Appendix N

Wetland Investigation and
Wetland Fuctional Analysis

by Paul Jaehnig, CPG

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WETLAND INVESTIGATION & WETLAND FUNCTIONAL ANALYSIS

of a

SMALL WETLAND AND ADJACENT LAND

on the

GATEWAY SUMMIT SITE

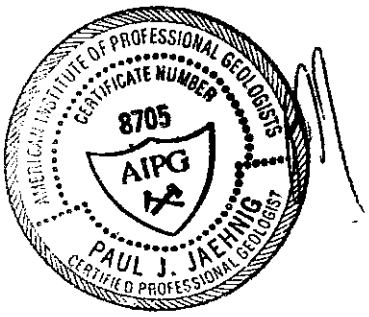
ROUTE 6

CARMEL, NY

prepared for

The Town of Carmel

Jan. 28, 2002



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INTRODUCTION

A small wetland area, identified by the Town of Carmel Environmental Conservation Board (ECB) in the field with flagging numbers ECB WL-1 to WL-11, was studied and mapped in the field Jan. 20 & 24, 2001 by Paul J. Jaehnig, Certified Professional Geologist, Soil Scientist, and Wetland Scientist at the request of the Town of Carmel. The area of investigation is on a property identified as Gateway Summit fronting on the north side of Route 6 in the Town of Carmel (see enclosed *Wetland Map- Depicting Vegetative Distribution*). The work in this ECB wetland area included: the taking of soil borings in the wetland to identify the wetland or hydric soils; conducting an inventory of wetland vegetation groups and their areal distribution in the wetland as well as an analysis of selected wetland functions.

In addition to this work, the land adjacent to and north of this ECB wetland area was also investigated for consideration as a wetland creation area. The work in this adjacent land consisted of: taking of soil borings to characterize the soil-types; and documenting the vegetative cover.

ECB WETLAND DESCRIPTION

The ECB wetland is an irregular-shaped area of about 0.9 acres with maximum dimensions of about 210 ft. east-west and about 250 ft. north-south (see enclosed *Wetland Map-Depicting Vegetative Distribution*). The wetland slopes down gently to the east, with slopes of about 6 to 2 % from west to east. On the easternmost portion of the wetland, the land is nearly level, then drops steeply down for a short run down to the banks of a stream, which flows south and parallel to the east side of the ECB wetland.

There is no flowing surface in the ECB wetland at this time; only wet soil surfaces. The wetland does experience inundation by floodwaters. Water tables here may be expected to fluctuate, being at or near the surface during the wetter times of the year, and depressing to 1-2 ft. or more during droughty times of the year. Water tables encountered in the wetland at the time of this investigation ranged from 14 inches below the ground surface, on the west portion of the wetland, to 7 inches below the ground surface, on the eastern portion of the wetland. Surface drainage is directed toward the east across the ECB wetland. Surface drainage in the ECB wetland outlets via a shallow drainage course on the northeast corner of the wetland, and down into the stream.

The ECB wetland has a somewhat poorly developed micro-topography with only small slight depressions formed. Shallow and surficial tree root development contributes to an irregular ground surface as well as local "tree-throw". Surface stones and boulders also contribute to the micro-topography of the wetland. The western portion of the wetland

has less than 1% stones covering the surfaces, while the eastern and more level portion of the wetland has stones and boulders covering up to approx. 10% of the ground surface. Boulders reach a maximum of 3.5 ft. across.

The ECB wetland has a structured vegetative cover, that is, it has a tree canopy, shrub understory, and groundcover. The vegetative cover is complete over much of the wetland, with only small irregular patches of bare soil. The vegetative cover in the ECB wetland consists of: an extensive tree canopy of thin red maple (4 – 6 inch d.b.h.) and few ash (2 to 4 inch d.b.h.); sparsely-developed shrub understory of spice bush, some winterberry, and minor barberry; a ground cover of scattered skunk cabbage, blankets of sphagnum moss, sparse christmas fern, and spot areas of tussock sedge (see *photo 1* in Appendix I). Tussock sedge areas were concentrated on the western portions of the wetland. Some scattered growth of horsetail was found on along the west bank of the stream where it is in contact with the ECB wetland. It should be noted that the examination of vegetation, particularly herbaceous growth, during the winter months is limited because of plant dormancy and snow cover. Fortunately because of the unseasonably mild winter at the time of the investigation, there was no snow and some plants, such as skunk cabbage, were beginning a new growth cycle. The areal distribution of wetland vegetation is show on the enclosed *Wetland Map - Depicting Vegetation Distribution.*

Soils borings were taken in the ECB wetland to characterize the soil-type using a dutch auger. The soils were logged noting the color, texture, redoximorphic or wetland indicators such as mottling, and water table. The location of the soil borings (SS-1, SS-2, etc.) is shown on the enclosed *Wetland Map- Depicting Soils Distribution.* Detailed descriptions of soils, as collected by soil boring, are provided in Appendix II.

Wetland poorly-drained Ridgebury loam (RdB on the map) was identified in the ECB wetland. This soil is a mineral hydric soil developed from a parent glacial till. The wetland soil profile in the wetland is typically: 0-8" depth of dark gray silt loam with some local oxidized rhizosperes; below this is a gray clay loam with dark yellow brown mottling. The thin dark organic surface layer and mottled subsoil support the notion that there is some fluctuation of the water table of the cycle of a year. To the north and south of ECB wetland are wetland soils area with Ridgebury loam. The stream borders the east side of the ECB wetland in part. A small inclusion of non-wetland well-drained Paxton loam (PnB) borders the northeast edge of the ECB wetland. Sloped woodlands with non-wetland well-drained Paxton loam (PnC) borders the west side of the ECB wetland.

ECB WETLAND JURISDICTION, CLASSIFICATION, AND FUNCTIONS

The ECB wetland is a locally regulated wetland. The wetland is not a NYSDEC wetland based on a review of NYSDEC Wetland Maps and because its area of about 0.9 areas is well below the NYSDEC 13 acres jurisdictional minimum area.

The ECB wetland is classified as a *Slope Wetland- surface water driven subclass*, using the model system in the *Rapid Assessment Procedure, (Magee, D.W. and G.G. Holland, 1998, "A Rapid Procedure for Assessing Wetland Functional Capacity", published by the Association of State Wetland Managers, Berne, NY,)*. The slope wetland typically has a unidirectional flow of water through the wetland, directed toward the outlet. The slope wetland is situated on a hillside, does not have a basinal shape, and is therefore not generally configured to provide long-term water storage. The subclass of *surface water driven* denotes that the wetland soils are low permeability formed in a glacial till and bedrock geology. A slope wetland tends to be drier than other wetland environments such as riverine, level depressional wetlands, and large peatlands.

The ECB wetland functions as a point of ground water discharge. The wetland is part of contributory drainage of a watershed with converging drainage locally defined by the adjacent stream to the east of the ECB wetland. The wetland has a topographic "draw" and poorly-defined intermittent outlet whereby surface drainage may collect and discharge into the stream. Because of the relatively small area of the wetland, the percentage contribution of the wetland to the overall drainage system is relatively small. The wetland provides in a limited way to trap and filter out sediment carried in runoff from wooded upland areas to the west prior to reaching the stream. The good cover of plant life over the wetland surface secures the soil and minimizes potential for erosion and sediment transport from the wetland and into the stream. Since the wetlands soils in the ECB wetland have developed on a parent glacial overburden with typically low hydraulic conductivity (as compared to glacial outwash deposits of sand and gravel with high hyraulic conductivity), the wetland would not considered as providing significant groundwater recharge site. While the ECB wetland has a structured vegetative cover, the small variety of vegetative types, the paucity of the shrub understory, limits the wildlife habitat opportunities of the wetland The wetland provides some habitat potential for small reptiles and amphibians. The wetland connection to the stream provides somewhat of a corridor for wildlife movement from one wetland area and into another. Deer use the wetland for short-term browsing. Small birds may use shrubs for temporary resting and red maple trees for long-term habitation. Although the ECB wetland has drier periods, there does not appear to be conditions favoring opportunities for burrowing animals.

ECB WETLAND FUNCTIONAL ANALYSIS

Selected important wetland functions were analyzed for the ECB wetland. The ability of this wetland to carry-out these functions were tabulated using the *Rapid Assessment Procedure, (Magee, D.W. and G.G. Holland, 1998, "A Rapid Procedure for Assessing Wetland Functional Capacity". Published by the Association of State Wetland Managers, Berne, NY.).* This procedure is a hydrogeomorphic model approach developed for use in the glaciated northeast region. The approach is grounded in the essential importance of geomorphic setting of a wetland and its hydrology in determining its wetland functional performance. The results are tabulated below. Note that the higher number of the range is, the higher score for the functional category. The wetland area in the study area is classified as to model type, in this case a *Slope Wetland.*

For the model type there is a "functional capacity index" or FCI, where available, that is determined by dividing the score for the assessed function by the total possible in that category for that particular model. This is a visual tool in evaluating the score for the wetland.

Where a "disfunction" is denoted with a *, the wetland provides no level of ability to provide that particular function.

Wetland Functional Analysis

Wetland Function	Score for ECB wetland	Range	Avg.
Modification of Groundwater Discharge	6	3-15	9.0
Total for model	15		
FCI	.40		
Modification of Groundwater Recharge	12	4-21	12.5
Total for model	21		
FCI	.57		

Wetland Function	Score for ECB wetland	Range	Avg.
Storm and Flood-Water Storage	12	4-30	17.0
Total for model	30		
FCI	.40		
Modification of Water Quality	17	4-18	11.0
Total for model	18		
FCI	.94		
Export of Detritus	12	5-18	11.5
Total for model	18		
FCI	.67		
Contribution to Abundance and Diversity of Wetland Vegetation	9	2-15	8.5
Total for model	15		
FCI	.60		
Contribution to Abundance and Diversity of Wetland Fauna	21	4-30	17.0
Total for model	30		
FCI	.70		

DISCUSSION OF ECB WETLAND FUNCTIONAL ANALYSIS RESULTS

In general, the wetlands analysis of the ECB wetland shows 2 of the 7 functions reviewed to score around the average for that particular function, 2 of the 7 functions to be slightly higher, 1 to be well above the average, and 2 to be well below the average.

"Modification of Groundwater Discharge", "Modification of Groundwater Recharge", and " Contribution to Abundance and Diversity of Wetland Vegetation" scores were around average. "Modification of Water Quality" score was well above average. "Modification of Groundwater Discharge" and "Storm and Flood-Water Storage" scores were well below average.

An average score for "Modification of Groundwater Recharge" reflects the fact the wetland is underlain by low permeability glacial till deposits, has a surface drainage outlet, and does not have inundation of surface water (floodwaters) passing over the wetland. Such conditions do not provide the opportunity for water to collect and percolate into the ground and recharge the ground water significantly.

An average score for "Contribution to Abundance and Diversity of Wetland Vegetation" reflects an intermediate density of vegetative development. Although the vegetative cover is throughout the wetland, and there is a tree, shrub, and herbaceous structure, there is only a thin shrub development and not a large variety of plant types.

A slightly higher than average score for " Export of Detritus" function is due in part to the fact that the wetland has woody vegetation, mineral soil, and is not flooded. Such conditions make for some accumulation of plant material on the ground, break down into detritus, and periodic export of this detritus in runoff to wetland systems downstream. Such detritus provides nutrients to habitats downstream.

A slightly higher than average score for "Contribution to Abundance and Diversity of Wetland Fauna" is reflected in the fact that the wetland is undisturbed, there is interspersion or mixing of different plant types, and close proximity to other wetlands. These factors contribute to making habitat opportunities for a variety of wildlife.

The "Modification of Water Quality" function score was very high due in part to the fact that the wetland has a somewhat restricted outlet, has a vegetative cover throughout the wetland, and the wetland is not disturbed by land use activities. The vegetative cover and restricted outlet act to collect and trap sedimentation from upland areas.

The "Modification of Groundwater Discharge" function score was well below average reflected by the fact that the wetland has no inlet and an intermittent outlet, mineral hydric soils, and a drier moisture regime. If the wetland was a significant groundwater discharge site, one would expect wetter conditions, thicker organic soils deposits. The lack of an inlet limits the steady influx of water available to the wetland for discharge.

A rather lower than average score was obtained for the "Storm and Flood-Water Storage" function, due to the inclination and non-basinal shape typical of a slope wetland. Such characteristics limit the storage capacity of storm and floodwater.

DESCRIPTION OF LAND TO THE NORTH AND ADJACENT TO ECB WETLAND

The land to the north and adjacent to ECB wetland is a gently sloped wetland similar to ECB wetland area (see *photo 2* in Appendix I). The vegetative cover consists of: a thin tree canopy of red maples and few ash; some shrub understory of winterberry, spicebush, few barberry; and groundcover including local tussock sedge, sphagnum moss; Christmas ferns. There is a shrub area, which includes red osier dogwood, in addition to other shrub mentioned previously, in the area adjacent to the stream. Tree root development is shallow. The soils in this area are wetland and identified as Ridgebury loam. Water tables were found to be near the surface in this area.

DISCUSSION REGARDING POTENTIAL FOR WETLAND CREATION AREA

Based on this investigation the land, north of and adjacent to ECB wetland, is a wetland area based on vegetation, soils, and hydrology. As a result, this area would could not be credited for use in the creation of a wetland.

Land investigated to the south of ECB wetland is also a wetland area similar to ECB wetland and cannot considered for wetland creation.

Land to the west of the ECB wetland is upland well-drained woodlands and would not be a suitable site for wetland creation because the anticipated depth of excavation to intercept the water table to replicate hydric conditions (see *photo 3* in Appendix I).

Most areas along the stream, to the south of the ECB wetland, would be impractical for consideration as areas for wetland creation because the stream is flanked, for the most part, by wooded steep slopes. Grading of soil, clearing of trees, removal of rock would be quite involved. At the southern end of the site, near Route 6, the stream flows through gently sloped to nearly level woodlands (see *photo 4* in Appendix I). The banks of the river are well defined. Although the land adjacent to the stream is only slightly higher elevation, excavation of these areas adjacent to the stream here would involve clearing of some trees, and removal of a few feet thickness of soil to intercept the ground water table. Heavy equipment access down to this southern part of the site would be quite difficult.

Appendix I

Selected Site Photographs

PHOTO 1 LOOKING NORTH ACROSS ECB WETLAND ON WESTERN PORTION OF WETLAND. NOTE RED MAPLE TREES WITH SHALLOW ROOTS; CLUSTER OF TUSSOCK SEDGE IN MIDDLE OF PICTURE WHERE AUGER WITH PINK RIBBON IS PLACED; STONES; SPHAGNUM MOSS

PHOTO 2 LOOKING WEST ACROSS STREAM AND TOWARD NORTHEAST END OF ECB WETLAND AND SOUTHERN END OF AREA CONSIDERED FOR WETLAND CREATION. NOTE INTERMITTENT DRAINAGE OUTLET FROM ECB WETLAND INTO STREAM IN CENTER OF PHOTO; RED MAPLE WITH SHALLOW ROOTING IN PROPOSED WETLAND CREATION.

JAN. 2002 GATEWAY SUMMIT SITE, CARMEL, NY

PHOTO 3 LOOKING EAST DOWN SLOPE TOWARD ECB WETLAND FROM WOODED UPLAND. NOTE ECB WETLAND IS ACROSS BACKGROUND OF PHOTO.

PHOTO 4 LOOKING EAST DOWN SLOPE TOWARD STREAM COURSE NEAR ROUTE 6. NOTE STREAM ACROSS CENTER OF PHOTO; LEVEL WOODLANDS WITH OPEN UNDERSTORY IN BACKGROUND.

JAN.2002 GATEWAY SUMMIT SITE, CARMEL, NY

Appendix II

Soil Boring Logs

Key to Soil Boring Logs

SS-1	SOIL BORING LOCATION
0-6"	DEPTH IN INCHES FROM GROUND SURFACE

COLOR	MUNSELL COLOR NOTATION		
	HUE	VALUE /	CHROMA
VERY DARK GRAY	10YR	3 /	1

SS-1

SITE: NEARLY LEVEL SWAMP; RED MAPLE 4-10" D.B.H. WITH SHALLOW AND BUTTRESSED ROOTS; BOULDER UP TO 3.5 FT. COVER 10% OF SURFACE; SPICEBUSH; SCATTERED BARBERRY; FEW ASH TREES 3" D.B.H.

0-12" VERY DARK GRAY 10YR 3/1 SILT LOAM.

12-17" GRAY BROWN 2.5Y 5/2 LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

17-30" GRAY BROWN 2.5Y 5/2 SANDY LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

WATER TABLE AT 11".

SS-2

SITE: GENTLY SLOPED WOODLANDS NEAR TRAIL; RED MAPLE; FEW ASH; THIN SHRUB UNDERSTORY OF SPICEBUSH; FALLEN TIMBER WITH SPHAGNUM MOSS; RED OSIER DOGWOOD.

0-13" DARK GRAY 10YR 4/1 SILT LOAM WITH BROWN 7.5YR 4/4 MOTTLES.

13-26" GRAY BROWN 2.5Y 5/2 SANDY LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

WATER TABLE AT 14".

SS-3

SITE: SIMILAR TO SS-2; GENTLY SLOPED; RED MAPLE; ASH; SPICEBUSH; SOME STANDING DEAD TIMBER; FEW TUSSOCK SEDGE; MINOR MULTIFLORA ROSE; CHRISTMAS FERN.

0-10" DARK GRAY 2.5Y 4/1 SILT LOAM WITH BROWN 7.5YR 4/4 MOTTLES.

10-13" DARK GRAY 2.5Y 4/1 CLAY LOAM.

13-24" GRAY BROWN 2.5Y 5/2 SANDY LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

WATER TABLE AT 13".

SS-4

SITE: GENTLY SLOPED WOODLANDS; RED MAPLE 4" D.B.H. WITH SURFACE ROOTS; PATCHY GRASS; SPHAGNUM MOSS; WINTERBERRY; POISON IVY.

0-10" OLIVE GRAY 5Y 5/2 LOAM WITH BROWN 7.5YR 4/3 OXIDIZED RHIZOSPHERES.

SS-4 (CONT.)

10-28" LIGHT OLIVE GRAY 5Y 6/2 CLAY LOAM WITH COMMON YELLOW BROWN 10YR 5/6 MOTTLES.

28-32" LIGHT OLIVE GRAY 5Y 6/2 CLAY LOAM WITH ABUNDANT YELLOW BROWN 10YR 5/6 MOTTLES.

WATER TABLE AT 13".

SS-5

SITE: SLOPED WOODLANDS; SUGAR MAPLE; BLACK BIRCH; MINOR BARBERRY; OPEN UNDERSTORY; 1% BOULDERS 8 FT. ACROSS.

0-1" LEAF LITTER; DARK BROWN 10YR 3/3 LOAM.

1-9" BROWN 10YR 4/3 LOAM.

9-26" OLIVE YELLOW 2.5Y 6/6 LOAM WITH TRACE OF GRAVEL.

WATER TABLE NOT ENCOUNTERED.

SS-6

SITE: VERY GENTLY SLOPED WETLAND AREA; RED MAPLE; SOME ASH; LOCAL MINOR TUSSOCK SEDGE NEARBY; SPHAGNUM MOSS.

0-8" DARK GRAY 2.5Y 4/1 SILTLOAM WITH BROWN 7.5YR 4/3 OXIDIZED RHIZOSHPERES.

8-20" GRAY 2.5Y 6/1 CLAY LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

WATER TABLE AT 15".

SS-7

SITE: NEARLY LEVEL WETLAND AREA SIMILAR TO SS-6.

SOIL: SIMILAR TO SS-6.

WATER TABLE AT 14".

SS-8

SITE: NEARLY LEVEL WETLAND AREA; REDMAPLE AND MINOR ASH TREES WITH COMMON SURFACE ROOTS; MINOR BARBERRY; LOCAL TUSSOCK SEDGE; SPHAGNUM MOSS; 10% BOULDERS UP TO 3.5 FT. ACROSS COVER SURFACE.

0-10" DARK GRAY 2.5Y 4/1 SILT LOAM WITH BROWN 7.5YR OXIDIZED RHIZOSPHERES.

10-25" GRAY 2.5Y 6/1 CLAY LOAM WITH DARK YELLOW BROWN 10YR 4/6 MOTTLES.

WATER TABLE AT 7".

SS-9

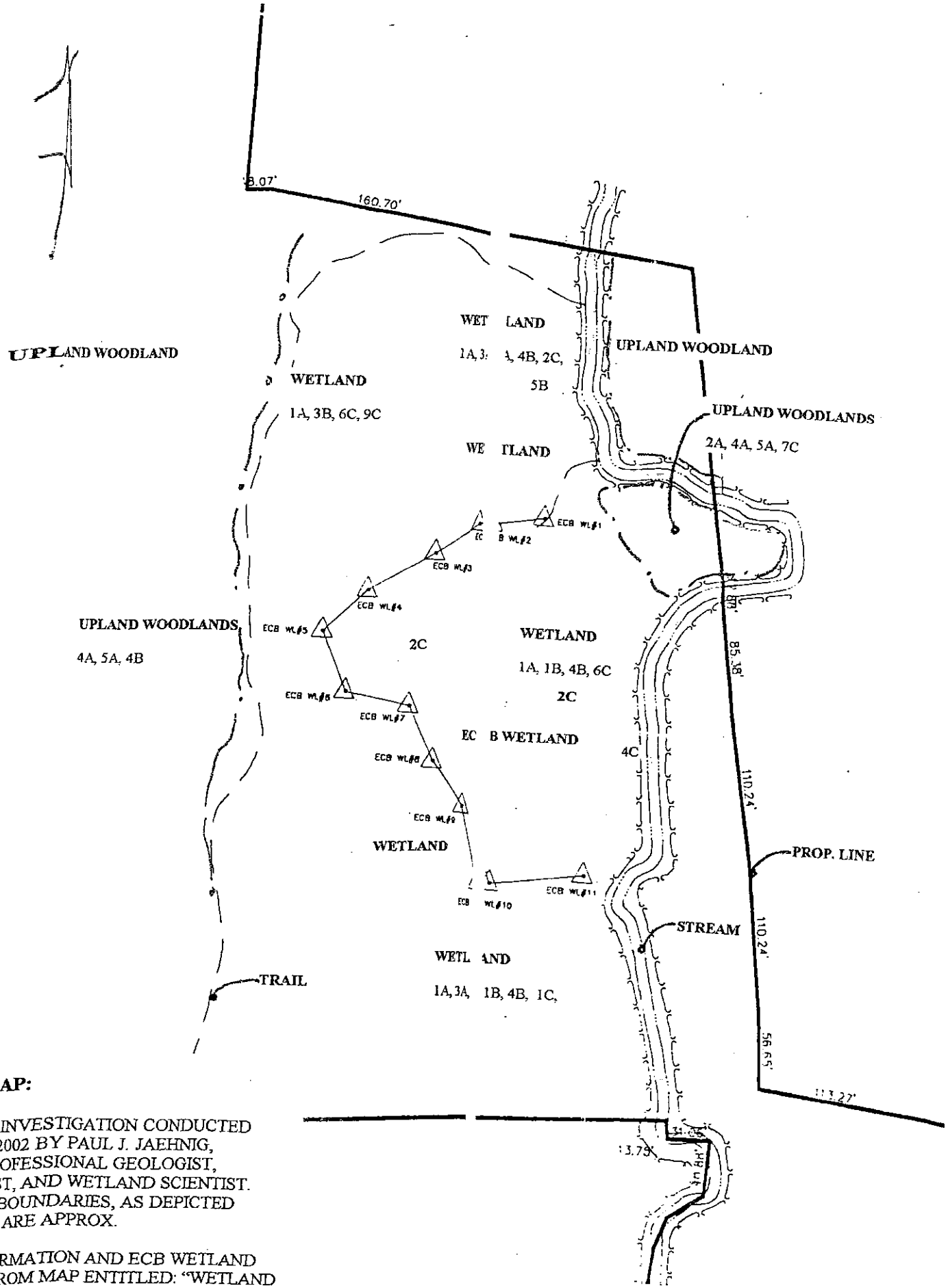
SITE: VERY GENTLY SLOPD WOODLANDS; OPEN UNDERSTORY; SUGAR AND RED MAPLE;THIN BEECH; BLACK BIRCH; SOME CLUB MOSS.

0-1" LEAF LITTER; DARK BROWN 10YR 3/3 LOAM.

1-7" BROWN 10YR 4/3 LOAM.

7-26" LIGHT OLIVE BROWN 2.5Y 5/6 LOAM WITH TRACE OF GRAVEL.

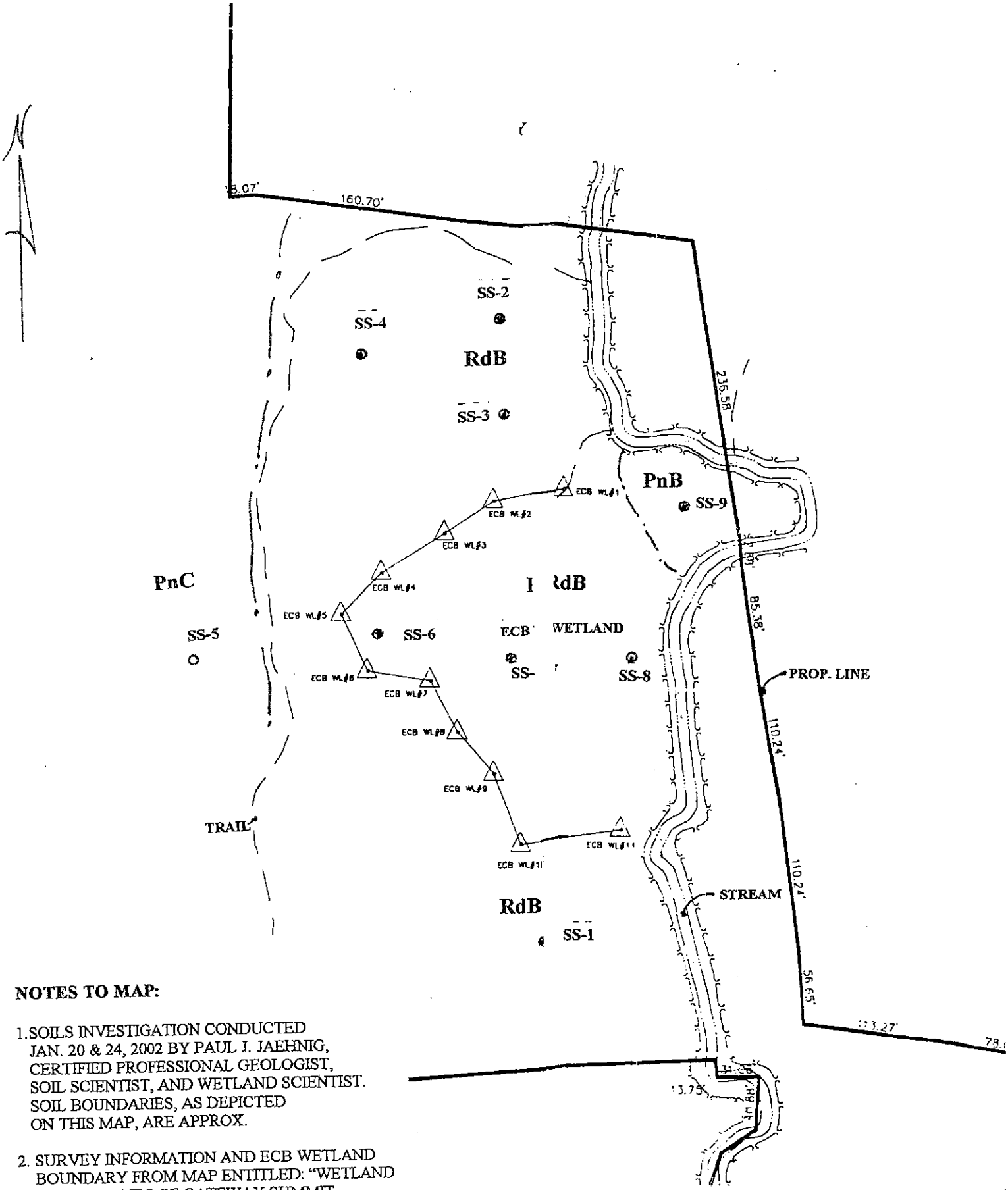
WATER TABLE NOT ENCOUNTERED.



NOTES TO MAP:

1. VEGETATIVE INVESTIGATION CONDUCTED JAN. 20 & 24, 2002 BY PAUL J. JAEHNIG, CERTIFIED PROFESSIONAL GEOLOGIST, SOIL SCIENTIST, AND WETLAND SCIENTIST. VEGETATIVE BOUNDARIES, AS DEPICTED ON THIS MAP, ARE APPROX.

2. SURVEY INFORMATION AND ECB WETLAND BOUNDARY FROM MAP ENTITLED: "WETLAND MAP OF LANDS OF GATEWAY SUMMIT, PREPARED BY TERRY BERGENDORFF, DATED OCT. 18, 2001.



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KEY TO MAP

● SS-1 SOIL BORING LOCATION

ECB WL #1
ECB WL #2 FLAGGED WETLAND BOUNDARY
ECB WL#3

SOILS INFORMATION

NON-WETLAND SOILS

PnB PAXTON loam, 2 to 8 % slope

PnC PAXTON loam, 8 to 15 % slope

WETLAND SOIL

RdB RIDGEBURY loam, 3 to 8 % slope

PnC
PnB SOILS BOUNDARY

WETLAND MAP- DEPICTING SOILS DISTRIBUTION

GATEWAY SUMMIT SITE
ROUTE 6
CARMEL, NY
prepared for
The Town of Carmel
Jan. 28, 2002

prepared by
Paul J. Jaehnig Wetlands and Soils Consulting
P.O. Box 1071 Ridgefield, CT

KEY TO VEGETATIVE COVER

1A GENERAL PLANT LOCATION

GENERAL VEGETATIVE COVER LIMITS

WETLAND BOUNDARY

A - TREE CANOPY

LOC.	COMMON NAME	BOTANICAL NAME
1A	RED MAPLE	ACER RUBRUM
2A	BEECH	FAGUS GRANDIFOLIA
3A	ASH	FRAXIMUS PENNSYLVANICA
4A	SUGAR MAPLE	ACER SACCHARUM
5A	BLACK BIRCH	BETULA LENTA

B - SHRUB / VINE UNDERSTORY

1B	SPICEBUSH	LINDERA BENZOIN
2B	MULTIFLORA ROSE	ROSA MULTIFLORA
3B	WINTERBERRY	ILEX VERTICILLATA
4B	BARBERRY	BERBERIS THUNGBERGI
5B	RED OSIER DOGWOOD	CORNUS SERICEA

C - GROUNDCOVER

1C	SKUNK CABBAGE	SYMPLOCARPUS FOETIDUS
2C	TUSSOCK SEDGE	CAREX STRICTA
3C	SOFT RUSH	JUNCUS EFFUSUS
4C	ROUGH HORSETAIL	EQUISETUM HIEMALE
5C	CHRISTMAS FERN	POLYSTICHUM ACROSTICHOIDES
6C	SPHAGNUM MOSS	SPHAGNUM
7C	CLUBMOSS	LYCOPODIUM
8C	GRASSES	GRAMINEAE SPP.
9C	POISON IVY	RHUS RADICANS

WETLAND MAP-
DEPICTING VEGETATIVE DISTRIBUTION

GATEWAY SUMMIT SITE
ROUTE 6
CARMEL, NY
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