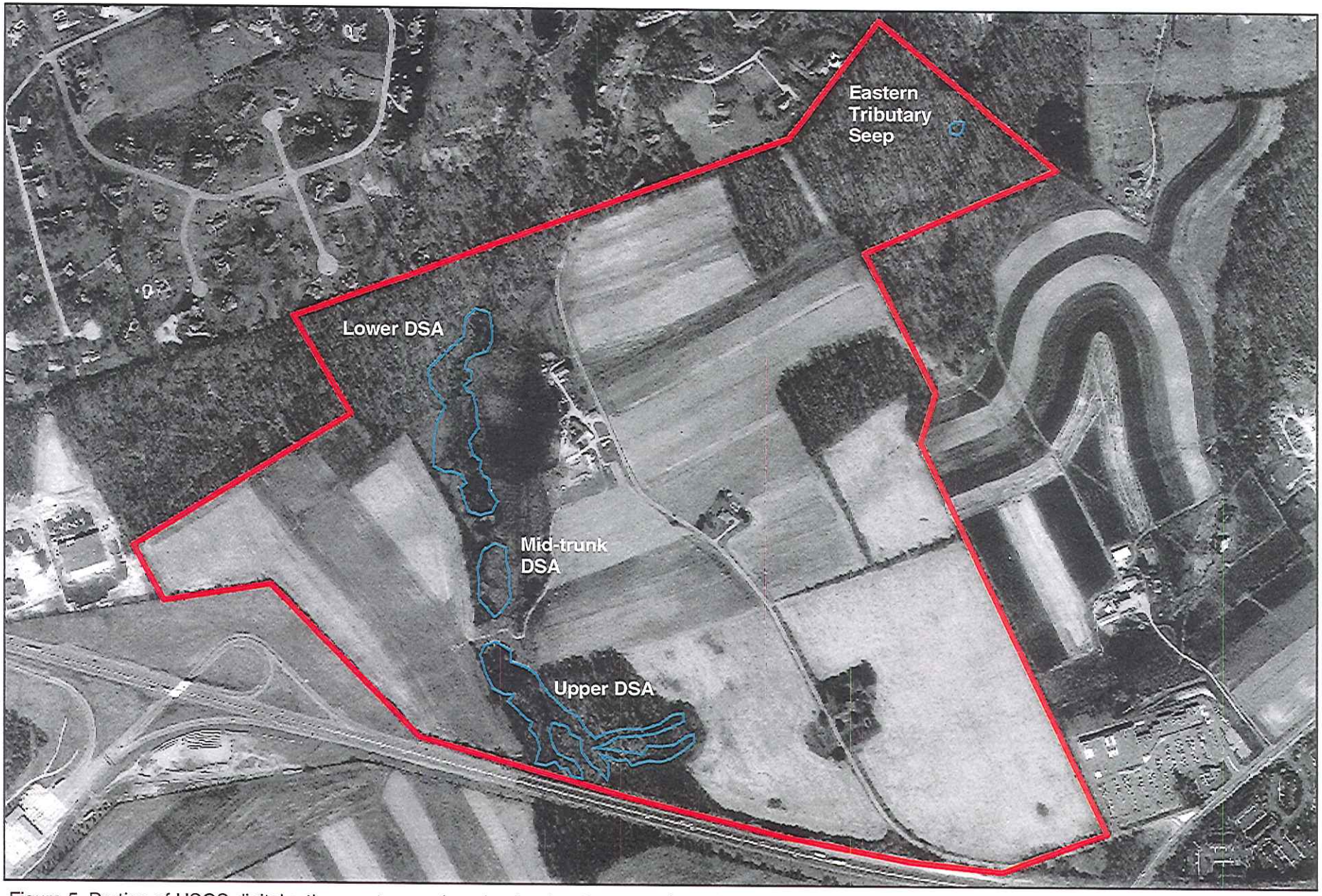


Figure 5. Portion of USGS digital ortho quarter quadrangle showing the approximate location of the 3 Designated Survey Areas bordering the Main Tributray and the Eastern Tributary Seep, at the Siemens Tract, Uwchlan Township, Chester County, Pennsylvania.

0 125 250 500 m

N

Source: 1:24 000 Downington DOQ quadrangle

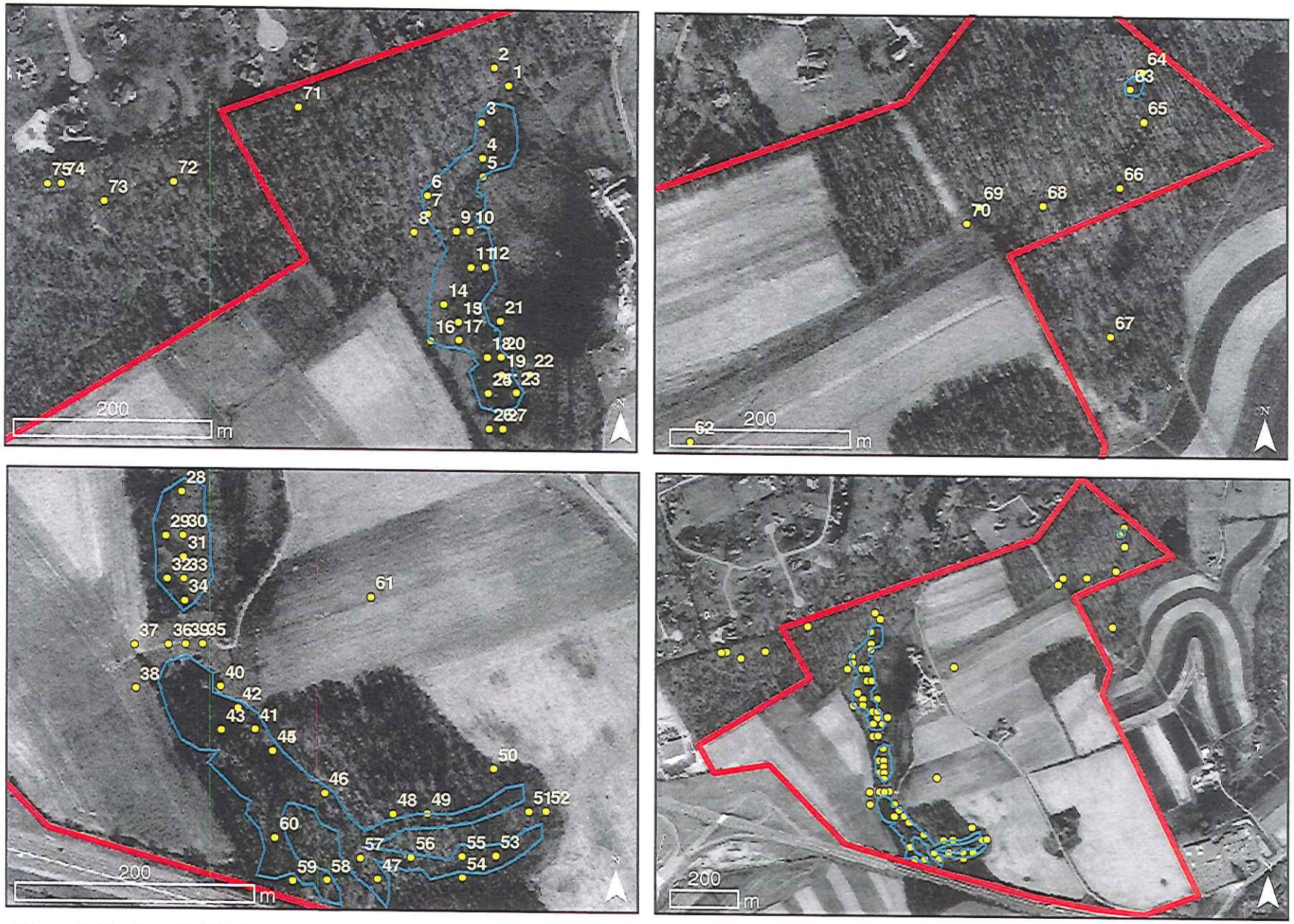


Figure 6. Portion of USGS digital ortho quarter quadrangle showing the 75 photo locations at the Siemens Tract, Uwchlan Township, Chester County, Pennsylvania. Photo location labels above correspond with identification numbers used in the CD.

Source: 1:24 000 Downington DOQ quadrangle

APPENDIX 1

BOG TURTLE SURVEY GUIDELINES

GUIDELINES FOR BOG TURTLE SURVEYS[1]

(revised April 2006)

RATIONALE

A bog turtle survey (when conducted according to these guidelines) is an attempt to determine presence or probable absence of the species; it does not provide sufficient data to determine population size or structure. Following these guidelines will standardize survey procedures. It will help maximize the potential for detection of bog turtles at previously undocumented sites at a minimum acceptable level of effort. Although the detection of bog turtles confirms their presence, failure to detect them does not absolutely confirm their absence (likewise, bog turtles do not occur in all appropriate habitats and many seemingly suitable sites are devoid of the species). Surveys as extensive as outlined below are usually sufficient to detect bog turtles; however, there have been instances in which additional effort was necessary to detect bog turtles, especially when habitat was less than optimum, survey conditions were less than ideal, or turtle densities were low.

PRIOR TO CONDUCTING ANY SURVEYS

If a project is proposed to occur in a county of known bog turtle occurrence (see attachment 1), contact the U.S. Fish and Wildlife Service (Service) and/or the appropriate State wildlife agency (see attachment 2). They will determine whether or not any known bog turtle sites occur in or near the project area, and will determine the need for surveys.

- If a wetland in or near the project area is *known* to support bog turtles, measures must be taken to avoid impacts to the species. The Service and State wildlife agency will work with federal, state and local regulatory agencies, permit applicants, and project proponents to ensure that adverse effects to bog turtles are avoided or minimized.

- If wetlands in or adjacent to the project area are *not* known bog turtle habitat, conduct a bog turtle habitat survey (Phase 1 survey) if:

  1. The wetland(s) have an emergent and/or scrub-shrub wetland component, or are forested with suitable soils and hydrology (see below), *and*

  2. Direct and indirect adverse effects to the wetland(s) cannot be avoided.

     See *Bog Turtle Conservation Zones*[2] for guidance regarding activities that may affect bog turtles and their habitat. In addition, consult with the Fish and Wildlife Service and/or appropriate State wildlife agency to definitively determine whether or not a Phase 1 survey will be necessary.

---

[1] These guidelines are a modification of those found in the final "Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan" (dated May 15, 2001). Several minor revisions were made to facilitate survey efforts and increase searcher effectiveness. As additional information becomes available regarding survey techniques and effectiveness, these survey guidelines may be updated and revised. Contact the Fish and Wildlife Service or one of the state agencies listed in Attachment 1 for the most recent version of these guidelines.

[2] See Appendix A of the "Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan" (dated May 15, 2001).

however, that one or more of these criteria may be absent from portions of a wetland or wetland complex supporting bog turtles. Absence of one or more criteria does not preclude bog turtle use of these areas to meet important life functions, including foraging, shelter and dispersal.

- If these criteria (suitable soils, vegetation and hydrology) are present in the *wetland*, then the *wetland* is considered to be potential bog turtle habitat, regardless of whether or not that portion of the wetland occurring within the project boundaries contains all three criteria. If the *wetland* is determined to be potential habitat and the project will directly or indirectly impact *any portion* of the wetland (see *Bog Turtle Conservation Zones*), then either:
  - Completely avoid all direct and indirect effects to the wetland, in consultation with the Service and appropriate State wildlife agency, OR
  - Conduct a Phase 2 survey to determine the presence of bog turtles.
- The Service and appropriate State wildlife agency (see list) should be sent a copy of survey results for review and comment including: a USGS topographic map indicating location of site; project design map, including location of wetlands and stream and delineation of wetland type (PEM, PSS, PFO, POW) and "designated survey areas"[3]; color photographs of the site; surveyor's name; date of visit; opinion on potential/not potential habitat; a description of the hydrology, soils, and vegetation. A phase 1 report template and field form are available from the States and Service.

BOG TURTLE SURVEY (= Phase 2 survey)

If the wetland(s) are identified as potential bog turtle habitat (see Phase 1 survey), and direct and indirect adverse effects cannot be avoided, conduct a bog turtle survey in accordance with the specifications below. Note that this is *not* a survey to estimate population size or structure; a long-term mark/recapture study would be required for that.

Prior to conducting the survey, contact the appropriate State agency (see attached list) to determine whether or not a scientific collector's permit valid for the location and period of the survey will be required.

The Phase 2 survey will focus on the areas of the wetland that meet the soils, hydrology and vegetation criteria, as defined under the Phase 1 survey guidelines. Those areas that meet the criteria are referred to as "designated survey areas" for Phase 2 and Phase 3 survey purposes.

1. Surveys should only be performed during the period from April 15-June 15. For the Lake Plain Recovery Unit (see Recovery Plan), surveys should only be performed during the period from May 1 to June 30. This coincides with the period of greatest annual turtle activity (spring emergence and breeding) and before vegetation gets too dense to accurately survey. While turtles may be found outside of these dates, a result of no turtles would be considered inconclusive. Surveys beyond June also have a higher likelihood of disruption or destruction of nests or newly hatched young.

[3] "Designated survey areas" are those areas of the wetland that meet the soils, hydrology and vegetation criteria for potential bog turtle habitat. These areas may occur within the emergent, scrub-shrub or forested parts of the wetland.

8. Walk quietly through the wetland. Bog turtles will bask on herbaceous vegetation and bare ground, or be half-buried in shallow water or rivulets. Walking noisily through the wetland will often cause the turtles to submerge before they can be observed. Be sure to search areas where turtles may not be visible, including under mats of dead vegetation, shallow pools, underground springs, open mud areas, vole runways and under tussocks. Do not step on the tops of tussocks or hummocks because turtle nests, eggs and nesting microhabitat may be destroyed. Both random opportunistic searching and transect surveys should be used at each wetland.

   The following survey sequence is recommended to optimize detection of bog turtles:

   - Semi-rapid walk through the designated survey area using visual encounter techniques.
   - If no bog turtles are found during visual survey, while walking through site identify highest quality habitat patches. Within these highest quality patches, begin looking under live and dead vegetation using muddling and probing techniques.
   - If still no bog turtles are found, the rest of the designated survey area should be surveyed using visual encounter surveys, muddling and probing techniques.

9. Photo-documentation of each bog turtle located will be required; a macro lens is highly recommended. The photos should be in color and of sufficient detail and clarity to identify the bog turtle to species and individual. Therefore, photographs of the carapace, plastron, and face/neck markings should be taken of each individual turtle. Do not harass the turtle in an attempt to get photos of the face/neck markings; if gently placed on the ground, most turtles will slowly extend their necks if not harassed. If shell notching is conducted, do the photo-documentation after the notching is done.

10. The following information should be collected for each bog turtle: sex, carapace length-straight line and maximum length, carapace width, weight, and details about scars/injuries. Maximum plastron length information should also be collected to differentiate juveniles from adults as well as to obtain additional information on recruitment, growth, and demography.

11. Each bog turtle should be marked (*e.g.*, notched, PIT tagged) in a manner consistent with the requirements of the appropriate State agency and/or Service. Contact the appropriate State wildlife agency prior to conducting the survey to determine what type of marking system, if any, should be used.

12. All bog turtles must be returned to the point of capture as soon as possible on the same day as capture. They should only be held long enough to identify, measure, weigh, and photograph them, during which time their exposure to high temperatures must be avoided. No bog turtles may be removed from the wetland without permission from the Service and appropriate State agency.

13. The Fish and Wildlife Service and appropriate State agency should be sent a copy of survey results for review and concurrence, including the following: dates of site visits; time spent

Attachment 1

CONTACT AGENCIES - BY STATE

(April 2006)

STATE	FISH AND WILDLIFE SERVICE	STATE AGENCY
Connecticut	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Department of Environmental Protection Env. & Geographic Information Center 79 Elm Street, Store Floor, Hartford, CT 06106 *(info about presence of bog turtles in or near a project area)* Department of Environmental Protection Wildlife Division, Sixth Floor 79 Elm Street, Store Floor, Hartford, CT 06106 *(to get a Scientific Collectors Permit or determine what type of marking system to use)*
Delaware	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Nongame & Endangered Species Program Delaware Division of Fish and Wildlife 4876 Hay Point Landing Road Smyrna, DE 19977
Maryland	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Maryland Department of Natural Resources Wildlife & Heritage Division PO Box 68, Main Street Wye Mills, MD 21679
Massachusetts	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Division of Fisheries and Wildlife Dept. Fisheries, Wildlife and Env Law Enforcement Rt. 135 Westboro, MA 01581
New Jersey	U.S. Fish and Wildlife Service New Jersey Field Office 927 North Main Street, Bldg. D-1 Pleasantville, NJ 08232	New Jersey Division of Fish and Wildlife Endangered and Nongame Species Program 143 Van Syckels Road Hampton, NJ 08827
New York	U.S. Fish and Wildlife Service 3817 Luker Road Cortland, NY 13045	New York Natural Heritage Program Department of Environmental Conservation 700 Troy-Schenectady Road Latham, NY 12110-2400 *(info about presence of bog turtles in or near a project area)* NY Department of Environmental Conservation Special Licenses Unit 50 Wolf Road, Albany, NY 12233 *(for endangered species permit applications)*
Pennsylvania	U.S. Fish and Wildlife Service Pennsylvania Field Office 315 South Allen Street, Suite 322 State College, PA 16801	Natural Diversity Section Pennsylvania Fish and Boat Commission 450 Robinson Lane Bellefonte, PA 16823

APPENDIX 2

WETLAND DELINEATION SUMMARY

Subject: RE: Uwchlan Bog Turtle Study
Date: Fri, 14 Apr 2006 11:56:56 -0400
X-MS-Has-Attach:
X-MS-TNEF-Correlator:
Thread-Topic: Uwchlan Bog Turtle Study
Thread-Index: AcZf2xNP5jzfpBQVQ/G6Ltp2keTWwAAAGTXg
From: "Timothy Casey" <tcasey@navenewell.net>
To: "Gian L. Rocco" <gxr124@psu.edu>
X-Virus-Scanned: amavisd-sophos
X-PSU-Spam-Flag: NO
X-PSU-Spam-Hits: -2.599
X-MIME-Autoconverted: from quoted-printable to 8bit by seawolf.aset.psu.edu id k3EFv02w7880848

Gian,
I only have an approximate wetland area, which is 26 acres. I do not think a Phase 2 was performed, based up on the summary on page 9 of the report. Unfortunately, this is the only information on any bog turtle studies performed on this site, so I can not confirm if a Phase 2 was performed. Please let me know if you should need anything else.-Tim

-----Original Message-----
From: Gian L. Rocco [mailto:gxr124@psu.edu]
Sent: Friday, April 14, 2006 11:50 AM
To: Timothy Casey
Subject: Re: Uwchlan Bog Turtle Study

Tim,

Your transmissions came through fine. Thanks. I also spoke with Mike. It appears that habitat is present and a Phase 2 was completed in 2001, a somewhat different situation from what you described. Given the time elapsed since this work was completed, I'd recommend completing a Phase 2. I'll check with Bonnie Dersham, US FWC about their current policy regarding the lifespan of their concurrence letters.

One thing I'll need from you, which I'm not certain is included with your transmissions, is the total wetland acreage on site. Please advise if this information exists on your attachments.
Thanks

Gian

At 11:09 AM 4/14/2006, you wrote:
>Gon,
>Here is an existing features plan showing the wetlands onsite for the
>project we discussed. I am working on getting the electronic file for
>the previous report from Herpetological Associates, and I spoke with
>Mike Torroco and he mentioned he would be calling you to discuss what
>he knows about the project.
>Thanks,
>Timothy M. Casey, PE, Project Manager

APPENDIX 3

NOAA WEATHER STATION DATA
APRIL 15 - JUNE 15, 2006

All data was recorded by the NOAA and accessed at:
http://www.erh.noaa.gov/er/phi/climate/archives

Siemens Property, Uwchlan Twp., Chester Co., PA
SUMMARY FROM CLIMATOLOGICAL STATION IN READING, PA
ON SURVEY DAYS APRIL 20 - JUNE 10, 2006

Field Day	Date	Ambient Temps. (F)			Precip. >0.1 inch	Sky Index*
		Max	Min	Avg		
1	4/20/2006	83	49	66		0
2	4/29/2006	66	41	54		0
3	5/10/2006	80	50	65		4
4	5/17/2006	70	51	61		5
5	5/25/2006	77	53	65		2
6	5/30/2006	93	66	80		2
7	6/6/2006	76	54	65		2
8	6/10/2006	71	54	63		5

*Clear (0-3), Partly cloudy (4-7), Cloudy (8-10)

Explanation of the Preliminary Climate Data (F6) Product

Please note this information is preliminary and subject to revision. Official and certified climatic data can be accessed at the National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/oa/ncdc.html).

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

000
CXUS55 KPHI 010800
CF6RDG
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: READING
MONTH: MAY
YEAR: 2006
LATITUDE: 40 22 N
LONGITUDE: 75 58 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
										AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	72	38	55	-1	10	0	0.00	M	M	6.6	20	80	M	M	0		26	80
2	77	41	59	2	6	0	0.00	M	M	3.2	12	330	M	M	0		15	80
3	75	45	60	3	5	0	0.00	M	M	6.5	21	360	M	M	1		28	10
4	82	46	64	6	1	0	0.00	M	M	4.8	15	270	M	M	0		21	260
5	79	57	68	10	0	3	0.00	M	M	4.0	14	310	M	M	0	8	20	260
6	77	49	63	5	2	0	0.00	M	M	8.5	26	300	M	M	1		31	300
7	67	39	53	-6	12	0	0.00	M	M	3.7	10	150	M	M	1		13	170
8	67	51	59	0	6	0	T	M	M	6.5	16	70	M	M	8		22	150
9	72	49	61	2	4	0	0.00	M	M	4.2	16	20	M	M	7		23	360
10	80	50	65	5	0	0	0.00	M	M	5.4	17	130	M	M	4		22	140
11	68	56	62	2	3	0	0.64	M	M	10.2	22	110	M	M	9	13	33	100
12	71	51	61	1	4	0	0.01	M	M	4.7	13	280	M	M	3	1	17	270
13	72	50	61	0	4	0	0.14	M	M	3.5	16	120	M	M	5	18	22	120
14	62	53	58	-3	7	0	0.03	M	M	7.3	13	70	M	M	9	1	16	80
15	64	50	57	-4	8	0	0.13	M	M	4.7	14	80	M	M	9	1	17	90
16	65	50	58	-4	7	0	T	M	M	6.4	20	270	M	M	8	1	24	250
17	70	51	61	-1	4	0	0.01	M	M	6.2	16	280	M	M	5	18	22	260
18	74	47	61	-1	4	0	0.14	M	M	3.9	24	300	M	M	2	138	29	270
19	63	49	56	-7	9	0	0.04	M	M	8.5	22	260	M	M	7	12	30	280
20	68	47	58	-5	7	0	0.00	M	M	10.1	24	290	M	M	5		30	300
21	67	41	54	-9	11	0	T	M	M	11.7	30	320	M	M	4		39	280
22	62	45	54	-9	11	0	0.00	M	M	13.9	28	310	M	M	7		31	310
23	69	40	55	-9	10	0	0.00	M	M	10.6	22	310	M	M	2		28	330
24	73	41	57	-7	8	0	T	M	M	4.9	17	300	M	M	0	1	22	270
25	77	53	65	1	0	0	0.00	M	M	4.0	15	220	M	M	2		21	200
26	80	54	67	3	0	2	0.29	M	M	2.7	15	240	M	M	M	18	18	230
27	81	60	71	6	0	6	0.00	M	M	6.8	17	10	M	M	4	128	22	340
28	85	55	70	5	0	5	0.00	M	M	3.5	9	250	M	M	0	1	13	10
29	92	59	76	10	0	11	0.00	M	M	3.4	13	250	M	M	0	18	16	250
30	93	66	80	14	0	15	0.00	M	M	5.2	16	360	M	M	2	18	20	360
31	90	68	79	13	0	14	0.00	M	M	4.8	13	150	M	M	0	8	15	170
SM	2294	1551			143	56	1.43	M		190.4			M		105			
AV	74.0	50.0								6.1	FASTST		PSBL	%	4		MAX(MPH)	
									MISC ---->	#	30	320				#	39	280

Column Explanations -- Column numbers are in parentheses ()

(1) - Day of the month ("calendar day"). Note that the time period is different between Standard Time and Daylight Savings Time. The calendar day is midnight to midnight Standard Time, but 1 a.m. to 1 a.m. DST.

(2) - Maximum temperature. This is the highest temperature (°F) recorded for the calendar day.

(3) - Minimum temperature. This is the lowest temperature (°F) recorded for the calendar day.

(4) - Average temperature. The sum of the previous two columns, divided by 2, and rounded, gives the value for this column.

(5) - Departure from normal. This value is derived by subtracting the "normal" temperature from the "average" temperature (column 4). The "normal" temperature is the 30-year smoothed average for the date, supplied by the National Climatic Data Center.

(6a) - Heating Degree Days. The average temperature (column 4), subtracted from 65, yields HDD. The amount of energy used for heating is almost directly proportional to the number of heating degree days.

(6b) - Cooling Degree Days. Similar to (6a) above, CDD are derived in the reverse manner. Sixty-five is subtracted from the "average" temperature (column 4). Again, energy usage is the main application of this value.

(7) - Precipitation (Water Equivalent). This is the amount of liquid precipitation, in inches, to the nearest hundredth, that has fallen during the calendar day. If frozen or freezing precipitation (snow, sleet, freezing rain, etc.) falls, it is melted and added to the total of any liquid precipitation.

(8) - Snowfall. This total, where measured, is the amount of snow, hail, or ice pellets, in inches, to the nearest tenth, that falls during the calendar day. In this case, the frozen precipitation is *not* melted before measurement. Typically, snowfall is about 10 times its water equivalent (see column 7), but this ratio can vary dramatically when snow falls at temperatures above freezing - or well below freezing.

(9) - Snow depth. The depth of frozen precipitation (whether snow, ice, or hail) on the ground at 6 a.m. Standard Time (7 a.m. DST), in whole inches, is shown here. The value is the actual depth of the snow and ice, without including such things as grass underneath.

(10) - Average wind speed. The calendar-day average wind speed is shown here, in miles per hour, to the nearest tenth. This value is normally derived by dividing the total "distance" of the wind (as measured by an anemometer) and dividing by 24. Note that wind speeds during the daylight hours tend to be substantially stronger than those that occur at night.

(11) - Fastest 2-minute speed. The strongest 2-minute average wind speed that occurs during the calendar day is identified here. The units are miles per hour. By definition, this value must be less than the peak gust (column 18) and more than the daily average (column 10).

(12) - Fastest 2-minute direction. (See column 11 for information on the "fastest 2-minute wind.") This is the prevailing direction of the strongest 2-minute wind, expressed in tens of degrees. North is 36 (north could also be shown as 0, but 36 is used here); east is 09; south is 18; west is 27; and all other directions are in-between. Northeast, for example, would be shown as either 04 or 05, since it is 45 degrees clockwise from north.

(13) - Total minutes of sunshine. Where available, this value is the approximate number of minutes that the sun is detected as shining, according to a sunshine indicator.

(14) - Percent of possible sunshine. Where available, this is the ratio of the value in column 13 with the number of minutes between sunrise and sunset, expressed as a percent.

(15) - Sky cover. [Scale used appears to indicate as follows: clear (0-3), partly cloudy (4-7), cloudy (8-10)] ---- **note inserted by GLR**

(16) - Weather occurrences. The numbers presented in this column are described in a chart at the lower right of the Form 6.

(17) - Peak gust direction. This is the direction associated with the strongest gust of wind measured during the calendar day. See the description of column 12 for details on the coding.

(18) - Peak gust speed. The strongest wind gust measured during the calendar day is recorded here, in miles per hour.

Viewing Site Photos

Site photos can be viewed from the enclosed CD from any Windows-based PC (Windows 98 or more recent) equipped with MS Explorer or any other web-browser (Netscape, Mozilla etc). **Software installation is not required**. The contents are best viewed with your monitor set to 1080 X 1024 or the next closest setting.

1. If you are reading this now, you have already inserted the CD in the CD drive and the Autorun has done what it was meant to do: get you to this point!

2. If you are ready to begin viewing the site photos, click start. Before you begin though, please read the rest of this page.

3. If nothing happens, close this window and browse to the CD drive [e: in most PCs] to reveal contents. Double click on the gear logo icon named "index". This should get things started. If neither does – see my contacts below.

4. Once the web page is launched, thumbnails of each photo will be visible on the left panel. A map on the right side will show numbered locations of photos in the project area.

5. To view a photograph, simply click on a thumbnail - this will open a new window showing the photograph and its location in two other maps. Scrolling the page down will reveal a table of data related to the photo. Clicking on the main photo will open the original, more detailed image. Use the sliding bar on the bottom and on the right of the window to pan left, right, up, or down if the entire image is not visible.

6. Clicking on the links (blue numbers) displayed on the main overview map lets you view photos at desired points on the site.

7. To return to the overview page, close the active window or go back using your browser. Pages can be printed as any other web page. Use the print preview for best results.

Gian L. Rocco, 509 Orlando Ave, State College, PA 16803
Voice/fax 814.237.2313, Email: gxr124@psu.edu

CMX

October 9, 2007

U.S. Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen St.
Suite 322
State College, PA 16801

RE: Species Impact Review (SIR)
Downingtown Area School District- North Campus
Uwchlan Township, Chester County, Pennsylvania
PNDI Search ID: 20070807104558
Our Project Number: 070208801

Dear Reviewer:

On behalf of the Downingtown Area School District (DASD), CMX performed an online Pennsylvania Natural Diversity Inventory (PNDI) search on August 7, 2007. The PNDI search resulted in two potential impacts under the jurisdiction of the Pennsylvania Fish and Boat Commission (PAFBC) and the U.S. Fish & Wildlife Service (USFWS). It has been my experience that the bog turtle (*Glyptemys muhlenbergii*) is the main cause of PNDI conflict responses for development sites in Chester County. It is the opinion of CMX that the bog turtle will not be adversely impacted by this project given the extensive data collected in both Phase I and Phase II bog turtle investigations.

A copy of the PNDI search receipt, USGS site location map, preliminary sketch plan and Phase II Bog Turtle Reports are attached to assist you with your potential impact determination.

Bog Turtle Site History and Data Collection

There are three wetlands totaling approximately 26 acres on-site (identified in the field by Del Val Soils in 2006) that contain three unnamed tributaries to Pickering Creek.

Two Phase II Bog turtle investigations have been performed on the site. An investigation was conducted in May and June 2001 by Herpetological Associates, Inc. for Siemens Medical Solutions Health Services Corporation. This investigation resulted in the finding of some potential suitable bog turtle habitat on-site, but no bog turtles or evidence of them. A second investigation was conducted from April to June 2006 by Gian L. Rocco for the DASD. The outcome of this investigation reflected similar results as the first investigation conducted by Herpetological Associates, Inc. Refer to the attached reports for details.

Project Description

DASD is proposing to develop a north campus on the approximately 240 acre site in Uwchlan Township, Chester County, PA. The campus includes the development of a middle school, high school and elementary school accompanied by athletic fields, parking facilities and other associates infrastructure. Also, Lionville Station Road must be relocated as a part of the proposed site development (refer to attached plan). The project will be completed in phases. Currently, Phase I includes the construction of the middle school, parking lots, athletic fields and a portion of the relocated Lionville Station Road; Phase II includes the construction of the high school, parking lots, athletic fields and the remainder of the relocated Lionville Station Road; and Phase III includes the construction of the elementary school, athletic fields and playground. A Township Park located in the northeast corner of the site may be built at a later time. Aquatic impacts will be caused by four (4) wetland crossings, each with only under 0.10 of wetland or stream impact.

Existing Conditions

The site appears on the Downingtown, PA U.S. Geological Survey 7.5 minute quadrangle (Latitude 40° 3' 56.2" N and Longitude 75° 39' 23.3" W). The site is surrounded by residential and commercial parcels to the north and west, an agricultural field to the east, the Pennsylvania Turnpike to the south and is bisected by the existing Lionville Station Road. The site currently consists of three vacant farmstead parcels, active agricultural fields with small areas of successional and mature woods. The elevation on-site ranges from approximately 365 to 535 feet above sea level. Drainage is conveyed downslope into three unnamed tributaries to Pickering Creek and offsite to the north. Pickering Creek and its tributaries are designated by the Pennsylvania Code Title 25, Chapter 93 as a High Quality-Trout Stocked Fishery (HQ-TSF).

Proposed Avoidance and Mitigation Measures

Impacts to wetlands and potential bog turtle habitat have been avoided to maximum extent practical during the development of the site design. A 50-foot buffer of no disturbance is shown around all wetland areas. The construction of the four road crossings is proposed to occur between October 15 and April 1 when the bog turtle is inactive to avoid impact to transient individuals. Prior to the start of construction silt fence will be installed around the construction area.

Water Quality Consistency and Improvement

Several post-construction stormwater management Best Management Practices (BMPs) are proposed as part of the development of this campus in an effort to protect and enhance the natural features of the site. Some of these BMPs include riparian buffers, green roofs, infiltration beds, bioretention areas within parking lots and stormwater basins with wetland plantings. Emphasis is being placed on maintaining or prolonging the base flow of existing intermittent stream channels and reducing the thermal degradation caused by impervious surfaces. Please refer to the preliminary sketch plan for details.

Conclusion

Given the absence of bog turtles during two (2) Phase II surveys in 2001 and 2006 it is the belief of CMX that there will be no adverse impacts on bog turtles during the development of the DASD- North Campus. A 50-foot buffer is currently proposed for protection of water quality resources and as a precaution for transient bog turtles that may enter the area unexpectedly we are proposing avoidance measures such as timing restriction and physical barrier (i.e., silt fence) during construction.

If there is any additional information needed or questions please contact me at 610-594-0507 x125.

Very truly yours,

CMX

Beth E. Arnold
Environmental Scientist

GAH:gah

Attachments: 1) PNDI Search Receipt;
2) USGS Site Location Map;
3) Preliminary Sketch Plan;
4) Phase II Bog Turtle Reports

N:\project\2007\0702088\Ecological\T&E\Ltr to USFWS 10-09-07.doc

PFBC-DES-NDS-1 (5/2/03)

COMMONWEALTH OF PENNSYLVANIA

FISH AND BOAT COMMISSION

NATURAL DIVERSITY SECTION

SPECIES IMPACT REVIEW (SIR) REQUEST FORM

A. This form provides the site information necessary to perform a computer database search for species of special concern listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat Code or the Wildlife Code.

B. Use only *one form* for each proposed project or location. Complete the information below and mail form to:

Natural Diversity Section
Division of Environmental Services
PA Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
Fax: (814) 359-5175

C. This form, a cover letter including a project narrative, and accompanying maps should be sent to the above address for environmental reviews that *only* concern *reptiles, amphibians, fishes and aquatic invertebrates.* Reviews for other natural resources must be submitted to other appropriate agencies.

D. The absence of recorded information from our databases and files does not necessarily imply actual conditions on site. Future field investigations could alter this determination. The information contained in our files is routinely updated. A review is valid for one year.

E. *Please send us only one (1) copy of your request* – either by fax or by mail – not both. Mail is preferred to improve legibility of maps. Facsimile submission will not improve our response turn-around time.

F. *Allow 30 days for completion of the review from the date of PFBC receipt.* Large projects and workload may extend this review timeframe.

G. *In any future correspondence with us following your receipt of the SIR response, please refer to the assigned SIR number at the top left of our cover letter.*

H. **FORMS THAT ARE NOT COMPLETED IN FULL WILL NOT BE REVIEWED.**

PLEASE PRINT OR TYPE: If available, provide the potential conflict **PNDI Search Number:** 20070807104558

PFBC response should be sent to:

Company/Agency: CMX Form Preparer: Beth Arnold

Address: 412 Creamery Way, Suite 100 Exton, PA 19341

Phone (8:00 AM to 4:00 PM): 610-594-3500

Project Description: Downingtown School District is proposing to develop a north campus, which includes an elementary, middle + high school + assoc. facilities.

Indicate if the project is: Transportation ☐ or Non-transportation ☒ (check one)

Will the proposed project encroach directly or indirectly (e.g., runoff) upon wetlands or waterways? Circle one for each:

Wetlands: (Yes) No Unknown Waterways: (Yes) No Unknown

County: Chester Township/Municipality: East Lancaster Twp.

Name of the United States Geological Survey (U.S.G.S.) 7.5 Minute Quadrangle Map where project is located: Downingtown PA Project size (in acres): 26

Attach an 8.5" by 11" photocopy (**DO NOT REDUCE**) of the section of the U.S.G.S. Quadrangle Map which identifies the project location. On this map, indicate the location of the project center (if linear, depict both ends) and outline the approximate boundaries of the project area.

Specify latitude/longitude of the project center. **Latitude:** 40 °/ 3 '/ 56.2" N

Indicate latitude/longitude in degrees-minutes-seconds format only. **Longitude:** 75 °/ 39 '/ 23.3" W

Three steps are needed to convert from decimal degrees to degrees-minutes-seconds: (1) Degrees will be the whole number. (2) To get minutes, multiply the decimal degree portion by 60. (3) Multiply the decimal minute portion by 60 to get seconds.
Example: (Latitude) 40.93748 = 40°; 0.93748 x 60 = 56.2488' = 56'; 0.2488 x 60 = 14.928 = 15" = **40°56'15" N**
(Longitude) 75.94740 = 75°; 0.94740 x 60 = 56.844' = 56'; 0.844 x 60 = 50.64 = 51" = **75°56'51" W**

FOR PFBC USE ONLY

SIR#	Quad Name	Data Source	Search Result-Potential Species Conflict	Action

Historic Buildings and Regulations

Two of the three vacant residences on the Siemens Property are classified as "Class I Historic Resources" by the Uwchlan Township Zoning Ordinance and Historic Commission. Any proposed renovation or demolition of the structures at these residences is subject to Section 612-Historic Preservation of the Zoning Ordinance. Demolition or alteration of historic structures requires a permit. A demolition or alteration permit application requires a Historic Resource Impact Study and a financial analysis inclusive of a current appraisal, the intended use of the site and demolished materials. All rehabilitation applications must be in substantial compliance with U.S. Department of the Interior's standards for rehabilitation. The Uwchlan Township Historic Commission reviews all applications and makes a recommendation to the Board of Supervisors, where the final decision is made.

Based upon the age of the buildings onsite, asbestos containing materials (ACM) may be present. RT Environmental recommends that an ACM Survey be conducted by a licensed inspector before any renovations and/or demolitions are planned.

Based upon the age of the buildings onsite, lead based paint (LBP) may be present. RT Environmental recommends a LBP Survey be conducted by a licensed inspector before any renovations and/or demolitions are planned.

Sewage Treatment and Disposal Evaluation

Due to the site being designated for on-site sewage treatment and disposal by the Uwchlan Township Act 537 Plan, Del Val Soil and Environmental Consultants (Del Val) completed a sewage disposal feasibility evaluation for two different scenarios. Option 1 includes a proposed elementary school, middle school, and high school. Option 2 includes a middle school and high school. In order to evaluate the feasibility for land-based sewage disposal, an estimate of the projected sewage flow must be completed. Based upon flows provided by DASD, the highest monthly average sewage flow based upon water meter readings was 3.73 gpd/person for the elementary school, 4.38 gpd/person for the middle school, and 12.35 gpd/person for the high school. (gpd=gallons per day) Del Val contacted a Sewage Planning Specialist at PaDEP who provided the following acceptable sewage flows for land based disposal systems: 8 gpd/person for elementary and middle schools, and 15 gpd/person for a high school.

Based upon the number of students and staff for each school, the following sewage flows were developed for each school:

Proposed Elementary School:	6,000 gpd*	[750 students and staff]
Proposed Middle School:	11,760 gpd*	[1,470 students and staff]
Proposed High School:	29,925 gpd*	[1,995 students and staff]

Option 1(Elementary, Middle, and High Schools) = 47,685 gpd
Option 2 (Middle and High Schools) = 41,685 gpd

*Note: The minimum sewage flows provided by PaDEP are for spray or drip irrigation systems assuming sufficient flow equalization is provided to mitigate the peaks in sewage flows due to the variable nature of sewage flow volumes at schools.

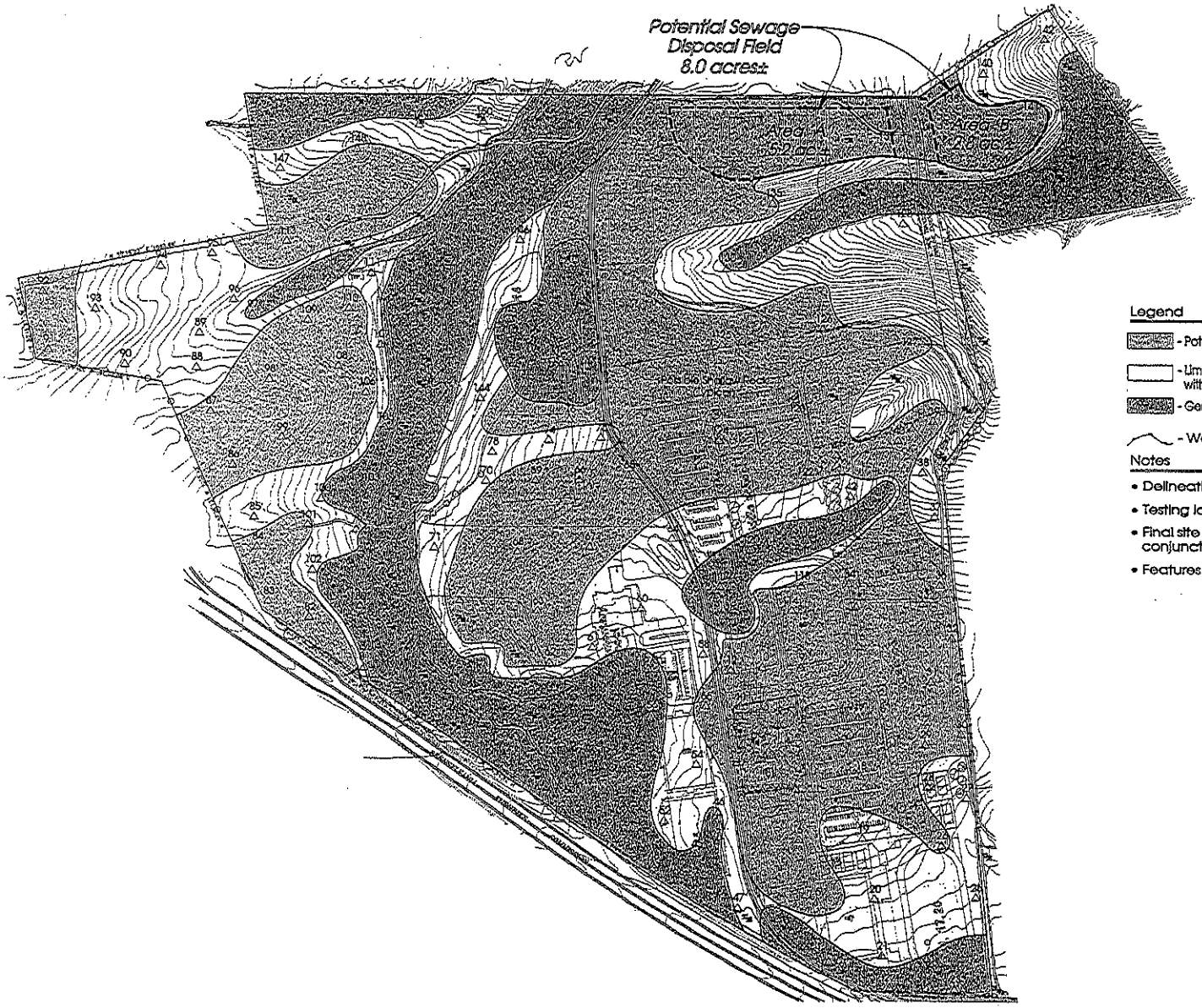
Based upon previously conducted field testing by Del Val, and the standard PaDEP application rate of 6,000 gpd/acre, the following areas are required for sewage disposal:

Option 1(Elementary, Middle, and High Schools) = minimum of 8 acres
Option 2 (Middle and High Schools) = minimum of 7 acres

The area estimations do not include isolation distances, treatment, or storage facilities. Final site suitability and disposal field size is dependent upon detailed soil testing with PaDEP, soil hydraulic conductivity testing, a detailed hydrogeologic study, and design. The results of a detailed hydrogeologic evaluation and hydraulic conductivity testing my reduce application rates, thus requiring additional disposal area, depending upon the results.

Based upon the analysis performed, there appears to be sufficient area of suitable soil onsite to accommodate the projected sewage flow using community spray or drip irrigation disposal pending results of detailed testing. Please see the following page for the potential sewage disposal field location based upon a site meeting on April 6, 2006.

While the site appears to have sufficient area for on-site sewage treatment and disposal, the evaluation for connection to public sanitary sewer systems in Uwchlan Township was not completed. It appears the Township has public sanitary sewer to the east of the property and to the south across Route 113, but the available capacity of the sanitary sewer interceptor is not known at this time. Also, an evaluation of the sanitary sewer inverts and site elevations was not completed to investigate if gravity sanitary sewer could flow from the site to the sanitary sewer in the Township.



Legend

- Potentially Suitable for Community Land-based Sewage Disposal
- Limited Suitability for Community Land-based Sewage Disposal with reduced application rate
- Generally Unsuitable for Community Land-based Sewage Disposal
- Wetlands

Notes

- Delineation based upon preliminary field testing as shown
- Testing location is approximate - not survey located
- Final site suitability dependent upon detailed testing in conjunction with reviewing agency
- Features taken from plan by others

Preliminary Sewage Disposal Feasibility Plan
Made for
Downingtown Area School District
Located in
Uwchlan Township, Chester County, Pennsylvania

DATE	SCALE	TAX/PARCEL	JOB	DRAWING
8-10-06	1"=200'		03-4300	U-060510-A.1

REVISIONS: DATE | ITEM

Del Val Soil & Environmental Consultants Inc.

Sky Iron II • Suite A-1 • 4000 Skyron Drive • Doylestown, PA 18901
Voice (215) 345-5345 Fax (215) 345-8238

Phase I Environmental Assessment

RT Environmental Services (RT) reviewed aerial photographs and performed a database search, a site inspection, and interviews as part of the Phase I site assessment to address potential environmental liabilities. The following are the results of the site assessment:

1. The subject property has historically been utilized as farmland. RT recommends the collection of surface soil samples to be analyzed for the presence of pesticides, arsenic and lead, to determine if historic agricultural operations at the subject property have impacted the soils.
2. Each of the three residences has an above-ground heating oil storage tank. If no future use of the tanks is planned, RT recommends they be properly disposed of.
3. There is one well listed as being on the subject property. A public water supply line is present along Lionville Station Road. If no future use of the well is planned, RT recommends that it be properly closed.
4. Based on the age of the buildings, asbestos containing material (ACM) may be present. RT recommends that an ACM Survey be conducted by a licensed inspector before any renovations and/or demolition are planned.
5. Based on the age of the buildings, lead based paint (LBP) may be present. RT recommends that a LBP Survey be conducted by a licensed inspector before any renovations and/or demolition are planned.
6. Former structures existed on the subject property which may have been demolished in place. If so, construction and demolition waste may be present in former structure areas.
7. RT observed two piles of debris at the subject property, one behind the barn at 450 Lionville Station Road, and one at the woodline along the eastern property border with the Matthews Farm. Metal debris, tires, glass, and plastic were observed. RT recommends that all debris be removed.

Upon completion of Phase 2 work (to include surface soil sampling), and in the event of planned demolition, (ACM/LBP Surveys) RT will reach further conclusions on the environmental liabilities at the subject property.

Soils Study and Testing

David Blackmore and Associates completed soils test borings and well tests from May 8 to May 16, 2006 at the Siemens Property. The soils testing consisted of forty (40) boring tests and four (4) well tests. All of the soil boring tests and well tests were located to the east of the unnamed tributary to Pickering Creek and associated wetlands. The testing locations were approximated in the field based upon the site sketch plan by DWKCB of the proposed school campus, and are shown on the following page.

The depth to bedrock for the areas tested ranged from nine (9) feet to thirty-one (31) feet down from the surface. Two gneiss boulders were encountered at depths approximately at six (6) feet from the surface. Dense weathered rock was encountered in twelve (12) soils boring tests and in one (1) well test. The depths to weathered rock ranged from four (4) feet to twenty-five (25) feet.

The depth to groundwater was given for twelve (12) of the soils boring tests and one (1) well test. The depths to groundwater ranged from 2.67-feet to 21.75 feet below the surface, with the shallow depths located near the onsite wetland areas.

The depths to bedrock will need to be accounted for during site design and grading, stormwater management design, sanitary sewer disposal design, and the installation of remaining utilities. The avoidance and/or disturbance of bedrock will have a direct impact on the cost of the construction of the school campus. The depths to groundwater will need to be accounted for during the design process as the depths will have an impact on construction methods for buildings and other structures, and stormwater management facilities.

Reference Reports and Studies

1. Phase 1 Environmental Site Assessment-Siemens Property, Lionville Station Road, Uwchlan Township, PA 19425, May 2006, by RT Environmental Services, Inc.
2. Sewage Disposal Feasibility Evaluation-Siemens Property, Lionville Station Road, Uwchlan Township, Chester County, PA, May 10, 2006, by Del Val Soil and Environmental Associates.
3. Geotechnical Investigations-Downingtown School District, Lionville Station Road, Uwchlan Township, Chester County, PA, May 2006, by David Blackmore and Associates, Inc.
4. Results of a Bog Turtle (Clemmys muhlenbergii) Habitat Evaluation and Survey at the Siemens Property, Upper Uwchlan Township, Chester County, Pennsylvania, July 28, 2001, by Herpetological Associates, Inc.
5. Bog Turtle Habitat Suitability Assessment- Siemens Property, Uwchlan Township, Chester Co., PA, April 2005, by Trident Environmental Consultants.
6. Bog Turtle Survey and Inventory Report-Siemens Property, Uwchlan Township, Chester County, Pennsylvania, June 2005, by Trident Environmental Consultants.
7. Land Analysis & Development Alternatives-Siemens Property, Lionville, Pa, February 20, 2001, by Insignia/ESG Advisors.

IV. RT ENVIRONMENTAL SERVICES, INC. PHASE 1 ENVIRONMENTAL ASSESSMENT SUMMARY AND RECOMMENDATIONS

RT Environmental Services, Inc.

May 2, 2006

Mr. Gilbert C. Lappano
Downingtown Area School District
122 Wallace Avenue
Downingtown, PA 19335
610.269.8480 x-6223 / FAX: 610.269.1227

RE: PHASE I ENVIRONMENTAL SITE ASSESSMENT
SIEMENS PROPERTY
LIONVILLE STATION ROAD
UWCHLAN TOWNSHIP, CHESTER COUNTY, PA 19425
RT PROJECT # 71076-01

Dear Mr. Lappano:

RT Environmental Services, Inc. (RT) is pleased to present this Phase I Environmental Site Assessment for the above referenced property. The following information summarizes our findings.

Executive Summary

RT was retained by Mr. Gilbert C. Lappano of Downingtown Area School District to perform a Phase I Environmental Site Assessment for the Siemens property located on Lionville Station Road in Uwchlan Township, Chester County, PA. The subject property is comprised of five parcels (401, 420, 450, 455 and 459 Lionville Station Road), encompassing approximately 240 acres. There are three vacant residential properties, two of which are designated as "Class I Historic Resources" located on the property. The parcel to the north, on the west side of Lionville Station Road, also has numerous shed/barn structures used for storing agricultural equipment. A large barn and silo on this parcel could not be accessed due to their extremely poor condition.

Scope Limitation

Access to the three houses located on the subject property, along Lionville Station Road, was not available at the time of the site investigation. Therefore, our scope of work regarding the interior conditions of the structures associated with the subject property was limited.

Based on a review of aerial photographs, a database search, a site inspection, and interviews, RT recommends the following to address potential environmental liabilities identified as part of this Phase I site assessment.

- The subject property has historically been utilized as farmland. RT recommends the collection of surface soil samples to be analyzed for the presence of pesticides, arsenic and lead, to determine if historic agricultural operations at the subject property have impacted soils.

215 West Church Road ■ King of Prussia, PA 19406 ■ (610) 265-1510 ■ Fax: (610) 265-0687
E-Mail RTENV@AOL.COM ■ Web Address http://www.RTENV.COM

- There appear to be three mapped wetland areas located to the west of Lionville Station Road along an unnamed tributary to the Pickering Creek. RT recommends that these areas be taken into account prior to/or during any planned site development.

- Based on the EDR report for ZIP code 19425, the subject property is in Radon Zone 1, with average indoor level radon readings above 4 pCi/L. Radon potential should be taken into account as part of planned site development, if future use is to include residential.

- Each of the three residences has an aboveground heating oil storage tank. RT could only inspect the tank at 401 Lionville Station Road, due to limited site access. The tank appeared to be in good condition, with *de minimis* staining observed. If no future use of the tanks is planned, RT recommends that they be properly disposed of.

- There is one well listed, under two Map IDs (A-1 & A-2), in the EDR report as being located on the subject property. The Well ID is 400412075392601 and the listed owner is Shared Medical Systems. Uses of the well are described as both observation and domestic. The site contact stated to RT that one of the residences at the subject property did utilize a private supply well in the past. A public water supply line is present along Lionville Station Road, if no future use of this well is planned, RT recommends that it be properly closed.

- Based on the age of the buildings, asbestos containing materials (ACM) may be present. RT recommends that an ACM Survey be conducted by a licensed inspector before any renovations and/or demolition are planned.

- Based on the age of the buildings, lead based paint (LBP) may be present. RT recommends that a LBP Survey be conducted by a licensed inspector before any renovations and/or demolition are planned. The residences appeared to have been damaged due to moisture from roof leaks and paint was observed to be peeling in each building.

- There is a pole mounted transformer in front of each of the three residences. There is no visual indication of staining, therefore the transformers do not appear to be of further concern at this time.

- Former structures existed on the subject property which may have been demolished in place. If so, construction and demolition waste may be present in former structure areas.

- RT observed two piles of debris at the subject property, one behind the barn at 450 Lionville Station Road and one at the woodline along the eastern property border with the Matthews Farm. Metal debris, tires, glass and plastic was observed. RT recommends that all debris be removed.

Upon completion of Phase 2 work, to include surface soil sampling, and in the event of planned demolition, ACM/LBP Surveys, RT will reach further conclusions on the environmental liabilities at the subject property.

RT appreciated this opportunity to be of service to Downingtown Area School Districton this project. Please contact me if you have any questions regarding this project.

Very truly yours,

RT ENVIRONMENTAL SERVICES, INC.

Gary R Brown /RSL

Gary R. Brown, P.E.
President

V. DEL VAL SOIL AND ENVIRONMENTAL CONSULTANTS SEWAGE DISPOSAL FEASIBILITY EVALUATION

DelVal Soil & Environmental Consultants, Inc.

Sky Run II • Suite A1 • 4050 Skyron Drive • Doylestown, PA 18901
Phone 215-345-5545 Fax 215-345-8138

May 10, 2006

Downingtown Area School District
122 Wallace Avenue
Downingtown, PA 19335

Attn: Gilbert C. Lappano

Re: Sewage Disposal Feasibility Evaluation
Siemens Property
Lionville Station Road
Uwchlan Township, Chester County, PA
DelVal Job # 00-430C

Dear Mr. Lappano:

DelVal Soil & Environmental Consultants, Inc. (DelVal) is pleased to provide a land-based sewage disposal feasibility analysis for the proposed Downingtown Area School District school campus at the above referenced property. As requested, this evaluation has been completed for two different scenarios. Option 1 includes a proposed elementary school, middle school, and high school and Option 2 includes only a middle school and high school.

Projected Sewage Flow Estimate

In order to evaluate the feasibility for land-based sewage disposal, an estimate of the projected sewage flow must be completed. DelVal has calculated historic average sewage flows utilizing monthly water records provided by the school district (attached in Appendix A). These records show sixteen months of water meter records from an existing elementary school, middle school, and high school.

Based on information provided to our office, these schools have similar facilities to the schools proposed. The elementary school has a cafeteria with dishwashers and bathrooms with no shower facilities. The middle school sewage has gyms with showers and dishwasher for the cafeteria. The high school sewage is similar to the middle school but with sinks in the science labs.

To estimate the average sewage flows for each type of school, the daily average flow per person (including students and staff) was calculated for each month of water meter data. This was determined by utilizing the water flows records from each school, the number of days in the month, and the number of students and staff. Based on these calculations, the highest monthly average sewage flow based on the water meter readings provided was 3.73 gpd/person for the elementary school, 4.38 gpd/person for the middle school, and 12.35 gpd/person for the high school.

DelVal contacted Donna Ulan-Smith, Pennsylvania Department of Environmental Protection (PADEP) Sewage Planning Specialist, to discuss the historic sewage flow calculations above and the minimum sewage flows PADEP would accept for the proposed facilities. Based on this

conversation, the PADEP southeast regional office will not accept sewage flows for land-based disposal system lower than 8 gpd/person for elementary and middle schools and she would prefer to have 15 gpd/person used for the high school.

Per the discussion with PADEP, the following projected sewage flows are estimated for the proposed school facilities:

Proposed Elementary School		
Maximum Proposed Students*	675	
Maximum Proposed Staff*	75	
Total Maximum Proposed Persons	750	
Sewage Flow per Person**	8.0	gpd/person
Projected Sewage Flow	6,000	gpd
Proposed Middle School		
Maximum Proposed Students*	1,300	
Maximum Proposed Staff*	170	
Total Maximum Proposed Persons	1,470	
Sewage Flow per Person**	8.0	gpd/person
Projected Sewage Flow	11,760	gpd
Proposed High School		
Maximum Proposed Students*	1,800	
Maximum Proposed Staff*	195	
Total Maximum Proposed Persons	1,995	
Sewage Flow per Person**	15.0	gpd/person
Projected Sewage Flow	29,925	gpd

* Based on information provided by Tim Casey of Nave Newell.
** Based on PADEP minimum accepted sewage flows per conversation with Donna Ulan-Smith.

Option #1 (elementary, middle, and high school) Total Sewage Flow = 47,685 gpd

Option #2 (middle, and high school) Total Sewage Flow = 41,685 gpd

Please note the minimum sewage flows provided by PADEP are for spray or drip irrigation systems assuming sufficient flow equalization is provided to mitigate the peaks in sewage flow due to the variable nature of sewage flow volumes at schools. Please note PADEP also recommended that due to the variable nature of a school's sewage flow, if a mechanical treatment plant is proposed, an extended air wastewater plant rather than a sequencing batch reactor is preferred by PADEP.

Analysis of Sewage Disposal Feasibility

Utilizing the projected sewage flow calculated above, the sketch plan provided by Nave Newell, and soil testing previously conducted throughout the site, DelVal has evaluated the feasibility for land-based disposal for the proposed school campus project.

DelVal has previously conducted a soil evaluation utilizing a series of 116 backhoe-excavated test probes. A staff soil scientist evaluated each test probe for the feasibility for community land-based disposal using the current PADEP requirements. Based on this testing, a color-coded plan was prepared showing the feasibility of the soil on site to support community land-based sewage disposal. The current school campus sketch plan was overlain on the sewage disposal feasibility plan (see attached). The plan is color-coded as follows:

Green - Well Drained Soil - Potentially Suitable for Community Land-Based Sewage Disposal

Yellow - Moderately Well Drained – Potentially Suitable for Community Land-Based Sewage Disposal at a Reduced Application Rate

Red - Generally Unsuitable for Community Land-Based Sewage Disposal

The soils shown in green on the attached plan are well drained and area best suited for community land-based sewage disposal via spray or drip irrigation disposal. The standard PADEP application rate for deep, well drained soil using spray or drip irrigation disposal is approximately 6,000 gpd/acre. Based on the total projected sewage flow for Option 1 (47,685 gpd), a minimum of 8 acres of well drained soil would be required to provide land-based sewage disposal for this option. A minimum of 7 acres of well drained soil would be required to provide land-based sewage disposal for Option 2 (41,685 gpd).

Please note the area estimations presented above do not include isolation distances, treatment or storage facilities. Final site suitability and disposal field size is dependent upon detailed soil testing with PADEP, soil hydraulic conductivity testing (if required by PADEP), a detailed hydrogeologic study, and design. Please note the results of a detailed hydrogeologic evaluation and hydraulic conductivity testing may reduce application rates, thus requiring additional disposal area, depending upon the results.

A schematic 8-acre disposal area has been shown on the attached plan. The location of this schematic disposal field is based on proximity to the sewage disposal area location shown on the sketch plan and based on the possible relocation of athletic fields 3, 10, and 15 per Nave Newell. Other well drained areas throughout the site could also be considered for disposal depending on the plan configuration and moderately well drained areas (shown in yellow) are also potentially feasible but at a reduced application rate.

Sewage Disposal Options

Both community spray and drip irrigation sewage disposal can be considered as land-based sewage disposal options for this project. To determine the most viable option for the site, several factors should be considered such as isolation distances, storage requirements, treatment requirements, and cost.

Isolation Distance Requirements:
Community drip irrigation systems typically have less isolation distance requirements to the disposal area than spray irrigation systems. The following is a list of isolation distances for community spray and drip irrigation systems previously approved by PADEP on other projects. Please note the Municipality may require more stringent isolation distance requirements than those listed below.

Spray Irrigation	Distance from Wetted Area to:	Drip Irrigation
100'	Occupied Dwelling or Building Envelope	25'
50'	Other Buildings	25'
50'	Property Lines	25'
50'	Township and State Road Right-Of-Way Outside of Development	25'
25'	Internal Development Road Right-Of-Way where Bermed Evergreen Tree Screen is Utilized	25'
50'	Active Recreation Areas	25'
25'	Stormwater Facilities	25'
50'	Streams, Surface Water Bodies	25'
25'	Wetlands	25'

Storage Requirements:
Community spray irrigation systems require a greater volume of treated effluent storage. Since community spray irrigation systems have a higher application rate during the summer months and lower application rate during the winter months, considerable storage is required. A typical community spray irrigation system requires approximately 95 days of treated effluent storage. For Option #1, approximately 4.5 million gallons of useable storage volume would be required. Given the large volume of storage required, storage is typically provided in a lagoon.

PADEP typically requires approximately 3-7 days of treated effluent storage for community drip irrigation system projects to allow for repairs and maintenance of the drip field components. For Option #1, approximately 143,000 – 334,000 gallons of useable storage volume would be required. This storage is typically provided in a covered tank to avoid the need for additional filtration prior to the drip disposal field.

Treatment Requirements:
More stringent treatment is required by PADEP for a community drip irrigation systems. PADEP does not allow for a crop uptake credit for drip systems like they allow for spray irrigation systems so a mechanical wastewater plant with denitrification or nitrogen reduction is typically required for community drip irrigation systems.

Installation Costs:
Community drip irrigation disposal fields are typically more expensive to install than community spray irrigation disposal fields. In order to obtain approximate costs for installation, a wastewater engineer should be consulted.

Other Considerations:
Other factors may also play a role in the decision of which type of sewage disposal that is best for the project. For example, if the area selected for disposal is wooded or very rocky, installation and approval through PADEP is less problematic for spray irrigation systems than for drip irrigation systems. The possibility for wind drift or aesthetic concerns may also be considered depending on the proximity of the proposed disposal field to existing or proposed facilities, etc.

Conclusion

Based on the analysis performed, there appears to be sufficient area of suitable soil on site to accommodate the projected sewage flow using community spray or drip irrigation disposal pending results of detailed testing. The site engineer should determine if the proposed plan can be sufficiently modified to accommodate the proposed disposal field, isolation distances, and associated wastewater treatment and storage facilities.

Should you have any questions or require additional information please do not hesitate to contact the office.

Sincerely,

DelVal Soil & Environmental Consultants, Inc.

Jamie Sundermier

Jamie Sundermier
Soil Scientist

Enclosures

CC: Tim Casey, Nave Newell

VI. DAVID BLACKMORE AND ASSOCIATES SOIL STUDY AND TESTING

DBA

DAVID BLACKMORE & ASSOCIATES, INC.

GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

REPORT OF
PRELIMINARY GEOTECHNICAL INVESTIGATION

DOWNINGTOWN SCHOOL DISTRICT
PROPOSED SCHOOL FACILITIES
UWCHLAN TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA

PREPARED FOR

DOWNINGTOWN SCHOOL DISTRICT
126 WALLACE AVENUE
DOWNINGTOWN, PA 19335

PROJECT 3565G1R1
July 6, 2006

DAVID BLACKMORE AND ASSOCIATES, INC.
3335 WEST RIDGE PIKE
POTTSTOWN, PENNSYLVANIA 19464
(610) 495-6255

Brian D. McCree, P.E.
Vice President

Cindy Baxindine
Geotechnical Engineer

TABLE OF CONTENTS

FIGURES AND TABLES

APPENDIX

EXECUTIVE SUMMARY

Purpose:

This investigation was completed to provide a preliminary evaluation of the subsurface conditions and their affect upon the proposed site development. This investigation focused on the proposed Downingtown School District school campus, including Elementary School, Middle School, and High School buildings with associated paved parking and driveway areas and sports fields, as well as proposed groundwater infiltration beds. The proposed campus site spans the east and west sides of Lionville Station Road, south of Township Line Road and north of the Pennsylvania Turnpike (Route 76), in Uwchlan Township, Chester County, Pennsylvania. At this time the site development design is in its schematic phase. Changes to the design are anticipated as site development design progresses.

Scope:

A total of forty-four (44) test borings were completed at the subject site, including the following:

- two (2) test borings drilled within the proposed Elementary School Building to spoon refusal at depths of 30.17 feet and 29.25 feet, respectively (B2 and B3) and one (1) boring drilled within the proposed Elementary School parking area to a depth of 16 feet (W2; also a potential groundwater infiltration area);
- four (4) test borings drilled within the proposed Middle School Building to spoon refusal or auger refusal at depths ranging from 20.58 feet to 31.50 feet (B26 through B29) and two (2) borings drilled within the proposed Middle School parking area to a maximum depth of 21 feet or to auger refusal (B17 and B18);
- six (6) test borings drilled within the proposed High School Building to a maximum depth of 31 feet or to auger/spoon refusal (B32 through B37; depths ranging from 15.83 feet to 31 feet) and one (1) boring drilled within the proposed High School parking area to a depth of 22 feet (B23);
- twenty-seven (27) test borings drilled within the proposed sports fields to a maximum depth of 21 feet or to auger/spoon refusal (B1, B4 through B16, B19 through B22, B24, B25, B30, B31, B38 through B40, W1, and W3; depths ranging from 9.08 feet to 21 feet); borings W1 and W3 were also located in potential groundwater infiltration zones;
- one (1) test boring drilled to a depth of 16 feet within another potential groundwater infiltration area located on the north end of the property, east of Field #12 (W4).

NOTE: Drill depths at each test boring location were determined based on an evaluation of the preliminary cut/fill depths provided by the Client.

Test borings W1 through W4 were converted into temporary observation wells from which falling head permeability testing was completed to determine insitu permeability as well as an overall evaluation of the suitability of infiltration at four (4) potential infiltration locations; well depths ranged from 5 feet to 13 feet.

All test boring logs and a test boring location plan are included in the appendix of this report.

Findings:

Significant findings in the geotechnical investigation include the following:

- The presence of dense weathered gneiss in thirteen (13) of the forty-four (44) test borings completed across the subject site at depths ranging from 4.75 feet to 25 feet below existing grades.
- The presence of gneiss bedrock in six (6) of the forty-four (44) test borings completed across the subject site at depths ranging from approximately 12.33 feet to 27.33 feet below existing grades.
- The presence of gneiss boulders within the overburden soils – a product of the underlying gneiss geologic formations.
- The presence of groundwater in thirteen (13) of the forty-four (44) test borings completed across the subject site at depths ranging from approximately 2.67 feet to 21.75 feet below existing grades.

Recommendations:

As mentioned above, the underlying gneiss geologic formations encountered at the subject site (refer to Section 4.2, Geology) commonly produce **large gneiss boulders** within the overburden soils, sometimes up to 12 feet in diameter. These boulders can typically be dislodged from bulk excavations using standard excavation equipment. However, over-excavation, hydraulic hammering, and/or blasting may be required to dislodge boulders from foundation and/or utility trench excavations. Shallow boulders were encountered at test borings B15 and B29 and are expected to impact the construction of the proposed Field Hockey Field #9 and the proposed Middle School Building. Although boulders were only encountered in two (2) of the forty-four (44) test borings drilled across the subject site, it is likely that additional boulders will be encountered during construction in areas between test boring locations.

Compared to proposed cuts, the presence of dense weathered gneiss, gneiss bedrock, and groundwater is not expected to affect the construction of the proposed structures, parking areas, and sports fields. However, these conditions may be encountered in the installation of deep utility lines throughout the subject site.

Refer to Section 7.1.1, Specific Recommendations by Construction Area, for more information on the impact, if any, that the aforementioned significant findings will have on proposed construction within each area, and/or potential conflicts within deep utility lines in each area. Also refer to Table IIA, Approximate Rock Elevations, and Table IIB, Approximate Groundwater Elevations, for more information regarding the depths and elevations at which dense weathered rock, gneiss bedrock and boulders, and groundwater were encountered at each test boring location.

It is anticipated that a shallow foundation system with slab on grade construction is feasible for each of the proposed structures provided that the recommendations included herein are followed. However, once the site development plans are finalized, a more detailed site investigation – including additional test drilling – will be required to establish the engineering properties of the site subsurface for use in the building and site improvement design.

Infiltration Testing Areas

Permeability testing at test borings W1 through W4 resulted in the following average infiltration rates at each well location.

- W1: 1.50×10^{-4} feet/minute; approximately 2.6 inches/day
- W2: 8.09×10^{-6} feet/minute; approximately 0.14 inches/day
- W3: 3.29×10^{-4} feet/minute; approximately 5.7 inches/day
- W4: 1.11×10^{-3} feet/minute; approximately 19.2 inches/day

Given the low rate of infiltration at well W2, DBA is of the opinion that infiltration at this location and/or elevation would not be practical.

TABLE IIA
APPROXIMATE ROCK ELEVATIONS

Boring Number	Surface Elevation	Depth to Dense Weathered Rock[1]	Dense Weathered Rock Elevation	Depth to Bedrock[2]	Bedrock Elevation
B1	518 feet	NE	N/A	>10.50 feet	<507.50 feet
B2	514 feet	24.00 feet	490.00 feet	>30.17 feet	<483.83 feet
B3	524 feet	23.00 feet	501.00 feet	>29.25 feet	<494.75 feet
B4	502 feet	NE	N/A	>11.00 feet	<491.00 feet
B5	476 feet	NE	N/A	>11.00 feet	<465.00 feet
B6	481 feet	NE	N/A	>11.00 feet	<470.00 feet
B7	531 feet	NE	N/A	>11.00 feet	<520.00 feet
B8	530 feet	NE	N/A	>11.00 feet	<519.00 feet
B9	523 feet	NE	N/A	>11.00 feet	<512.00 feet
B10	511 feet	NE	N/A	>11.00 feet	<500.00 feet
B11	490 feet	NE	N/A	>11.00 feet	<479.00 feet
B12	494 feet	NE	N/A	>12.00 feet	<482.00 feet
B13	536 feet	NE	N/A	>11.00 feet	<525.00 feet
B14	539 feet	NE	N/A	>11.00 feet	<528.00 feet
B15	534 feet	12.00 feet **5.25 feet**	522.00 feet **528.75 feet**	12.50 feet **5.50 feet**	521.50 feet **528.50 feet**
B16	530 feet	NE	N/A	>21.00 feet	<509.00 feet
B17	540 feet	9.75 feet	530.25 feet	12.33 feet	527.67 feet
B18	540 feet	NE	N/A	>21.00 feet	<497.00 feet
B19	490 feet	NE	N/A	>16.00 feet	<474.00 feet
B20	497 feet	4.75 feet	492.25 feet	>14.08 feet	<482.92 feet
B21	523 feet	NE	N/A	>16.00 feet	<507.00 feet
B22	534 feet	NE	N/A	>16.00 feet	<518.00 feet
B23	547 feet	NE	N/A	>22.00 feet	<525.00 feet
B24	547 feet	18.00 feet	529.00 feet	>19.33 feet	<527.67 feet
B25	535 feet	NE	N/A	>21.00 feet	<514.00 feet
B26	531 feet	NE	N/A	>31.50 feet	<499.50 feet
B27	533 feet	NE	N/A	>30.50 feet	<502.50 feet

[1] As determined by drilling difficulty and Standard Penetration Resistance data.
[2] As determined by auger refusal.

TABLE IIA (cont'd)
APPROXIMATE ROCK ELEVATIONS

Boring Number	Surface Elevation	Depth to Dense Weathered Rock[3]	Dense Weathered Rock Elevation	Depth to Bedrock[4]	Bedrock Elevation
B28	530 feet	NE	N/A	>30 33 feet	<499.67 feet
B29	532 feet	18.50 feet **5.25 feet**	513.50 feet **526.75 feet**	20.58 feet **6.17 feet**	511.42 feet **525.83 feet**
B30	496 feet	NE	N/A	>11.00 feet	<485.00 feet
B31	520 feet	NE	N/A	>11.00 feet	<509.00 feet
B32	542 feet	NE	N/A	>31.00 feet	<511.00 feet
B33	550 feet	NE	N/A	>31.00 feet	<519.00 feet
B34	536 feet	12.50 feet	523.50 feet	23.25 feet	512.75 feet
B35	538 feet	25.00 feet	513.00 feet	>29.08 feet	<508.92 feet
B36	544 feet	25.00 feet	519.00 feet	27.33 feet	516.67 feet
B37	531 feet	11.00 feet	520.00 feet	15.83 feet	515.17 feet
B38	518 feet	NE	N/A	>16.00 feet	<502.00 feet
B39	493 feet	7.00 feet	489.00 feet	>9.08 feet	<486.92 feet
B40	493 feet	NE	N/A	>11.00 feet	<482.00 feet
W1	497 feet	NE	N/A	>17.00 feet	<480.00 feet
W2	522 feet	NE	N/A	>16.00 feet	<506.00 feet
W3	531 feet	12.50 feet	518.50 feet	>15.33 feet	<515.67 feet
W4	452 feet	NE	N/A	>16.00 feet	<436.00 feet

NOTES:
Boring locations were staked out in the field by the CLIENT. Surface elevations were provided on each stake.
Depths and elevations in bold denote those locations where gneiss boulders were encountered.

[3] As determined by drilling difficulty and Standard Penetration Resistance data.
[4] As determined by auger refusal.

TABLE IIB
APPROXIMATE GROUNDWATER ELEVATIONS

Boring Number	Surface Elevation	Depth to Groundwater	Groundwater Elevation
B1	518 feet	4.58 feet	513.42 feet
B2	514 feet	2.67 feet	511.33 feet
B3	524 feet	13.42 feet	510.58 feet
B5	476 feet	5.17 feet	470.83 feet
B16	530 feet	15.67 feet	514.33 feet
B21	523 feet	5.67 feet	517.33 feet
B24	547 feet	18.08 feet	528.92 feet
B26	531 feet	19.00 feet	512.00 feet
B28	530 feet	16.75 feet	513.25 feet
B32	542 feet	21.67 feet	520.33 feet
B35	538 feet	21.75 feet	516.25 feet
B38	518 feet	9.67 feet	508.33 feet
W2	522 feet	10.75 feet	511.25 feet

VII. Conclusions and Recommendations

Based upon the studies and research performed for the Siemens Property, the following conclusions and recommendations have been developed:

1. Seek use approval or re-zoning to allow for the proposed School Campus.

2. A Special Exception will need to be obtained from Uwchlan Township Zoning Hearing Board to allow for the proposed School Campus.

3. The unnamed tributary to Pickering Creek is classified as "High Quality" by PaDEP. Disturbance to and near the tributary should be minimized during the planning process to avoid a lengthy permitting process with PaDEP and the Chester County Conservation District.

4. A 100-year flood plain will need to be calculated for the unnamed tributary. The Township required Riparian Buffer of 50-feet from the edge of the 100-year flood plain and/or wetlands will need to be accounted for during the planning process to minimize disturbances to these areas.

5. The recommended RT surface soils samples should be taken to be analyzed for the presence of pesticides, arsenic, and lead, to determine if the past farming operations have impacted the site's soils. This testing is to determine whether or not excavated materials meet PaDEP Fill Policy Criteria and limits. RT recommends that no material be moved offsite, or re-deposited onsite, unless it is confirmed that constituents of concern in soils meet the applicable limits.

6. Based upon prior Bog Turtle Surveys and current results to date, there is no evidence of bog turtles on the Siemens property. Current survey is pending.

7. Permitting will be required to renovate or demolish the two "Class I Historic Resources" onsite from the Uwchlan Township Historic Commission and Board of Supervisors.

8. Based upon the age of the buildings onsite, asbestos containing material and lead based paint surveys should be completed by licensed inspectors prior to any renovations and/or demolition.

9. The site soils will provide sufficient area of suitable soil onsite to accommodate the projected sewage flow using community spray or drip irrigation disposal, pending results of detailed testing.

10. The current school campus sketch, by DWKCB Architects, will need to be revised to remove some ball fields and allow for the sewage disposal treatment, storage, and disposal areas.

11. The soils testing study revealed depths to bedrock onsite to range from nine (9) feet to thirty-one (31) feet from the ground surface. The depths to bedrock should be accounted for during the site design and layout process to limit removal of bedrock to lower the cost of construction.

12. The soils testing study revealed depths to groundwater onsite to range from 2.67-feet to 21.75 feet from the ground surface. The depths to groundwater should be accounted for during the site design and layout process to minimize special construction methods for buildings and stormwater management facilities to lower the cost of construction.