Conservation Permit No. 00-009.DFW

Issuing Authority: Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP)

Applicant: Eqmarc Joint Venture c/o Towermarc Boston Corp.

Issue Date: March 1, 2000

Expiration Date: None. This permit runs with the land and must be transferred to successive property owners.

Extension Requirements: None.

Notes:
This permit was issued on the condition that the Conservation Plan submitted by Eqmarc Joint Venture dated February 25, 2000 and approved by the Division is adhered to.

Summary:
This permit was issued to allow an authorized "taking" of the state protected Blanding's Turtle and the Eastern Box Turtle on the project site in the towns of Boxborough and Harvard for the development of a business park and a golf course. This permit required the creation of the 60-acre and the 49-acre conservation restrictions, as well as the construction of the three turtle tunnels under the subdivision roadway. This permit also required the installation of the turtle curbing around the development site to prevent migrating turtles from entering the roadway and parking areas.

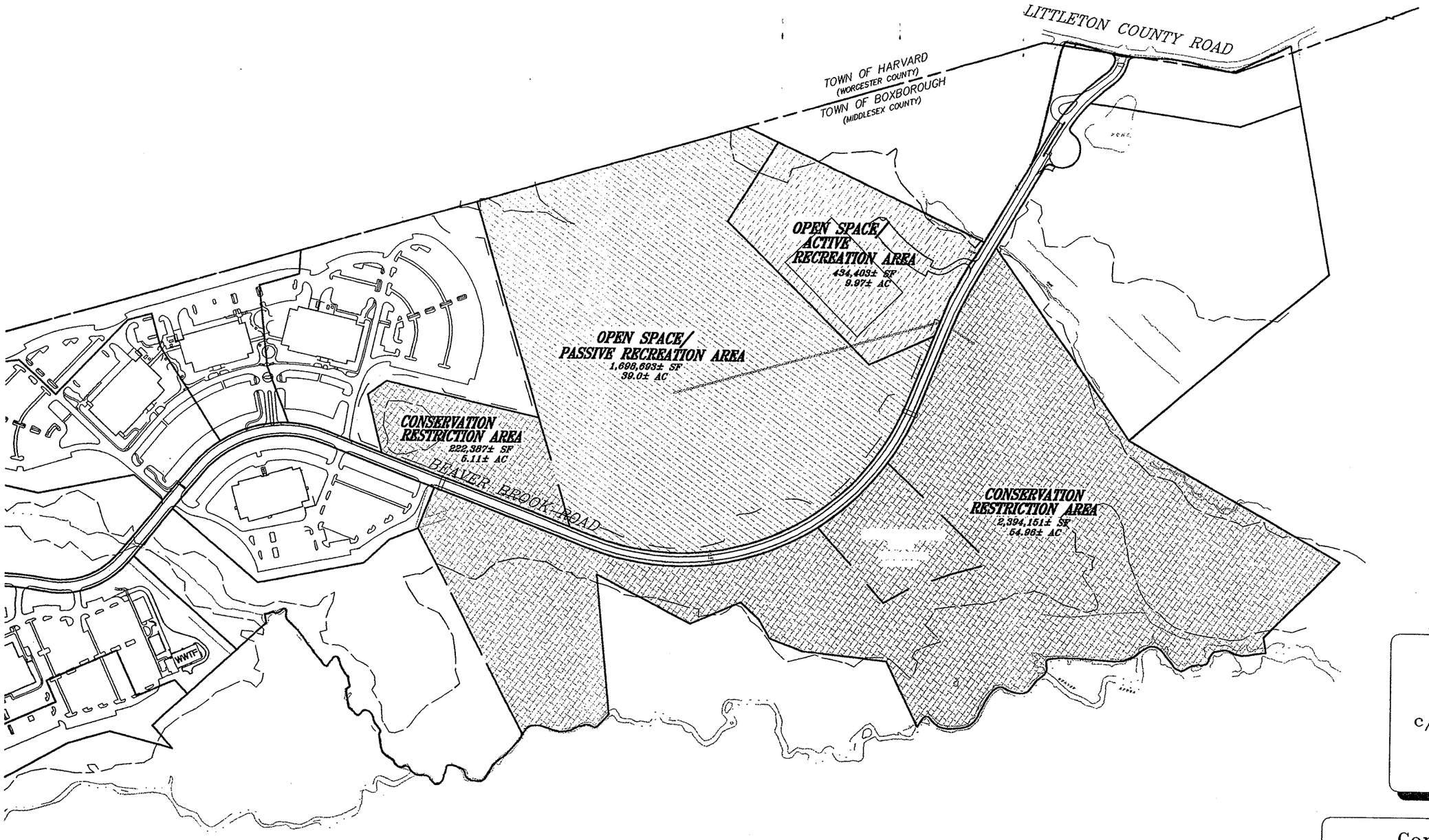
Conditions:

- The permit holder shall enhance 16 acres of turtle nesting habitat within the 60-acre Conservation Restriction according to the Conservation Plan. The area outside the existing stockpile area #1 shown on Attachment H shall be enhanced by April 1, 2002; and the area currently occupied by the stockpile area #1 shall be enhanced by April 1, 2003.
- The permit holder shall fund a 2-year construction phase turtle monitoring plan, a 3-year post-construction turtle monitoring plan, and a 2-year Blanding's Turtle conservation research project for the construction of the business park and the subdivision roadway.
- If no golf course is built, then alternative development may proceed in the area designated as "Development Area B"
- The permit holder shall place construction barriers around the development area before March 15th of the year that construction begins. If construction barriers are not in place by March 15th, construction shall not begin until October 1st.
- At completion of construction of the alternate development the Permit Holder shall place permanent barriers to exclude turtles from the development site as demarcated on Attachment G.
- The permanent barriers constructed along the western boundary of the subdivision roadway opposite Lot 3 as part of Phase I (as shown in Attachment G) can be altered so as to allow vehicle and pedestrian access to the development area.

- The area within the boundaries of the 60-acre CR shall not be used for passive or active recreational activities and the boundaries within the 49-acre CR shall only be used for passive recreation activities except for the 10-acre envelope that allows for active recreation.

Plan Reference: 30

HSJ/hsj/004967RP001



CISCO SYSTEMS
NEDC SITE 2
BOXBOROUGH, MA

c/o Cisterra Partners, LLC
260 FRANKLIN STREET
SUITE 1840
BOSTON, MA 02110-3712

Conservation Permit
No. 00-009.DFW

Scale: 1"= 400'
Date: 04/04/2003
Source File: 0049451A.dwg
BTI Dwg No.: 0049481
BTI Project No. W-49.67

Figure 30

Scott - Pls. look at Phase II+III for changes. Call if there is a problem. Hanni

Commonwea . of Massachusetts

Division of Fisheries & Wildli

Wayne F. MacCallum, *Director*

CONSERVATION PERMIT

Date: 1 March 2000

Conservation Permit No.: 00-009.DFW

Initial Permit Holder: Eqmarc Joint Venture c/o Towermarc Boston Corp.
260 Franklin Street
Boston, MA 02110

Pursuant to the authority granted in the Massachusetts Endangered Species Act (M.G.L. c. 131A:3) and its implementing regulations (321 CMR 10.00), the Director of the Massachusetts Division of Fisheries & Wildlife (the "Division") hereby issues a Conservation Permit to the Eqmarc Joint Venture authorizing the "taking" of the state-protected Blanding's Turtle (*Emydoidea blandingii*), listed as threatened, and the Eastern Box Turtle (*Terrapene carolina*), listed as a species of special concern, on the project site in the towns of Boxborough and Harvard, Massachusetts ("Site")(see Attachment A). The project entails the development of a business park and golf course in two phases.

Based on the Conservation Plan submitted by the Eqmarc Joint Venture dated February 25, 2000 and approved by the Division (see Attachment B), this permit is issued on the condition that the Conservation Plan is adhered to and with the following specific conditions. These conditions shall initially apply to the Initial Permit Holder and subsequently to any successor Permit Holder, as provided below.

Phase I – Development of Business Park

1. Permit Holder shall fund a 2-year construction-phase turtle monitoring plan, a 3-year post-construction turtle monitoring plan, and a 2-year Blanding's Turtle conservation research project for the construction of the business park and the subdivision roadway in accordance

with and not to exceed the budget for Phase I in Attachment C. Except for the funds allocated to the first year of the construction monitoring (which monitoring shall be paid for and performed by the Permit Holder), these funds shall be made payable to Manomet, Inc and delivered to the Division in accordance with the disbursement schedule in Attachment C.

2. Permit Holder shall place a Conservation Restriction on 60 acres of land on the project site, as shown on Attachment D that will protect Blanding's Turtle habitat in perpetuity. This Conservation Restriction allows for the development of a golf course if all necessary Order(s) of Conditions have been obtained for the subject property by May 1, 2006. (The Conservation Restriction shall be in substantially the same form as Attachment E. Changes in the Conservation Restriction other than typographical or grammatical changes shall be provided to the Division before the Conservation Restriction is submitted to the Secretary of the Executive Office of Environmental Affairs for execution). An executed copy of the Conservation Restriction shall be delivered to the Division after it is recorded and before construction begins on the project site.

3. Permit Holder shall place a Conservation Restriction on 49 acres of land on the project site, as shown on Attachment D, that will protect Blanding's Turtle and Eastern Box Turtle habitat in perpetuity. This Conservation Restriction allows for the development of a golf course and use of the area for passive and active recreation purposes as more particularly provided in the Conservation Restriction. (The Conservation Restriction shall be in substantially the same form as Attachment F. Changes in the Conservation Restriction other than typographical or grammatical changes shall be provided to the Division before the Conservation Restriction is submitted to the Secretary of the Executive Office of Environmental Affairs for execution). An executed copy of the Conservation Restriction shall be delivered to the Division after it is recorded and before construction begins on the project site.

4. Permit Holder shall apply for and use best efforts to obtain permission to construct three (3) tunnels under the subdivision roadway to allow for turtle passage in accordance with the approved Conservation Plan, and if such approval is obtained, the Permit Holder shall construct the tunnels. In the event the Boxborough Planning Board denies permission to construct the tunnels as shown in the Conservation Plan, the Permit Holder will use best efforts to obtain approval to construct, and to construct, alternative tunnels in accordance with an alternative design approved by the Division, provided, however, that at least three (3) tunnels must be constructed at least fifteen (15) feet wide and one of which must have a grate

at least three (3) feet wide, centered on the tunnel, spanning the width of the roadway. Tunnels must be located north of the southern boundary of Wetland 10, as shown on Attachment G.

5. Permit Holder shall construct permanent structures that provide a continuous barrier to turtles ("turtle barriers") along the roadway and parking lots, to exclude turtles from these areas in accordance with Attachment G entitled "Conservation Plan Turtle Protection Measures". Construction of permanent turtle barriers shall be completed by March 1, 2002, provided that the permanent turtle barriers can be reconstructed and/or replaced with alternative barriers in the same location with the same effectiveness.

6. Permit Holder shall place temporary construction barriers to exclude turtles from areas with active construction operations in accordance with the Attachment H entitled "Phase I Construction Barriers". Placement of construction barriers shall be completed by March 31, 2000. Notwithstanding the placement of the construction barriers, the existing spoil pile #2 as shown on Attachment H, located north of the construction barriers, can be removed between September 1 and April 1, or as otherwise approved by the Division.

7. Permit Holder shall enhance 16 acres of turtle nesting habitat within the 60 acre Conservation Restriction in accordance with the Conservation Plan (Attachment B). The area outside the existing stockpile area #1 as shown on Attachment H shall be enhanced by April 1, 2001; and the area currently occupied by the stockpile area #1 shall be enhanced by April 1, 2003.

8. Permit Holder may construct a leaching field, and conduct maintenance and construction support activities in "Development Area B" as shown in Attachment I.

Phase IIA – Development of Golf Course

If Permit Holder has obtained all necessary Order(s) of Conditions from the Boxborough Conservation Commission (and, as appropriate, from the Harvard Conservation Commission) to construct a golf course on the project by May 1, 2006, the following conditions must be met before construction of the golf course begins:

1. The golf course design must adhere to the general design as approved in the Conservation Plan. Any changes to the general golf course design as shown on Attachment A

must be approved by the Division prior to construction, such approval not to be withheld provided that the Division reasonably determines that nesting habitat for Blanding's Turtles is of similar size, quality, location, and accessibility from a habitat perspective as is included in the Conservation Plan.

2. Permit Holder shall fund a 2-year construction-phase turtle monitoring plan and a 3-year post-construction plan for the construction of the golf course in accordance with and not to exceed the budget for Phase IIA as shown on Attachment C. Funds will be deposited in accordance with this Attachment C.

3. In any year when golf course construction will occur, Permit Holder shall place temporary construction barriers, locations to be approved by the Division, around the project site before April 1st prior to construction. If barriers are not placed before April 1st, construction cannot begin until October 1st.

Phase IIB – No Development of Golf Course

If the Permit Holder elects not to proceed with Phase IIA, or has not obtained the necessary Order(s) of Conditions for the golf course by May 1, 2006, then alternative development may proceed in the area designated as "Development Area B" on the Phase II site plan (see Attachment I) subject to the following conditions:

1. Permit Holder shall place construction barriers around "Development Area B" before March 15th of the year that construction begins. If construction barriers are not in place by March 15, construction shall not begin until October 1st. The earlier date for construction barriers is required because construction monitoring is not required.

2. At the completion of construction of the alternate development in 'Development Area B", Permit Holder shall place permanent barriers to exclude turtles from the development site as demarcated on the Attachment G.

3. The permanent barriers constructed along the western boundary of the subdivision roadway opposite lot 3 as part of Phase I (as shown in Attachment G) can be altered so as to allow vehicle and pedestrian access to Development Area B.

4. The area within the boundaries of the 60 acre CR shall not be used for passive or active recreational activities and the boundaries within the 49 shall only be used for passive recreation activities accept for the 10 acre envelope that allows for active recreation.

Nothing in this Permit shall be construed to limit or restrict construction activities or uses in areas of the Site outside of: (1) the 60 acre Conservation Restriction referenced in Paragraph 2 of the Phase I approval in this Permit; and (2) the 49 acre Conservation Restriction referenced in Paragraph 3 of the Phase I approval. The only condition on construction in the area designated as "Development Area B" is the installation of construction and permanent barriers along the border of said area, as referenced in paragraphs 1 and 2 of the Alternative Phase II approval in this Permit. There are no restrictions or limits on construction or uses in the remainder of the Site.

This permit pertains solely to the upland habitat of the state-protected Blanding's Turtle and the Eastern Box Turtle under the Massachusetts Endangered Species Act, M.G.L. c. 131A and authorizes construction on the entire Site in accordance with this Permit and supporting attachments regardless of the number or location of Blanding's Turtles or Eastern Box Turtles observed on the Site in the future. However, this permit does not preclude the review of future wetlands and buffer zone alterations associated with the project by the Natural Heritage and Endangered Species Program of the Division of Fisheries & Wildlife under the Wetlands Protection Act (M.G.L. c. 131) and its implementing regulations (310 CMR 10.00).

TRANSFERRABILITY

This permit shall transfer to successor owners or operators of the project site (or a portion thereof) upon the Division's receipt of a letter from such a successor indicating (1) that the successor is the current owner or operator of the project site (or a portion of thereof) and (2) that the successor can and will perform the obligations of the Permit Holder, as set forth in this Permit.

Issued this 28 February 2000

Wayne F. MacCallum

Wayne F. MacCallum, Director
Massachusetts Division of Fisheries & Wildlife

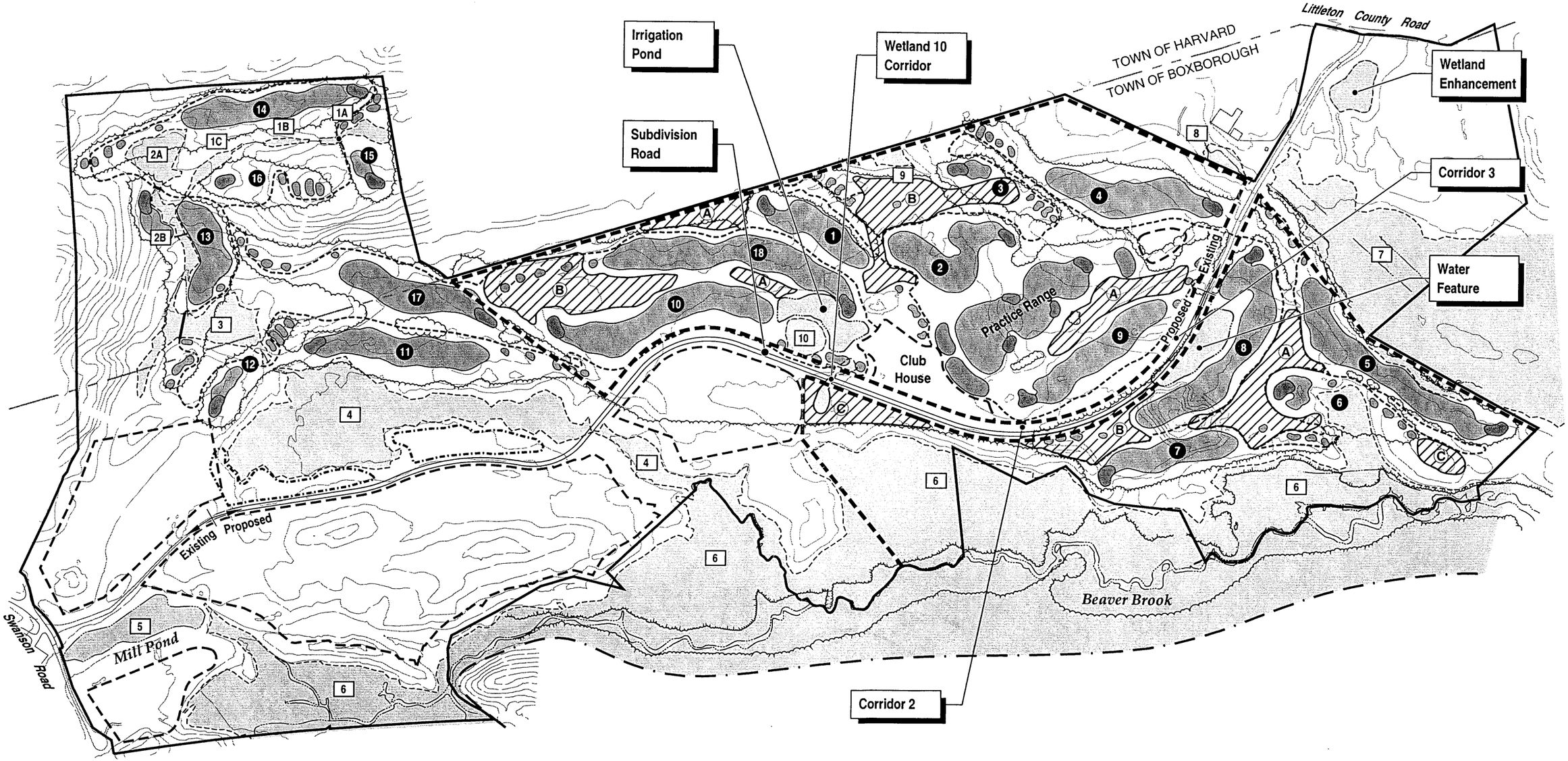
P:\HDINKEL\Towermarc.doc

encl.

Attachment A	Phase I and IIA Site Plan
Attachment B	Conservation Plan
Attachment C	Schedule of Commitments
Attachment D	Restriction Plan
Attachment E	Conservation Restriction (60 acres)
Attachment F	Conservation Restriction (49 acres)
Attachment G	Turtle Protection Measures
Attachment H	Construction Barriers
Attachment I	Phase IIB Site Plan

N
0
250
500 Feet
Vegetated Wetland
Project Site
Limit of Clearing/Grading or Existing Treeline
Limit of Bank
Approximate Development Activity Areas
Approximate Conservation Areas
Approximate Restricted Open Space Areas
Restricted Public Water Supply Radius
TOWN OF HARVARD
TOWN OF BOXBOROUGH
Vanasse Hangen Brustlin, Inc.
Attachment I
Phase IIB Site Plan
Alternate Development
Towermarc Business Park / Golf Course
Boxborough, Massachusetts

EV.05625 Graphics Figures 5625-CL.dwg



1A Vegetated Wetland

Project Site

Limit of Clearing/Grading or Existing Treeline

Limit of Bank

Approximate Limit of Phase I Commercial Development

Cart Path

1 Golf Hole

Detention Basin

Approximate Limit of Proposed Turtle Nesting Habitat Areas

Approximate Limits of Phase IIA Conservation Restriction

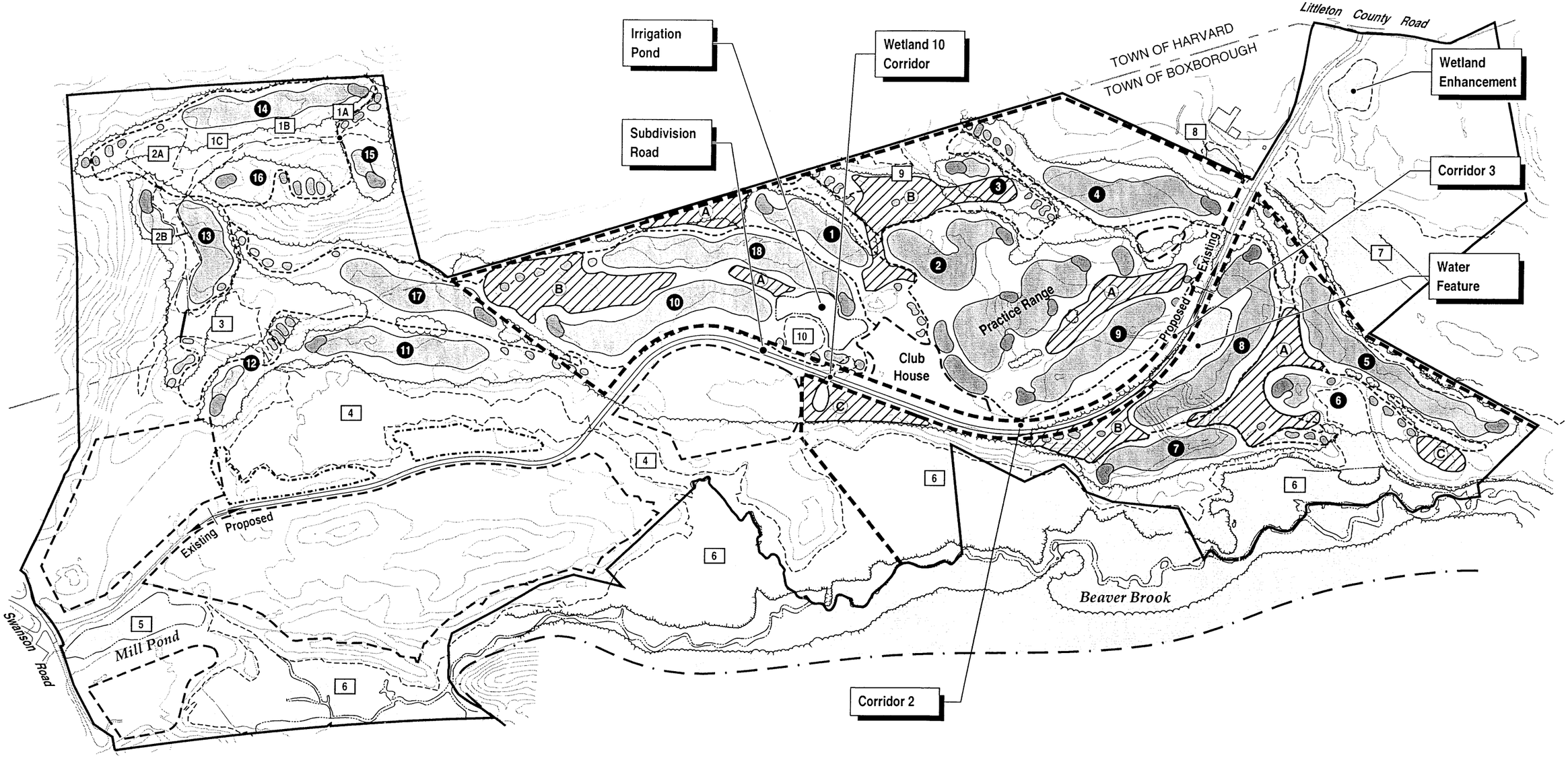
Ⓐ Area 1-A (Treat Years 5, 15, 25)
Ⓑ Area 1-B (Treat Years 10, 20)
Ⓒ Area 1-C (Treat Years 5, 15, 25)
Area 1-C will not be planted after disturbance.

0 250 500 Feet

Vanasse Hangen Brustlin, Inc.

Attachment A

Phase I and IIA Site Plan
Towermarc Business Park / Golf Course
Boxborough, Massachusetts



1A Vegetated Wetland

Project Site

Limit of Clearing/Grading or Existing Treeline

Limit of Bank

Approximate Limit of Phase I Commercial Development

Cart Path

1 Golf Hole

Detention Basin

Approximate Limit of Proposed Turtle Nesting Habitat Areas

Approximate Limits of Phase IIA Conservation Restriction

0 250 500 Feet

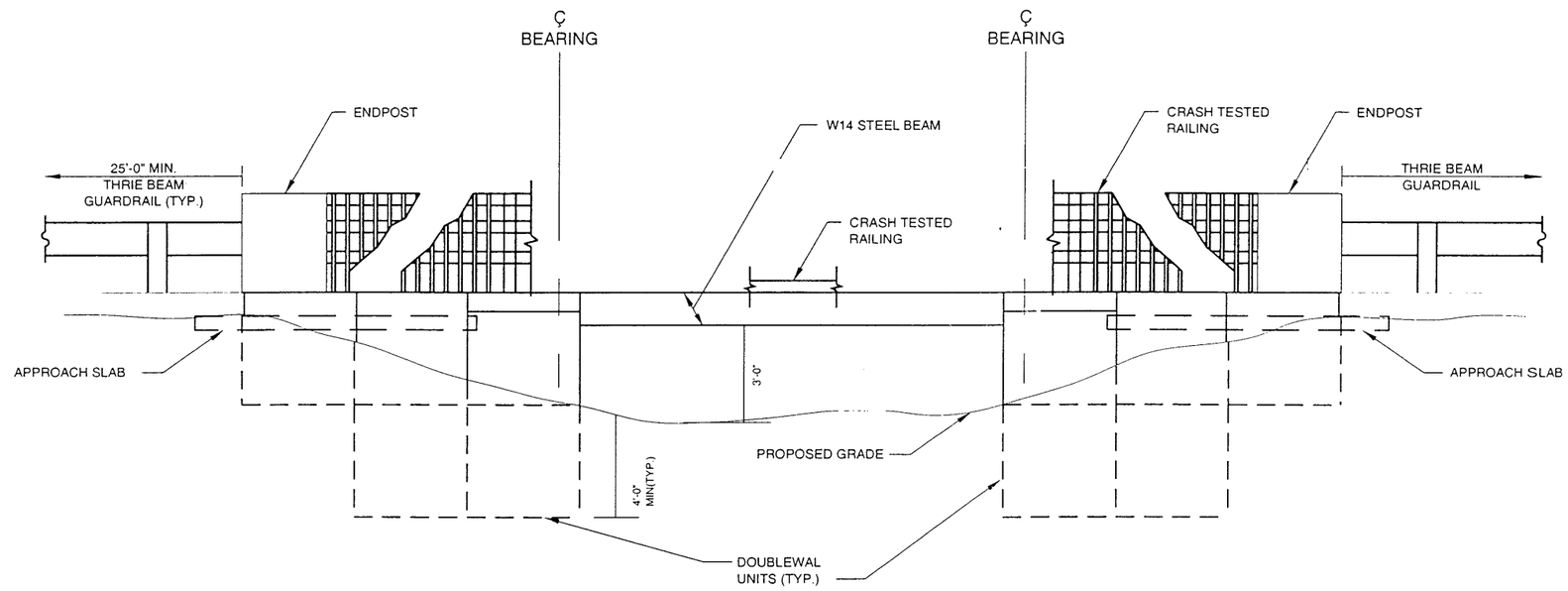
(A) Area 1-A (Treat Years 5, 15, 25)
(B) Area 1-B (Treat Years 10, 20)
(C) Area 1-C (Treat Years 5, 15, 25)
Area 1-C will not be planted after disturbance.

Vanasse Hangen Brustlin, Inc.

Figure 3

Phase I and IIA Site Plan
Towermarc Business Park / Golf Course
Boxborough, Massachusetts

ev 5625 t-underpass.dwg



ELEVATION

Not to Scale

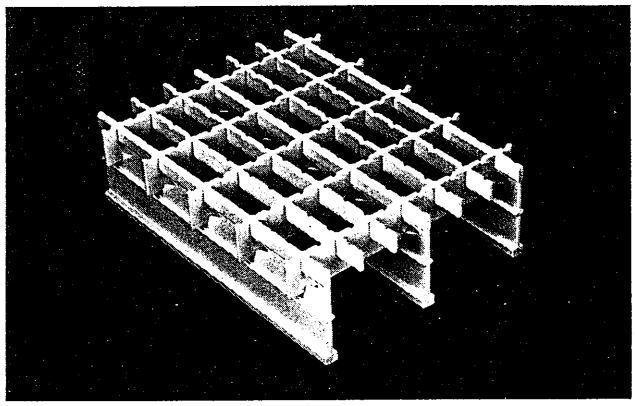
Vanasse Hangen Brustlin, Inc.

Figure 7
Turtle Migratory Corridor – Open Deck
Towermarc Golf Course
Boxborough, MA

Open Grid Deck

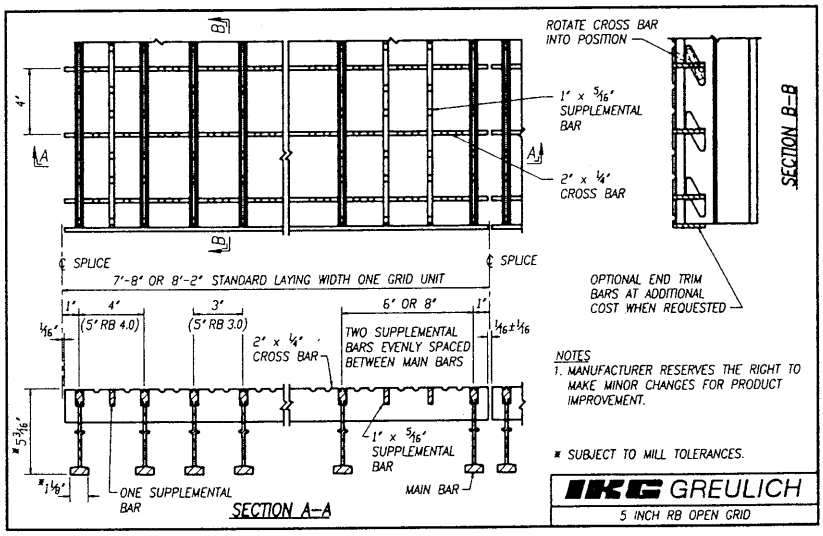
5 Inch RB

5-Inch RB achieves its rigidity and strength from the interlocking of the 5" Special Rolled Main Beams with Secondary Bars and from Supplemental Bars which run parallel to the Main Beam. This design creates a strong deck with simple lines. While only a little heavier than 5-Inch 4-Way, this deck can carry HS-20 loads. This economical design meets the standards of most highway departments.



Finish

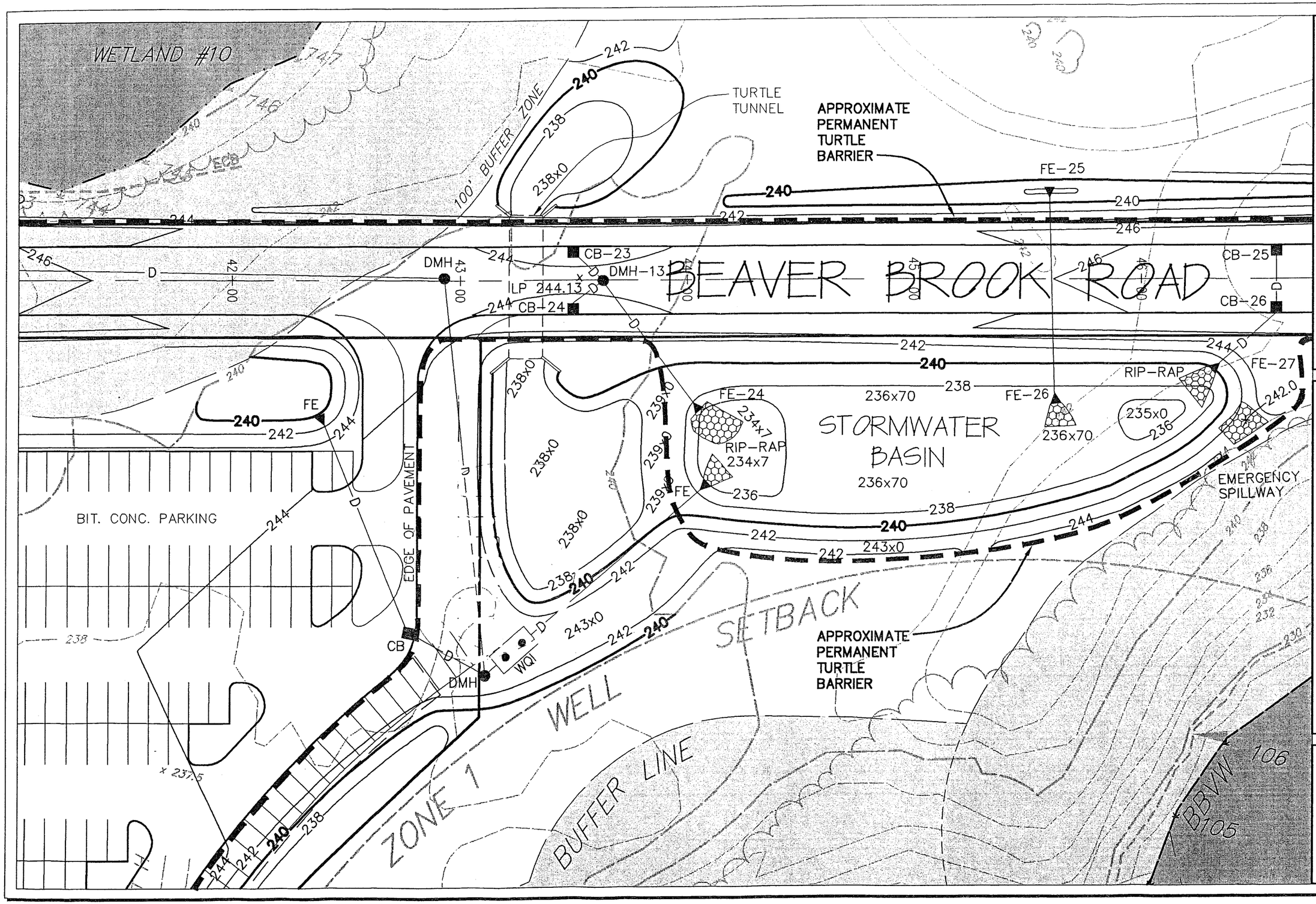
A.S.T.M. A-36 steel shall have a prime coat, shop applied.
A.S.T.M. — A-588 steel requires no painting. (Any approved finish may be specified and shop applied.)



HS 20 Load Tables

	MAIN BAR SPACING (in)	SECTION MODULUS (in³/ft)		MAXIMUM CONTINUOUS CLEAR SPAN (ft)		APPROXIMATE WEIGHT (lb/sf)
		TOP STEEL	BOTTOM STEEL	A36	A588	
5.51 lb MAIN BAR	3	5.522	6.773	5.80	7.85	27.7
	4	5.124	5.993	5.75	7.75	23.4
	6	4.045	4.583	5.10	6.85	20.0
	8	3.034	3.438	4.20	5.70	16.5

Figure 7A
Turtle Migratory Corridor - Open Deck



TURTLE CULVERT GRADING PLAN

Scale: 1 inch = 40 feet Date: January 3, 2000

BTI Project No. W-0049.67

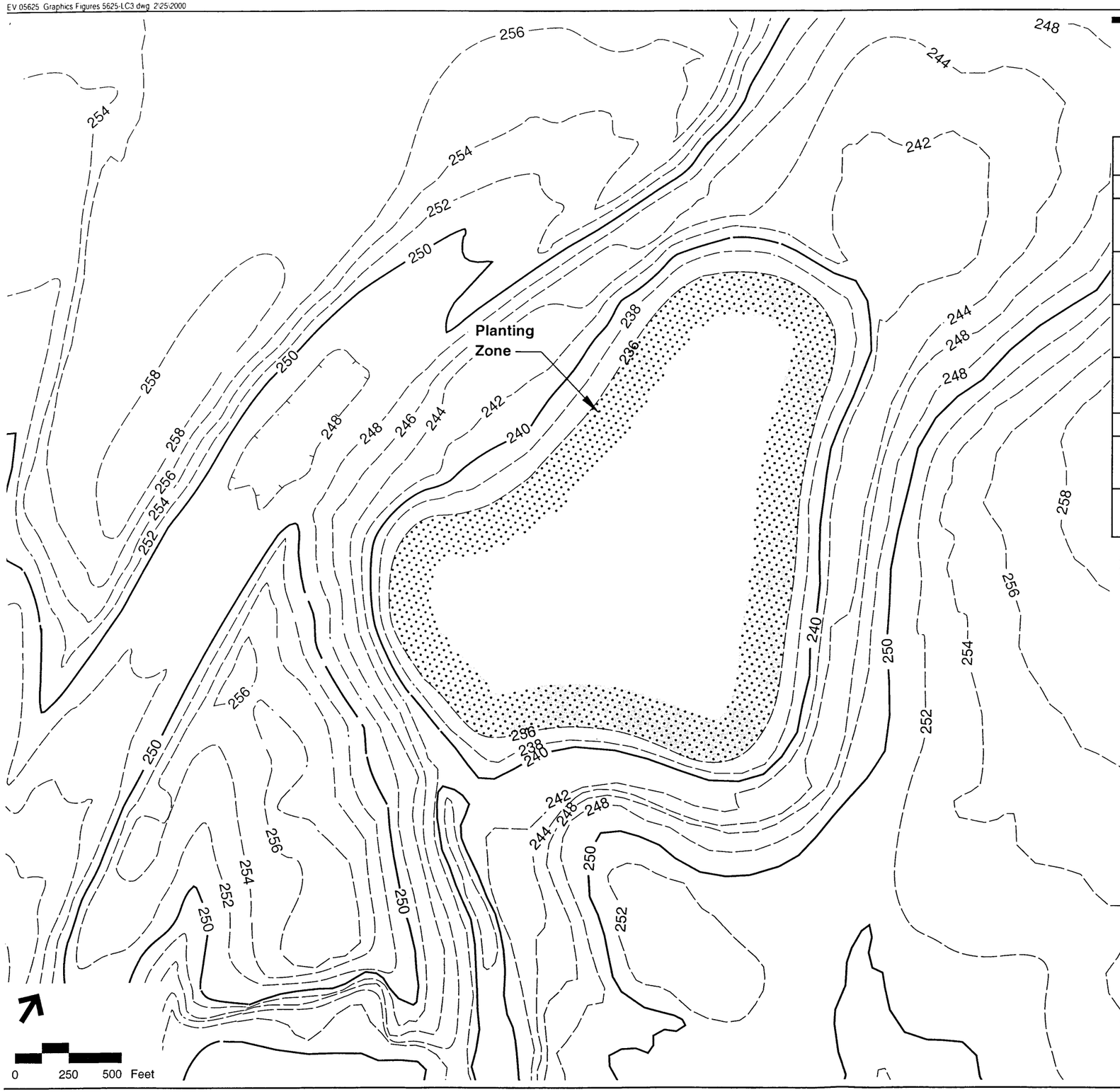
Dwg. No. 0049220 File No. 0049141Q

TOWERMARC BUSINESS PARK
in
Boxborough, Massachusetts
Middlesex County

Towermarc Corporation
260 Franklin Street
Boston, Massachusetts, 02110-3712

North Arrow

Figure 8
Turtle Migratory Corridor – Wetland 10



Planting Zone:

Approximately 20 feet wide, extending 10 feet above and 10 feet below mean water elevation (horizontally)

Planting Specifications

Common Name	Scientific Name	Specifications	Quantity
Buttonbush	Cephalanthus occidentalis	Plant in lower half of zone 18-24 inch plants	200
Meadow sweet	Spiraea latifolia	Plant in lower half of zone 18-24 inch plants	200
Highbush blueberry	Vaccinium corymbosum	Plant in upper half of zone 18-24 inch plants	200
Winterberry	Ilex verticillata	Plant in upper half of zone 18-24 inch plants	200
Woolgrass	Scirpus cyperinus	Plant throughout 1-quart container	200
Tussock sedge	Carex stricta	Plant in lower half of zone 1 quart containers	200

All planting must be done under the supervision of the wetland scientist.
Wetland scientist will mark all planting locations using colored stakes.
Plants will be placed, on average, 3-feet appart thrughout the planting zone.

Vanasse Hangen Brustlin, Inc.

Figure 9

Phase IIA Wetland Enhancement
Vesenka Fire Pond
Towermarc Business Park/Golf Course
Boxborough, Massachusetts

Towermarc Business Park/Golf Course

Boxborough and Harvard, Massachusetts

Prepared for **Towermarc Corporation**
260 Franklin Street
Boston MA 02110

Prepared by ***VHB*/Vanasse Hangen Brustlin, Inc.**
PO Box 9151
101 Walnut Street
Watertown, Massachusetts 02272

Dr. J. Whitfield Gibbons
University of Georgia
Savannah River Ecology Laboratory
Drawer E, Aiken SC 29802

February 25, 2000

Towermarc Business Park/Golf Course

Boxborough and Harvard, Massachusetts

Prepared for **Towermarc Corporation**
260 Franklin Street
Boston MA 02110

Prepared by ***VHB***/**Vanasse Hangen Brustlin, Inc.**
PO Box 9151
101 Walnut Street
Watertown, Massachusetts 02272

Dr. J. Whitfield Gibbons
University of Georgia
Savannah River Ecology Laboratory
Drawer E, Aiken SC 29802

February 25, 2000

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1 Summary

This Conservation Plan has been developed in accordance with the requirements of the Massachusetts Endangered Species Act (M.G.L. Ch. 131A) and implementing regulations (321 CMR 10.04 (3)(b)). This Conservation Plan provides a detailed description of the project and the mitigation measures that will be incorporated into the project design.

1.1 Project Description

The Proponent, Towermarc Corporation or its successor in title, proposes to construct a 900,000-square foot commercial development, subdivision roadway, and an 18-hole golf course on a 323-acre site in Boxborough and Harvard, much of which was an active sand and gravel excavation operation until the late 1980s. In 1997, a Blanding's turtle, a state-listed species, was observed to nest on a portion of the project site. An Eastern Box turtle, also a state-listed species, has also been observed nesting on the site. The project has an extensive history - development plans were initiated in the early 1980s, and a Final Environmental Impact Report for the commercial subdivision and submitted to EOEA in 1989. A Supplemental Final Environmental Impact Report was required due to design changes and rare species information and was filed in June 1998. The Final Certificate was issued by the Secretary on July 17, 1998. The current project elements and configuration were the result of extensive negotiations with the towns of Boxborough and Harvard, and meet the local objectives of supporting economic growth while protecting rural landscapes and open space. More importantly for these purposes, as set forth in this Conservation Plan, the development is consistent with the requirements for a Conservation Permit and will provide a net benefit to the local population(s) of state-listed turtle species found at the site. [1]

▼

[1] This plan has been developed under the supervision of Dr. J. Whitfield Gibbons, Professor of Ecology and Head of the Environmental Outreach and Education Division at the University of Georgia's Savannah River Ecology Laboratory. Dr. Gibbons is the leading North American expert on the conservation biology of turtles and, specifically, the biology of Blanding's turtle. Dr. Gibbons and his students have conducted research on the life history and ecology of the Blanding's turtle for over 30 years, in locations throughout eastern North America.

The project is anticipated to be constructed in two Phases. Phase I will consist of the construction of site infrastructure (subdivision roadway, drainage, wastewater treatment, and utilities), along with 900,000 square feet of commercial development. Phase II, to be initiated at a later date when all required permits and approvals have been obtained, will include either the construction of the golf course (Phase II A) or a tentative development on a smaller portion of the site (Phase II B), in which case, approximately 110 acres would be set aside for passive recreation and turtle conservation. If an Order of Conditions has not been issued for the golf course by May 1, 2006, the golf course will not be constructed and only the alternative development could proceed. In the event the golf course is not constructed, certain of the Phase II requirements will not apply, but the land restricted in Phase I could not subsequently be developed into a golf course or otherwise used except in accordance with the conservation restrictions.

1.2 Local Populations

This Conservation Plan will protect and provide a net benefit to the local population of Blanding's turtles, as well as any Eastern Box turtles that may use the site. The known local population of Blanding's turtles consists of 7 individuals resident in Muddy Pond, a small isolated wetland 1/4 mile east of the site, on land owned by The Nature Conservancy. Two female turtles from this population nested on the Towermarc/GBI golf course site in 1997 and 1998 in the former sand and gravel pit. One female Eastern Box turtle also successfully nested on the site in 1998. No spotted turtles have been observed on the site. Habitat quality on the site is likely to continue to decline as the gravel pit becomes revegetated.

1.3 Net Benefits

The golf course, designed and maintained in accordance with this Conservation Plan, may provide benefits to the local population by maintaining and increasing the size and stability of the population. A standard golf course will have a variety of habitats along the margins (in the rough) and possibly on some fairways that will serve as suitable nesting sites. In fact, clearing of marginal areas may enhance nest site suitability for this species of turtle by delaying the natural succession of plant communities that would eliminate currently available nesting habitat.

The Towermarc project will yield a net benefit by:

- Providing permanent protection of wetland and a portion of upland habitats
- Creating and enhancing nesting habitat.
- Increasing the amount of year-round aquatic habitat
- Protecting nests
- Supporting research to develop a conservation plan that will benefit the listed species state-wide

In the event that the golf course is not constructed, the project will yield a net benefit to the local population by maintaining and increasing nesting habitat, providing permanent protection of wetland and upland habitats, protecting nests, and supporting state-wide research.

1.4 Conservation Plan Goals

The Conservation Plan has been prepared to maintain the local population of Blanding's turtles. These measures will also benefit the Eastern Box turtle(s) using the site for nesting. Specific goals are:

- Protecting the local population by permanently maintaining nesting habitat, non-breeding aquatic habitat, and improving nest success
- Maintaining migration corridors between nest habitat and off-site non-breeding habitat (Muddy Pond)
- Protecting turtles through education of golfers, golf course staff, and business park employees
- Ensuring protection of the site for nesting through permanent conservation restrictions

1.5 Conservation Plan Elements

The Conservation Plan has been designed to meet these goals through providing permanent conservation restrictions on habitat areas, maintaining nesting habitat, enhancing non-breeding wetland habitat, maintaining migratory corridors, and restricting turtle access to roadway and parking lot areas. The Conservation Plan includes financial commitments to monitoring turtles on-site during construction, post-construction monitoring to assess the success of mitigation measures, and a state-wide research program. In addition, the Plan includes long-term maintenance of mitigation measures, and an educational program to enhance turtle protection through public awareness.

1.5.1 Permanent Conservation Restrictions

In Phase I, approximately 60 acres primarily east of the subdivision roadway (but including Wetland 10, a Certified Vernal Pool west of the existing road) will be placed under a permanent Conservation Restriction for the protection of turtle habitat. An additional 49 acres west of the roadway will be placed under a permanent Conservation Restriction designated for open space and recreational purposes, which will provide additional permanent protection of turtle nesting and non-breeding habitat. If Phase II involves the construction of the golf course, a total of approximately 200+ acres of upland (zoned for commercial use) and wetland will be protected by permanent conservation restrictions that will ensure that the land is perpetually available for nesting or non-breeding habitat use by turtle species.

1.5.2 Maintain Migration Pathways

Migration pathways will be maintained, and incidental mortality avoided, by measures that exclude turtles from roadways and parking areas, and which provide unimpeded migration pathways between wetlands and nesting areas. A system of curbing, barriers and other access controls will exclude hatchlings and adult turtles from the roadway, thereby avoiding road mortality. Corridors placed under the road at strategic intervals will allow state-listed turtles to travel to and from the nesting habitat.

The physical, structural measures are intended to ensure that migrating turtles cannot enter roadways or parking areas and that unrestricted pathways between wetlands and uplands are available. These structural measures will allow turtles to move between the Beaver Brook and Muddy Pond wetland systems and the uplands on both sides of the subdivision roadway. In order to ensure the success of these measures, the proponent will fund a 3-year post-construction monitoring program for each phase and will, if necessary, work with the Town of Boxborough to manage traffic on the subdivision roadway to avoid conflicts. As set forth more specifically in the following sections, in the event the migratory corridors and turtle barriers are ineffective in keeping turtles off Beaver Brook Road, and cannot be modified to exclude turtles the proponent will request permission to close a portion of the subdivision roadway during critical migratory periods. This provides an added assurance that state-listed animals will not be subject to roadway mortality.

Proposed measures include:

- Installing turtle-proof barriers (curbing) on the roadway
- Installing barriers around parking lots continuous with roadway barriers
- Creating unimpeded wetland and upland corridors
- Requesting permission for temporary closing of a portion of the subdivision roadway during critical migratory periods, if barriers and corridors are not found to be fully effective in keeping turtles off of the roadway

1.5.3 Maintain Nest Habitat

Nest habitat is not believed to be a limiting factor for the local population, as relatively little of the available habitat within the business park and golf course area appears to be used for nesting. A total of 3 turtle nests in 1998 and 2 in 1997 were known to occur within the approximately 25 acres of available optimal nesting habitat. Given the observed rates of natural succession, available optimal nesting habitat is expected to decline over time. In order to maintain the availability of nesting habitat in Phase I, approximately 16 acres of habitat within the 60 acre Conservation Restriction Area will be enhanced , monitored, and maintained. An additional 10 acres in the 49 acre Conservation Restricted Area (open space restricted area) will be protected and may be enhanced by the Natural Heritage Program.

In Phase II A, the golf course will create and maintain 26 acres of permanent nest habitat in the natural areas interwoven within the course. Specifications for the nesting habitat include:

- Less than 50% cover of low, clump-forming native perennials
- Minimum size 1 acre of continuous habitat
- Scattered shrub or white pine sapling clumps for cover
- Harrowed and replanted on a 10-year cycle
- Provide on-going active maintenance which will ensure that optimum nesting habitat is available for a longer period than if the site was allowed to revegetate in the absence of development
- If the golf course is not constructed on part of Phase II, the Phase I nesting habitat will remain.

■

1.5.4 Create Additional Aquatic Habitat

Aquatic habitat may be a limiting factor that controls size of the current population. The proposed golf course has been designed to provide additional aquatic habitat suitable for turtles. This aquatic habitat is provided as an additional benefit that would not occur in the absence of the course, and is not intended as compensatory wetland mitigation. Specific areas where aquatic habitat will be created as part of the Phase II A golf course include:

- Construct an irrigation pond to provide permanent aquatic habitat within the nesting area
- Construct a wetland/water feature to provide permanent aquatic habitat within the nesting area
- Enhance the wetland quality of the pond on the Vesenka parcel, to provide additional potential habitat for Blanding's turtles

■

1.5.5 Increase Nest Success

The Conservation Plan includes funding a post-construction monitoring program for each phase of construction that will assess the effectiveness of mitigation measures and protect nests. Towermarc or its successor in title will provide $60,000 for a 2-year Phase I post-construction monitoring program (the first year of post-construction monitoring would be included in the initial 2-year on-site and off-site research program) and a minimum of $90,000 (to be adjusted for inflation) for the Phase II 3-year monitoring program. Objectives of the to be monitoring, with respect to nesting success, are to:

- Track female turtles and determine nest site preferences and migratory pathways
- Protect nests from predators with wire mesh cages
- Install signage to protect nests from accidental damage by golfers (by proponent)

■

1.5.6 Research Program

Towermarc, or its successor in title, will fund a 2-year scientific research program to be supervised by the Natural Heritage and Endangered Species Program that will aid the development of a long term conservation plan to protect Blanding's turtles. The proponent has committed to $180,000 to fund research and monitoring during this period (the $180,000 includes one year of construction monitoring, one year of post-construction monitoring, and a 2-year state-wide research program).

■

1.5.7 Protection During Construction

Measures will be undertaken during the construction period to ensure that no state-listed turtles are harmed during construction activities, particularly during the nsting period. The program includes:

- Continuous drift fencing around construction areas (see Figure 1)
- Continuous monitoring during nest migratory season
- Radio telemetry to determine movements of female Blanding's and Eastern Box turtles during the nesting period

■

1.5.8 Education Program

A comprehensive education program, to be developed by the proponent and approved by NHESP, will to promote awareness of the Blanding's and Eastern Box turtle populations, appreciation of rare species protection, and to enhance the protection of migrating adult and juvenile turtles. The program will be aimed at users of the open space/recreation area, golfers, golf course employees, and employees of the business park, and will consist of:

- Signage
- Brochures
- Off-limits signs on course
- Ongoing program to train golf course staff
- Fund-raising events (e.g., golf tournaments or outings) targeted to contribute to conservation programs

Table 1-1
Schedule of Commitments

Schedule	Commitment
Phase I	
By 1 April, 2000	Funds for initial 2-year research and monitoring program and 3-year post-construction monitoring committed ($240,000)
By 1 April, 2000	Construction barriers installed
1 April – 1 October	Year 1 Construction monitoring conducted by Owner* with a consultant approved NHESP.
Prior to Construction	Conservation Restrictions recorded
15 October – 1 April, 2001	Phase I Habitat enhancement areas completed
By 1 April, 2002	Phase I Construction completed (subdivision roadway, infrastructure, turtle migratory corridors, permanent roadway barriers)
	NHESP conducts construction monitoring during 2001
	NHESP initiates post-construction monitoring, 2002.
	Owner* installs protective signage at completion of construction, provides educational brochures for employees pre-approved by NHESP
2005	Owner* and NHESP assesses habitat enhancement area and determines if additional treatment required
2002 2006	Owner* submits annual inspection reports to NHESP by November 1 of each year.(5 years post-construction)
Phase II (golf course construction)**	
By 1 November of calendar year preceding construction	Owner provides NHESP with detailed design plans for golf course, including 26 acres nesting habitat, GPS coordinates for habitat centers. Owner provides funding for 2-year construction and 3-year post-construction monitoring ($227,500 if initiated in 2001). Draft Conservation Restriction for remaining golf course areas provided to NHESP. The actual funding for Phase II is dependent on the calendar year in which golf course construction commences as follows:
	Year: Funding Level (adjusted for inflation)
	2001: $227,500
	2002: $234,000
	2003: $240,500
	2004: $248,000
	2005: $255,500
	2006: $263,000
	2007: $271,000
By 1 April of construction year	Construction barriers installed. NHESP initiates monitoring.
Construction period	Owner completes construction, including nest habitat areas and wetland enhancement areas (inc. Vesenka Fire Pond)
Year 5 following completion of construction	Nest Habitat Maintenance
5 years post-construction	Owner submits annual inspection reports to NHESP by November 1 of each year.

* Towermarc or successor in title

** If no golf course is constructed, then the only Phase II obligations are the installation of construction and permanent turtle barriers.

2

Conservation Plan

A Conservation Plan has been prepared for the Towermarc Business Park/ Golf Course, as documented in this section. The goals of the Conservation Plan are:

- Protect the size of the local population by maintaining nest habitat, nest success, and non-breeding habitat
- Provide permanent protection of wetland and upland habitat, including turtle nesting habitat that would otherwise be eliminated through the process of natural succession
- Maintain migration corridors that will allow access to nest sites as well as immigration/emigration from the Muddy Pond population
- Protect on-site turtles through education of golfers, staff, and employees of the business park

2.1 Conservation Restrictions

Towermarc or its successor in title will create two permanent conservation restrictions in Phase I of the project (Figure 2).

- A permanent conservation restriction will be placed on approximately 60 acres of wetlands and uplands, located primarily east of the subdivision road but including Wetland 10, a Certified Vernal Pool, and surrounding uplands west of the roadway. The purpose of this restriction is to provide permanent protection of turtle habitat. In the event that a golf course is not constructed, no passive or active recreational uses will be allowed in this area.
- A permanent conservation restriction will be placed on approximately 49 acres of wetlands and uplands located west of the subdivision roadway. The purpose of this restriction is to provide permanent protection of turtle habitat, and to allow use of the area for public recreation. Active public recreation will be restricted to approximately 10 acres in the northern portion of this area, outside of the area of potential nesting habitat. This area is further defined in the Conservation Restriction.

If Phase II consists of construction of the golf course, an additional conservation restriction will be placed on the portions of the golf course outside of the initial restricted areas, for a total of approximately 200 acres (Figure 3). This permanent restriction, which includes both upland and wetland areas, will provide specific and

permanent protection to the wetland and upland habitats of the Blanding's, box, and spotted turtles that use or may use portions of the Towermarc property and the Beaver Brook wetland system. If Phase II consists of alternative development, the approximately 110 acres placed under a conservation restriction could not be used for golf purposes but additional land would not be restricted.

2.2 Protection of Migratory Corridors

The roadway has been designed to mitigate for interference with migratory activities, and will allow access throughout the site while protecting against the potential for road-related mortality. Roadway culverts or bridges at Wetlands 4 and 8 and three additional tunnels under the subdivision roadway for turtle passage will allow turtles to move through the site.

Beaver Brook Road, between the Wetland 4 and Wetland 8 crossings, will be designed with one-way curbing (Figure 4) that will exclude turtles and other small reptiles and amphibians from the roadway. In the unlikely event that turtles or other animals gain access to the road, the curb between the road surface and sidewalk will be a sloped (45^0) granite curb that will allow animals to climb out of the road surface. The outer edges of the roadway will be constructed using vertical barriers 8 to 10 inches high. These barriers will exclude turtles and other reptiles or amphibians from the traveled roadway.

Similar barriers will be constructed around the proposed commercial development parking lots and golf clubhouse parking lot to prevent turtles from entering the paved areas. These barriers will be a minimum of 8 to 10 inches high, and will be vertical or constructed using the Westford model.

Turtle access between the east and west portions of the site will be facilitated by three turtle corridors beneath the roadway (see Figure 5). Turtles will be directed toward these underpasses by the roadway barriers, which will act as drift fences. Underpasses will be designed to be a minimum of 3 feet high and 15 feet wide, and will be vegetated with grasses and other herbaceous species to provide cover (Figure 6). One corridor has been designed with a grated bridge deck to provide continuous light under the roadway (Figure 7), and will allow NHESP to measure the effectiveness of different corridor designs. All of the corridors will be oriented east-west (beneath a north-south roadway), which will permit sunlight to penetrate under the structures.

One of the migratory corridors has been designed to provide a wetland system extending toward Wetland 10 to the east side of Beaver Brook Road (Figure 8). This wetland will allow turtles moving from Wetland 6 to move overland directly into Wetland 10, and from this wetland to nesting areas on the western half of the site. Wetland 10 has been documented to provide temporary habitat for female turtles prior to nesting. This corridor will be constructed to the following specifications:

- excavated and lined with a 12-inch clay liner to prevent exfiltration of water.

- A 12-inch layer of loam and leaf compost will be installed over the clay liner to provide a planting zone and burrowable substrate.
- excavated to provide a maximum spring water elevation of 18 inches
- Planted with a shrub edge (40 percent cover) of highbush blueberry and red maple
- Planted within the wetland basin with buttonbush (*Cephalanthus occidentalis*), woolgrass (*Scirpus cyperinus*), and winterberry (*Ilex verticillata*), to provide the same percent cover and species composition as Wetland 10.

If necessary, this area will be hydrologically maintained by pumping water from the on-site irrigation wells to maintain the same water depths as in the adjacent Wetland 10. Monitoring of water levels will be conducted on weekly between May 1 and September 30.

The use of turtle excluders, one-way barriers, and wildlife corridors is anticipated to ensure that no Blanding's or Eastern Box turtles gain access to Beaver Brook Road or office park development. Towermarc or its successor in title will fund a 3-year post-construction monitoring program to be conducted by NHESP to evaluate the effectiveness of the barriers and corridors. If these measures are not found to be completely effective in prohibiting turtle access to the subdivision roadway, the proponent is committed to redesigning the barriers or, if redesign is not feasible, to requesting permission from the Town of Boxborough to close Beaver Brook Road between the golf course clubhouse driveway (as shown on Figure 3) and Wetland 8 to vehicular traffic during the period when female turtles are migrating between Muddy Pond and nest sites.

2.3 Nesting Habitat Enhancement

Certain features of Blanding's and Eastern Box turtle nesting habitat are well understood by herpetologists, and are described in Section A.1 of this Plan. Females generally nest in sandy or loamy soils that are not tightly compacted, lack a dense herbaceous cover, do not have a continuous tree or shrub cover, and are relatively level. The species has been known to nest in small and large open areas and at varying distances from wetlands.

2.3.1 Created/Enhanced Nest Habitat Types

Towermarc or its successor in title will enhance, create and maintain 16 acres of nest habitat within the Conservation Restriction area and will maintain 10 acres of nest habitat in the open space restricted areas in Phase I (Figures 1 and 5), and within the golf course in Phase II (Figure 3).

Characteristics that provide optimal nesting habitat include:

- Vegetation cover (at the surface of the substrate) of 50 percent or less (ranging to less than 10 percent)
- Vegetation consisting of herbaceous species, either perennial caespitose grasses or forbs, or annuals,
- Partial surface cover of mosses *(Polytrichum)* or lichens *(Cladonia cristatella)*
- Clumps of shrubs (*Comptonia peregrina*) or sapling white pines (2-3 feet in height)

Other species characteristics of optimal nest habitat sites include *Achillea millifolium, Ambrosia artemissifolia, Andropogon virginicus, Antennaria sp., Asclepias syriaca, Aster liniarifolius, Baptisia tinctoria, Carex annectens, Carex muhlenbergii, Carex pensylvanica, Carex scoparia, Carex umbellata, Cyperus filiculmis, Danthonia spicata, Dianthus ameria, Erigeron sp, Hieracium sp, Hypericum gentianoides, Hypericum perforatum, Juncus greenei, Lechea intermedia, Lespedeza capitata, Linaria canadensis, Lysimachia quadrifolia, Oenothera biennis, Panicum sp, Plantago aristata, Plantago lanceolata, Potentilla simplex, Pyncnatheum tenuifolia, Rudbeckia hirta, Rumex acetosella, Schizachyrium scoparium, Scleranthus annuus, Solidago juncea, Solidago nemoralis, Tragopogon pratensis, Trifolium agrarium,* and *Trifolium hybridum.*

2.3.1.1 Phase I

Portions of the Phase I Conservation Restriction Areas do not currently provide optimal nesting habitat, and will be enhanced through vegetation management to provide characteristics associated with optimal turtle nesting habitat.

Areas designated on Figure 5 (Plan entitled: Turtle Protection Measures) as "Habitat Enhancement" will be harrowed, preserving existing clumps of shrubs (*Comptonia, Pinus*) that a minimum of approximately 20 feet in diameter. These clumps will be identified and marked by a scientist prior to starting to harrow the areas. No work will be undertaken within 100 feet of any wetland. Following removal of the sand pile, to occur prior to April 1, 2002, that area will be graded slightly elevated from the surrounding area with a gentle slope. The enhancement area will allowed to revegetate naturally.

The enhancement area will be allowed to recolonize naturally following harrowing.

Schedule

Harrowing and disturbance of the enhancement areas will be undertaken during the period when turtles are not migrating to the nest sites and when nests are not present. Harrowing will be done between October 15 and April 1.

Long-Term Maintenance

The habitat preservation (existing optimal nesting habitat) and enhancement areas will be assessed by a biologist in consultation with NHESP to determine whether, 5 years and 10 years after the initial harrowing and seeding, vegetative cover, on

average, exceeds 50 percent, and the area will be re-harrowed prior to the next nesting season.

2.3.1.2 Phase II A (Golf Course)

The golf course design includes optimal nest habitat, migratory cover areas, and small isolated wetlands. Nest habitat and cover areas will be created in the "rough", beyond the maintained areas that are part of the active play areas. For purposes of design, we estimate that the mowed, maintained rough extends approximately 30 to 50 feet from the edge of the fairway, and approximately 15 to 25 feet from the edges of tees and greens. As shown on Figure 3, this design will provide approximately 26 acres of nesting habitat interspersed with the golf course layout. This created and maintained nesting habitat will ensure that the golf course provides a substantial amount of suitable nesting habitat. Prior to construction, NHESP shall approve in writing any changes to the golf course design based on Figure 3, and the owner will provide NHESP with GPS coordinates of the center of each nest habitat area. Each habitat area will be a minimum of one acre.

Optimal Nest Habitat

Optimal nest habitat has been designed consistent with the observations described above. Species selected are typical of nest habitats on-site, and are commercially available as seed or rooted plants.

Table 2-1
Characteristics of Created Optimal Nest Habitat

Characteristic	Description
Percent Cover	less than 50 percent
Dominant Species	*Aster liniiarifolius* *Carex umbellata* *Carex pennsylvanica* *Danthonia spicata* *Schizachyrium scoparium* *Solidago nemoralis*
Plant Height	6 to 12 inches (average)
Patch Size	min. 1 acre

Shrub/Sapling Thickets

Several areas within the golf course rough will be planted and maintained as small shrub thickets to provide cover for turtles migrating between nest sites and permanent aquatic habitats. Two subcategories are proposed:

- Type A: *Comptonia* (sweetfern) thickets. these tend to be self-maintaining , but will require periodic monitoring to ensure that sapling trees (gray birch, aspen) do not become established.
- Type B: White pine thickets. White pine tends to grow quickly, and will require periodic removal and replacement to maintain the desired low height standard.

Table 2-2
Shrub Thicket Planting Specifications

Characteristic	Description	
Percent Cover	50 to 80 percent	
Dominant Species	Pinus strobus	
	Comptonia peregrina	
Plant height	12 to 36 inches (average)	
Patch size	min. 100 square feet	
Subcategories	A	Plant with Comptonia; remove tree saplings if these colonize and exceed height standards
	B	Plant with white pine; clear, grub and replant every 10 years

Planting Specifications

This section provides planting specifications for each of the areas described specified above. This plan will provide approximately 26 acres of habitat suitable for turtle nesting. At least five patches of each of the two shrub types will be incorporated into the design to provide cover.

Table 2-3
Phase II Planting Specifications

Habitat Type	Species	Planting Specifications	Number (area)
Nest	*Aster liniiarifolius*	0.5 lbs/ac	26ac
	Carex annectens	2 lbs/ac	
	Lespedeza capitata	0.5 lbs/ac	
	Rudbeckia hirta	1 lb/ac	
	Schizachyrium scoparium	5 lbs/ac	
	Solidago nemoralis	1 lb/ac	
	Carex pensylvanica	1000 plants/acre	
Shrub A	*Comptonia peregrina*	1-gal containers	5
		Plant 12-inches on-center	
		100 plants per patch	
Shrub B	*Pinus strobus*	12-18 inches seedlings plant 24-inches on-center, 50 plants per patch	5

Maintenance Specifications

This section provides maintenance and monitoring specifications for each of the nesting habitat areas.

Table 2-4
Phase II A Monitoring and Maintenance Specifications

Habitat Type	Frequency	Action
Nest	10 Years	Harrow, Replant
Shrub A	5 Years	Remove Tree Saplings
Shrub B	10 Years	Clear, grub and Replant

Nest habitat areas will be harrowed and replanted on a 10-year cycle, starting in Year 5 following establishment, for a 25-year period or thereafter, assuming the golf course is still in operation. Approximately 50 percent of each habitat area will be treated at each maintenance date (Year 5, Year 10, Year 15, Year 20, Year 25). We estimate that this treatment program will provide suitable nesting habitat for a minimum of 40 years following construction. The following table provides an example of this cycle.

Table 2-5
Phase II A Nest Habitat Maintenance Cycle

Area	Year 5	Year 10	Year 15	Year 20	Year 25
Area 1-A (50% area 1)	harrow and plant	no treatment	harrow and plant	no treatment	harrow and plant
Area 1-B (50% area 1)	no treatment	harrow and plant	no treatment	harrow and plant	no treatment

2.4 Phase II A Wetland Habitat Enhancement

Wetland habitat enhancement will be undertaken in Phase II A of the project, if the golf course is constructed. The golf course will be designed to enhance breeding habitat features and availability for Blanding's and Eastern Box turtles by providing additional small wetland areas within the potential nesting habitat areas, and by creating and maintaining extensive areas of potential nesting sites within the golf course. Wetland habitats are important resources to the species for two reasons: permanent non-breeding habitat and intermediate staging areas during nesting migration. The creation of new permanent wetland areas will benefit Blanding's turtles by increasing the number and diversity of staging areas, and more importantly by increasing areas of non-breeding habitat. The existing population is presumed to be limited by available non-breeding habitat (Muddy Pond), since only

two nest sites have been located in the more-than 20 acres of suitable existing nesting habitat.

The golf course will create a new irrigation pond located near Wetland 10 and a water feature located between the subdivision road and Wetland 6. These small waterbodies will be constructed with vegetated edges and will provide similar habitat value to the existing Wetland 10. Turtles moving from Muddy Pond or other off-site wetlands to nesting sites within the golf course will be able to use these small isolated ponds for staging, feeding, or rehydration during the nesting period. The habitat value of an isolated wetland on the north (Vesenka) parcel will also be enhanced through plantings along the banks of the pond (Figure 9). This wetland is adjacent to a corn field and to Wetland 7, which is connected to the Beaver Brook wetland system, and is within the potential home range of Blanding's turtles.

■

2.4.1 Irrigation Pond

An irrigation pond will be constructed adjacent to Wetland 10, separated from the natural wetland by a vegetated berm. The irrigation pond will provide a surface water pond and bordering emergent wetland community to enhance wildlife habitat. The pond will be planted with native water lilies (*Nymphaea odorata*). A 5-foot wide shelf will be created around the margin of the pond, extending to approximately 12 inches below the normal surface water elevation. This shelf will be planted with emergent wetland species, including pickerelweed, sedges, arrow arum, water plantain, and arrowhead. Rocks will be placed in several locations to provide basking habitat above the water surface. the wetland plantings will provide cover and food resources for aquatic invertebrates, reptiles, amphibians, and birds. This pond will create an additional 1.2 acres of potential Blanding's turtle habitat.

■

2.4.2 Water Feature

A sinuous linear water feature of approximately 1.3 acres will be created between Beaver Brook Road and the fairway for the 8th Hole. This water feature will be designed to a sufficient depth and width to provide a permanent water surface, with wetland vegetation along the perimeter. The upper edges of the swale, along the roadway, will be planted with wetland shrub species (red osier dogwood, sweet pepperbush, red chokeberry) that will provide cover, food resources and nest sites for wetland wildlife. The swale edges along the golf course will be planted with emergent wetland species including cattail, sedges, and pickerel weed that will provide cover and food sources for water-dependent amphibians, reptiles and birds.

This water feature will provide a wetland within the same area as turtle nesting habitat in the northeast section of the site. The proximity of the pond and nesting sites will facilitate Blanding's turtle nesting by providing a suitable water body where turtles may remain after their migration from Muddy Pond, waiting for optimal weather conditions for egg-laying. The area will also provide habitat for

turtles to rehydrate following migration or nesting, and may provide aquatic habitat for hatchling turtles.

2.4.3 Wetland Enhancement

The bank and edges of a constructed fire pond on the Vesenka parcel, north of Wetland 8 will be enhanced by planting indigenous wetland species (Figure 9). The pond has a substantial annual variation in water elevations (3-4 feet), and is isolated from other wetland resource areas. Although there are currently a few shrubs of willow and alder at the upper water line, the lower banks of the pond are vegetated only with annual species. There is a small patch of cattails near the southern berm of the pond. The proponent proposes to plant the pond shores with species typical of natural vernal pools to enhance the potential ability of the pond to support reptiles and amphibians typical of seasonal water bodies. The upper shores of this area will be planted with buttonbush and woolgrass. These enhancements will increase the habitat value of the wetland for invertebrates and amphibians by providing vegetative cover, food resources, and egg attachment sites. The pond would become suitable wetland habitat for Blanding's and other turtle species.

2.5 Nest and Hatchling Protection

Towermarc or its successor in title will fund a 3-year post-construction monitoring program to be undertaken by NHESP, that will monitor and protect turtle movement and nests. Towermarc has committed to $60,000 for Phase I post-construction monitoring studies, following the initial 2-year research and monitoring program, and $90,000 (to be adjusted for inflation) for the Phase II post-construction monitoring efforts if the golf course if constructed. This program will reduce or eliminate nest predation, and will enhance survivorship of eggs and juveniles that is critical to the population size of these "K-selected" species. The program will consist of the following elements:

- Radio transmitter tracking of tagged male and female turtles (Blanding's, box or spotted)
- Daily inspections of the course by trained biologists
- Any un-tagged male or female will have a radio transmitter attached
- Once female turtles are identified on the site, NHESP biologists will track them on a daily basis until nesting is observed
- Staked hardware cloth cages will be placed over each nest, and its location recorded.
- In Phase II, signs will be placed by the proponent at the edges of the rough used for nesting, alerting golfers that the area is "off-limits"
- Cages will be monitored during the hatching period (late August to mid-September

2.6 Research Program

Towermarc or its successor in title will fund a 2-year research program to be supervised by the Natural Heritage and Endangered Species Program to benefit the local and state-wide populations of Blanding's turtle. This 2-year effort, conducted simultaneously with the Phase I on-site monitoring study, will be funded for a combined total of $180,000.

2.7 Construction Period - Short Term Protection

In order to avoid the inadvertent destruction of Blanding's or Eastern Box turtle nests and injury to adults moving overland during the construction period, Blanding's turtles will not be allowed to enter the construction area. Silt fence barriers to restrict turtle movements between all construction activities and the Beaver Brook and Muddy Pond turtle populations will be installed before April 1.

Towermarc or its successor in title will fund a 2-year construction monitoring program to be conducted by the Natural Heritage Program. The purpose of this program will be to ensure that turtles do not enter the construction site, and to obtain additional information on turtle movement by radio telemetry. The proponent has committed to allocate $180,000 in Phase I for a combined on-site monitoring and off-site research program, and to provide $137,500 (adjusted for inflation) for Phase II construction monitoring if a golf course is constructed.

If a golf course is not constructed, no Phase II A monitoring is required.

If Phase II B is constructed instead of a golf course, Towermarc or its successor will initate the construction monitoring program including the funding of a biologist and the monitoring protocol approved by NHESP (Attachment C)

2.8 Educational Programs

Additional long-term mitigation measures are proposed to improve the understanding of Blanding's turtle ecology and to communicate this information to the general public and the regulatory community.

In Phase I, Towermarc or its successor in title will install signs at trail entrances and along the subdivision roadway, alerting users to the need to protect state-listed turtle species. Educational pamphlets will be produced and made available to employees of the business park, at trailheads, and at a parking lot for the active recreation area (if constructed).

In Phase II A, if the golf course is constructed, the educational program will promote concern for protection of the turtles. Golfers will be educated to accept a situation that the turtles seen walking across the course are an unusual aspect of the regional biodiversity and should not be harassed, picked up, and preferably not disturbed in any way if such can be avoided. An appreciation for the species will be engendered through an educational program directed toward club members and golfing visitors to the area. Prizes could be awarded to golfers who report the presence of Blanding's, box or spotted turtles on the course. Developing the attitude that Blanding's turtles should be allowed to "play through" will not be difficult to instill among the vast majority of golfers and citizens of the local community.

Maintenance workers using mowing equipment or driving vehicles on fairways or in areas of rough will be trained by the golf course facilities manager to watch for adult turtles during the nesting season and steer clear of them. During the mid-August through September season when hatchlings may be traveling terrestrially, mowing operators will be trained to avoid any turtles traveling across the site.

Public education programs similar to those being implemented for the Blanding's turtle by the New York Endangered Species Unit will be established to encourage people associated with the Towermarc Golf Course to identify with the species, be informed of its basic life history requirements, and understand that Towermarc is interested in the long-term welfare and sustainability of the species. Familiarity with a species is often one of the most powerful deterrents to human-caused negative impacts (Gibbons and Gibbons 1998).

Specific aspects of the education program include:

Phase I

- Signage on roadways warning drivers to be aware of turtles
- Brochures describing the three state-listed species, their biology, and threats to their persistence in Massachusetts, to be distributed to golfers and employees of the business tenants,
- Signage at trail heads and on the golf course, alerting recreational users and golfers to the potential occurrence of Blanding's turtle adults and juveniles

Phase II A (if golf course is constructed)

- Signage declaring wetlands "off-limits" to golfers
- Signage declaring natural areas within the course "off-limits" if nests have been identified
- Educational programs for golf course employees, intended to foster a stewardship ethic for Blanding's and other turtle species to be developed in conjunction with and approved by NHESP and include:
    - Brochure

- Mandatory briefing for new employees
- Incentives for identifying and protecting turtles.

This program will consist of signage, educational materials, and the detailing of the Blanding's turtle requirements to both tenants of the office park as well as golfers. We believe that through this type of local advocacy that a positive awareness will be provided to people utilizing the site and will provide long-term protection for the Blanding's turtle. We note that this type of program has had positive success elsewhere in the country with regard to how education is successful in changing behavior and being respectful to the environment.

2.9 Monitoring Commitments

As part of this long-term program, Towermarc or its successor in title will commit to submitting annual reports and compliance audits with regard to this program in order to demonstrate to the Natural Heritage Program that the program is in compliance and is producing the necessary safety for the species, for a period of 5 years post-construction of each phase. Monitoring will be targeted to maintaining the effectiveness of roadway barriers and wildlife corridors and adjusting the Conservation Plan where necessary to protect state-listed turtles as approved by NHESP.

Specific monitoring and maintenance commitments include:

- Assessment of the condition of the created or enhanced nesting habitats
- Monitoring turtle excluders to remove accumulated leaves and brush
- Repair of any damaged excluders

Attachments

A

Local Populations

This section provides information on the local populations of Blanding's turtle (*Emydoidea blandingi),* Eastern Box turtle (*Terrapene c.carolina*), and spotted turtle (*Clemmys guttata*) in the vicinity of the proposed Towermarc Business Park/Golf Course

A.1 Blanding's Turtle

Blanding's turtles (*Emydoidea blandingi*), a Threatened species under the Massachusetts Endangered Species Act (M.G.L. Chapter 131A) and Regulations (321 CMR 10.00), have been found on and adjacent to the project site. Threatened species are defined as "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and any species declining or rare as determined by biological research and inventory and likely to become endangered in the foreseeable future" [321 CMR 10.03 (6) (b)].

University of Georgia Professor J. Whitfield Gibbons, an expert in the study of freshwater turtles, provided direction for developing recommendations for the assessment of project impacts and potential mitigation strategies for the impact of the Towermarc project on the Blanding's turtle[2]. Dr. Gibbons has been engaged in studies of the Blanding's turtle for more than 30 years and is the author of several books on herpetology and ecology, including Life History and Ecology of the Slider Turtle published by the Smithsonian Institution Press. Dr. Gibbons was Chairman of the South Carolina Heritage Trust Advisory Committee from 1994-1997.

This section describes the local population of Blanding's turtles and their use of the site.

A.1.1 Habitat Requirements

Blanding's turtles are medium-sized (8 to 10 inches), and have a black carapace (top shell) with yellow spots and a yellow throat. This species is primarily aquatic, and eats fresh water plants, insects, fishes, amphibians, mollusks and crustaceans.

[2] Two scientists familiar with Blanding's turtle ecology and local habitats, Brian Butler (Oxbow Wetlands Associates) and Scott Smyers (ENSR) have provided assistance in the identification of habitat. Radiotransmitters and tracking equipment were provided to Mr. Smyers by Towermarc in 1997 and 1998.

Blanding's turtles require habitat complexes of wetland and upland to maintain a stable population. Wetlands provide habitat for most of the turtle's life-cycle, while uplands provide nesting habitat.

The geographic range of the Blanding's turtle (*Emydoidea blandingi)* is restricted to northern portions of the central and eastern United States and southern regions of Quebec and Ontario provinces in Canada. The easternmost populations are known from Nova Scotia, eastern sections of Maine, New Hampshire, and Massachusetts, and scattered areas in the southeastern part of New York (Ernst et al. 1994).

In Massachusetts, since 1972, the species has been reported from 57 locations in 37 towns (Fowle and Melvin 1998). However, only two of the records are based on more than 10 individual turtles, and three fourths of the records are of only one or two turtles. The Towermarc property is located approximately 15 miles southwest of Fort Devens, where the largest complex of Blanding's turtle populations known from Massachusetts has been reported (Butler 1997). The known population in the vicinity of the site (the Muddy Pond population) consists of fewer than 10 individuals, and may be a subset of a larger metapopulation. More research is needed to determine the number and extent of this local population.

Among the notable features of Blanding's turtle, besides its northern distribution, are the confirmed longevity of adults of both sexes (Brecke and Moriarty 1989; Congdon and van Loben Sels 1993; Congdon et al. 1993), placid nature of most individuals, and the absence of sexual size dimorphism in adults. The environmental requirements of Blanding's turtles are productive wetland habitats and nesting areas that are usually in open, treeless habitats with well-drained soils of sand or sandy loam. Nesting has been reported from mid-May through June in various parts of the geographic range, with most hatchlings emerging from the nest from mid-August through September.

Aside from general references, the first published studies on the population ecology and demography of Blanding's turtles anywhere in the geographic range were from Michigan in the 1960s (Gibbons 1968a). Since that time, substantive research on various aspects of the ecology of the species, including nesting behavior and nest habitat selection have been reported from Michigan, Minnesota, Massachusetts, Missouri, Wisconsin, Nebraska, New York, and Ontario by several researchers (McCoy 1973; Graham and Doye 1977; Baker and Gillingham 1983; Congdon et al. 1983, 1993; Kofron and Schreiber 1985; Brecke and Moriarty 1989; MacCulloch and Weller 1988; Linck et al. 1989; Ross and Anderson 1990; Congdon and van Loben Sels 1991, 1993; Rowe 1992; Pappas and Brecke 1992; Butler and Graham 1995; Butler 1997; Kiviat 1997).

A.1.1.3 Wetland Habitat

Blanding's turtles are primarily aquatic, and for most of the year, are found in nutrient-rich wetland systems with permanent, shallow water with no or little flow and a soft substrate--most often in marshes, bogs, small ponds or brooks. Pools of

deeper water in these wetlands are used by the turtles to escape the heat of the summer or to hibernate during the winter. The turtle generally occurs in wetlands without a closed forest canopy, but with abundant shrubs and herbaceous vegetation including buttonbush (*Cephalanthus occidentalis*), cattail (*Typha latifolia*), duckweeds (*Lemna minor*), and sedges (*Carex* spp. and *Scirpus* spp.). These wetlands provide areas where the turtles can bask, feed, hide and aestivate. Still water, shallow depth, dense surface vegetation, and the absence of a tree canopy in the wetlands allows the sun to warm the water surface quickly in the spring. Turtles can reach optimum activity temperatures quickly in these conditions, and can escape overheating by moving to deeper, cooler areas. Emergent and surface vegetation within the wetlands provides both basking areas for the turtle and habitat for the turtle's prey.

A.1.1.4 Upland Habitat

Aspects of nesting behavior, hatchling survival, and associated environmental factors have been reported for many species of freshwater turtles (Gibbons 1968b, 1983, 1990; Gibbons and Nelson 1978; Ernst et al. 1994), but the intricacies of life history and ecology are poorly understood for most of the species, including the Blanding's turtle. Despite the relative paucity of studies on most species of freshwater turtles, statements about some ecological behavior patterns of the Blanding's turtle can be made with a high degree of reliability. Due to the high variability in ecological observations of investigators during different years and in different parts of the geographic range, it is evident that the species exhibits considerable adaptability in nest site selection.

Most nesting occurs from late May to mid-June, although nesting by some individuals has been reported to occur as early as mid-May to as late as early July. Most observers have reported that female Blanding's turtles usually begin nesting late in the day or at night and complete the nesting process before midnight. Eggs hatch after 2-3 months and the young normally emerge from the nest from mid-August through September. Overwintering in the nest (i.e., the young remaining in the underground nest until the following spring) that is characteristic of many turtle species (Gibbons and Nelson 1978) has not been reported in Blanding's turtles, nor observed in recent studies of incubating eggs in natural nests (Lang et al. 1998). As fall emergence appears to be the norm for the species, no viable eggs or young are likely to be in the terrestrial habitat from October to May.

Blanding's turtles have been observed on some occasions to travel extensively during nesting ventures and commonly to nest long distances (more than 0.6 miles) from their home wetland, but in other instances nests may be placed relatively close to their usual wetland habitat or other wetlands (within 6 feet; Congdon et al. 1983). Nest site fidelity among years is highly variable (Congdon et al. 1983, Moriarty and Linck 1998), being observed in some females and not in others. In Massachusetts, females on nesting excursions have been observed to take as long as five days (Butler 1997). However, some females in Michigan have been observed to complete the entire nesting process, from departure from the aquatic habitat to return, in less than two hours whereas others have been observed to take more than 10 days. A common

observation is that adult turtles that travel terrestrially often seek out small isolated wetlands where they may stay from a few hours to several days.

Extensive variability has been observed in the choice of nesting sites by Blanding's turtles. For example, in addition to grasslands and other open natural areas (Congdon et al. 1983; Ross and Anderson 1990), nests have been documented from a variety of altered habitats including a planted corn field (Linck et al. 1989), plowed fields and dirt roads (Ross and Anderson 1990), gardens (Kiviat 1993), the inner and outer rings of a racetrack and soil piles (including fresh graves; Kiviat et al. 1996), suburban lawns and driveways (Breisch 1997), active agricultural fields (Casper 1998), recently burned prairies (Moriarty and Linck 1998), armored tank trails and fire breaks (Sajwaj et al. 1998), and earthen dams and alongside railroad grades (Kinney and Congdon 1998). Not all of these nests qualified as being located in habitats that meet a series of strict criteria in some categories of habitat characterization. For example, spatial extent of nesting sites varies, based on observations made of individual females from the various localities mentioned above.

Although several scientific investigators have reported on the habitat requirements necessary for successful nesting by Blanding's turtles, observations and experiences have varied considerably in some categories and been relatively consistent in others. Among the soil and habitat conditions often noted as important are sandy or loamy soils that are not highly compacted, south-facing slopes, open areas devoid of a heavy overstory of trees or dense shrubs, and the presence of dense herbaceous ground cover near the nesting area. Broad assertions cannot be made about some aspects of nesting ecology based on limited observations of a few individual turtles from single populations over a limited time period.

Single studies have been used, without supporting research from other populations, to declare that predation on nests of Blanding's and other turtle species increases near the edge of habitats (22 nests; Temple 1987). Other studies, including a study of 145 carefully monitored turtle nests (Burke et al., in press) revealed no relationships between spatial aspects of nest location and predation. Both studies may have been accurate in their assessments for the particular populations under study and perhaps indicate the high variability and unpredictability of the factors influencing turtle nesting success.

Studies of predation in areas without extensive human development suggest that eggs and hatchlings of Blanding's turtles may be highly susceptible to predators under natural conditions. In the most extensive and scientifically rigorous study (six years, 73 nests) that has monitored nest success by observing nesting females (rather than observing already predated nests), predation ranged from as low as 42 percent in one year to 93 percent in another (Congdon et al. 1983). Nest survivorship from all sources of mortality over 16 years ranged from 0 to 63 percent in a study in Michigan (Congdon et al. 1998), averaging 44 percent during the first nine years of study and 3 percent during the last seven. Other studies have reported 100 percent predation, but most of these should be considered as anecdotal or serendipitous observations rather than valid studies of the nesting dynamics of Blanding's turtle populations. In

the previously mentioned study (Congdon et al. 1983), tests were conducted to compare nest predation on nests (total of 73 nests) in open areas compared to those in habitats where predators could search linearly. Predation was significantly higher in the larger open areas (not within the linear corridors), indicating that nest predation is poorly understood and predictions of impacts on a population in a given habitat cannot always be made reliably.

In the following sections, we discuss how these habitat parameters relate to the local population.

■

A.1.2 Local Population

Individual Blanding's turtles found on-site are terrestrial migrants from a small population in Muddy Pond, an isolated wetland located between the site and Interstate 495, on property owned by The Nature Conservancy. A larger population is thought to occur centered in the extensive Beaver Brook wetlands northeast of the site, but has not been documented. Studies of this population were conducted by Scott Smyers in 1996, 1997 and 1998. Additional studies were undertaken by VHB in 1998 in consultation with the Massachusetts Natural Heritage and Endangered Species Program and directed by Dr. Gibbons.

Seven individuals were trapped in Muddy Pond between 1996 and 1998. Two female turtles tracked in 1997 and 1998 were observed nesting on-site in the former gravel pit area. Both turtles returned to Muddy Pond after nesting. Hatchlings were reported from one nest in 1997, and were followed over several days as they moved towards Beaver Brook (Wetland 6). Hatchlings were produced by one nest in 1998, and were transported to Wetland 6.

■

A.1.3 Existing Habitats

Under existing conditions, suitable Blanding's turtle habitat on-site is generally limited to nesting habitat in the patchy, bare soil areas within the central, disturbed gravel pit area. Wetland 10 has been observed to provide temporary habitat for migrating turtles during nesting periods. Turtles have moved through portions of Wetland 6 (Beaver Brook) when migrating to and from nesting sites. Trapping conducted in portions of Wetland 6 in 1998 did not locate any Blanding's turtles in on-site portions of Beaver Brook or adjacent wetlands. Wetlands and uplands elsewhere on the property have not been documented to provide, nor are they expected to provide Blanding's turtle habitat. These areas do not contain suitable upland characteristics for nesting, nor do they contain suitable aquatic habitats for feeding or overwintering.

None of the wetlands in Harvard (Wetlands 1 through 3) are within mapped estimated habitat of rare species.

A.1.3.1 Wetlands

No on-site wetlands provide suitable year-round habitat for Blanding's turtles, as none of these wetlands have the requisite hydrology or emergent vegetation. Wetlands throughout the site are generally forested and have seasonally saturated soils, while turtle habitat is characterized by permanent standing water and the lack of a developed tree canopy.

Wetland 4, which consists of a red maple swamp and a stream, does not provide Blanding's turtle habitat. Throughout this wetland, a well-developed tree canopy shades the ground and maintains cool temperatures in the stream. This wetland is also only seasonally inundated, whereas Blanding's turtles are usually found in areas of shallow, permanent standing water.

The on-site areas of the Beaver Brook wetland system (Wetland 6) are not typical of good Blanding's turtle habitat. While Blanding's turtles have been observed to pass through this wetland while seeking nesting sites, the turtles are more common in wetlands with permanent water, rather than the seasonally-inundated conditions prevalent in this area of Wetland 6. Additionally, the well-developed canopy in this area of Wetland 6 blocks sunlight and maintains cool temperatures on the ground. Important turtle habitat is, however, provided by portions of Wetland 6 east of the project site, where Beaver Brook supports permanently flooded areas.

Wetland 10 provides temporary habitat for Blanding's turtles, which have been observed to use this wetland during migration to nest sites. This small, isolated area contains standing water for several months of the year. This wetland, with a dense buttonbush (*Cephalanthus occidentalis*) stand, sedge tussocks, proximity to a larger wetland complex, and undisturbed shrub/sapling fringe, has many of the characteristics associated with Blanding's turtle habitat while inundated. However, this wetland is unlikely to provide suitable Blanding's turtle habitat during portions of the year when the wetland is dry.

In years when Wetland 10 contains water in the spring, it is used by females on nesting excursions. If water is present during the fall, Wetland 10 may be used by hatchlings on their way to more permanent aquatic habitats. However, the ephemeral aquatic nature of Wetland 10 precludes its value as a year-round habitat to support a population of Blanding's turtles. Although migrating Blanding's turtles may temporarily visit isolated, seasonally flooded wetlands, such as Wetland 10, for purposes of rehydration during nesting forays or movement between permanent aquatic habitats, occupancy will occur only during years and seasons when water is present. The turtles will normally remain in these seasonal, isolated wetlands for only a few days, eventually moving to a permanent aquatic habitat. During dry periods, habitats such as Wetland 10 will not be occupied by Blanding's turtles.

A.1.3.2 Uplands

Upland habitat for Blanding's turtles occurs within portions of the disturbed gravel pit area in the north/central portion of the site, where there is a mosaic of low vegetation and bare soil areas. Two turtles nested in this area in 1997 and 1998, with females showing relatively high site fidelity. The actual nesting habitat used by these turtles occupies small areas within the gravel pit, which currently provides only approximately 25 acres of suitable habitat.

Operation of the gravel pit started in the early 1970s and continued until 1989. The area affected by the operation of the gravel pit is nearly flat, except for a large, man-made sand and gravel pile in the northeastern section, created in the mid-1980s. The gravel pit area is sparsely to densely vegetated with waste-area plants, such as sweet fern (*Comptonia peregrina*), brambles (*Rubus* spp.), milkweed (*Asclepias syriaca*), common evening primrose (*Oenothera biennis*), and a variety of weedy grasses and composites. Areas that are densely vegetated with shrubs and forbs do not provide nesting habitat, while areas vegetated with sparse clumps of grasses and sedges do provide this habitat. These sparsely vegetated areas, and areas of bare soil or soil crusted with lichens or mosses, occur in small scattered patches throughout the site.

While the gravel pit area currently provides nesting habitat for some Blanding's turtles, this is a temporary condition caused by human disturbance. The gravel pit area only provides nesting habitat because of its disturbed nature. Before gravel operations, the area was unavailable to the turtles as nesting habitat; and as the area becomes more vegetated and an organic topsoil layer forms, gravid (egg-bearing) turtles will once again seek other areas to nest. Vegetation has already reclaimed much of the potential nesting habitat in the gravel pit, and without further disturbance, succession will continue to reduce and eventually eliminate potential turtle nesting habitat.

A.1.1.3 Nesting Habitat

This section provides information on known nest habitat requirements for Blanding's turtles throughout their range and on the Towermarc site specifically.

On-site Nest Habitat Characteristics

Two Blanding's turtles and one Eastern Box turtle are known to nest on the Towermarc site, despite the availability of approximately 25 acres of suitable habitat. Nest habitat was observed in 1997 and 1998. Turtle B nested, in both 1997 and 1998, in an area of sparse vegetative cover (50 percent or less) consisting primarily of native clumped perennials *(Carex umbellata, Danthonia spicata, Solidago nemoralis),* with patches of lichens and mosses. This area is approximately 2800 feet from Muddy Pond, the turtle's permanent habitat, and 150 feet from the nearest treeline.

The Eastern Box turtle nested in the same general area as Blanding's turtle B, although closer to the tree line.

The areas used by Turtle A, which nested adjacent to the sand pile at the north end of the site, varied substantially from 1997 to 1998. In both years, the female was first observed on top of the sand pile, and was subsequently disturbed by human observers. She moved to the base of the sand pile and laid eggs. In 1997, the nest site was south of the pile, in a flat open gravelly area sparsely vegetated (10 percent) with weedy annuals and perennials (hawkweed, ragweed, evening primrose). In 1998, the nest site was north of the pile on top of a mound of landscaping debris in a substrate composed of rotting hay bales. The surface vegetation consists of greater than 100 percent cover of Japanese knotweed, purple loosestrife, poison ivy, foxtail grass, crab grass, and other knotweed species. These areas are approximately 2,500 feet from Muddy Pond, and ranged from less than 100 to 225 feet from the nearest treeline.

Potential Nest Habitat On-Site

Based on these observations, "suitable" nesting habitat on the Towermarc site has the following parameters:

- Level or gently south- or west-sloping
- Substrate of sand or loamy sand
- Vegetation cover (at the surface of the substrate) of 50 percent or less
- Vegetation consisting of herbaceous species, either perennial caespitose grasses or forbs, or annuals,
- Partial surface cover of mosses *(Polytrichum)* or lichens *(Cladonia cristatella)*

Visual observation and transects were used to determine the area coverage of suitable habitat currently (1998) existing on the Towermarc site. Measurements were taken to quantify dimensions of some areas. In large areas with patchy distribution of suitable habitat, a series of parallel transects (minimum, 3) were walked to estimate the percent of suitable habitat.

The attached graphic shows the areas of "suitable habitat" as well as areas that do not provide nesting habitat due to their dense cover of rhizomatous and caespitose grasses, shrubs, saplings or trees. Some areas were determined to not provide suitable habitat due to their steep slopes (the sides of the sand pile) or compacted substrate (the roadway). The southeast subarea of suitable habitat contains an average of 55 percent suitable habitat, based on the transect analysis.

The southern development pod (Sweeney Parcel) was also assessed for its potential to provide suitable nesting habitat for Blanding's turtles. Using the criteria described above, areas that contain unsuitable dense vegetation, steep slopes were delineated, and the amount of suitable habitat within the remaining areas was estimated using transects. Approximately 65 percent of these areas contained suitable habitat.

Based on this analysis, we estimate that the site currently (1998) provides approximately 25 acres of suitable nest habitat.

The following tables provides lists of species characteristic of suitable nesting habitat and of those areas which do not provide nest sites.

Table A-1
Species Characteristic of Suitable Nesting Habitat Areas

Achillea millifolium	*Lechea intermedia*
Ambrosia artemissifolia	*Lespedeza capitata*
Andropogon virgincus	*Linaria canadensis*
Antennaria spp.	*Lysimachia quadrifolia*
Asclepias syriaca	*Oenothera biennis*
Aster liniarfolius	*Panicum* spp.
Baptisia tinctoria	*Plantago aristata*
Carex annectens	*Plantago lanceolata*
Carex muhlenbergii	*Potentilla simplex*
Carex pensylvanica	*Pyncnatheum tenuifolia*
Carex scooparia	*Rudbeckia hirta*
Carex umbellata	*Rumex acetosella*
Cyperus filiculmis	*Schizachyrium scoparium*
Danthonia spicata	*Scleranthus annuus*
Dianthus armeria	*Solidago juncea*
Erigeron spp.	*Solidago nemoralis*
Hieracium spp.	*Tragopogon pratensis*
Hypericum gentianoides	*Trifolium agrarium*
Hypericum perforatum	*Trifolium hybridum*
Juncus greenei	

Table A-2
Species Characteristic of Unsuitable Nesting Habitat Areas

Asclepias syriaca	*Phleum pratense*
Betula populifolia	*Pinus strobus*
Ceanothus americanus	*Poa pratensis*
Comptonia peregrina	*Populus tremuloides*
Cornus racemosa	*Rhus glabra*
Dactylis glomerata	*Rosa multiflora*
Daucus carota	*Rubus* spp.
Festuca arundinaria	*Solidago canadense*
Hypericum perforatum	*Solidago graminifolia*
Panicum clandestinum	*Solidago rugosa*
	Spiraea tomentosa
	Toxicodendron radicans
	Verbascum thapsus

Other Nesting Habitat Requirements

Direct observation of turtle movement during migration to nest sites indicates that females use two other habitat types as resting or staging areas during this short distance migration.

Clumps of shrubs (*Comptonia peregrina*) or sapling white pines (2-3 feet in height) are used by nesting turtles as cover and resting areas for short periods, overnight or during mid-day.

Isolated wetlands, such as Wetland 10, are used as resting or staging areas overnight or for longer periods. Observations suggest that female turtles may stay in small wetlands until optimal weather conditions for egg laying occur.

Summary

Available observations by other scientists and site-specific observations indicate that Blanding's turtles may utilize a wide range of nesting habitats. Generally, they prefer soft substrates with little or no vegetative cover. Vegetation typically ranges from none (dirt roads, graves, recently plowed agricultural fields) to approximately 50 percent cover. Preferred sites in natural vegetation are typically dominated by clump-forming grasses and sedges which leave interstices of bare ground, not by the more aggressive rhizomatous species. High-quality nesting habitat may be interspersed with patches of shrubs or low pine saplings which provide cover and temporary resting sites, and with small isolated wetlands. Specific analyses of the Towermarc Golf Course site demonstrate that approximately 25 acres of suitable nest habitat currently exists, interspersed with wetlands and shrub cover.

A.2 Eastern Box Turtle

Eastern box turtle (*Terrapene c. carolina*) is listed by the MNHESP as a Species of Special Concern. Eastern box turtles are medium-sized (4-8.5 inches) terrestrial turtles with a high-domed brown carapace patterned with yellow or olive markings. Eastern box turtles are omnivorous, feeding on earthworms, slugs, insects, frogs, leaves, grass, fruits, and fungi. Eastern box turtles are reported to use a wide range of habitats, including woods, fields, thickets, marshes, pastures, powerlines, and bogs, but are primarily characteristic of open deciduous woods (DeGraaf and Rudis, 1983). Nesting occurs in June and July, with hatchlings emerging after approximately 90 days (August-September). Preferred nesting sites are reported to be in areas of sandy soil in old fields, powerline clearings, or ecotones.

The range of the Eastern Box turtle extends from southern Maine to the Florida Keys, west to Michigan, Missouri, eastern Kansas, and Texas. In New England, the Eastern Box turtle occurs in southern Maine, southeastern New Hampshire, Massachusetts (except Berkshire County, northern Worcester County, and northern Essex County), Rhode Island, and Connecticut (except northwestern Litchfield County). The

MNHESP Fact Sheet lists 187 populations (reported to be generally sightings of single individuals), with the majority in southeastern Massachusetts and Cape Cod.

A.2.1 Local Population

One gravid female Eastern Box turtle was observed nesting on June 15, 1998 on the slope northwest of Wetland 10, approximately 40 feet from the treeline (Figure A-1). A transmitter was attached to the female after she finished nesting, and subsequent tracking indicates that she moved 2000 feet southwest through upland forested habitat.

A.2.2 Habitat Usage

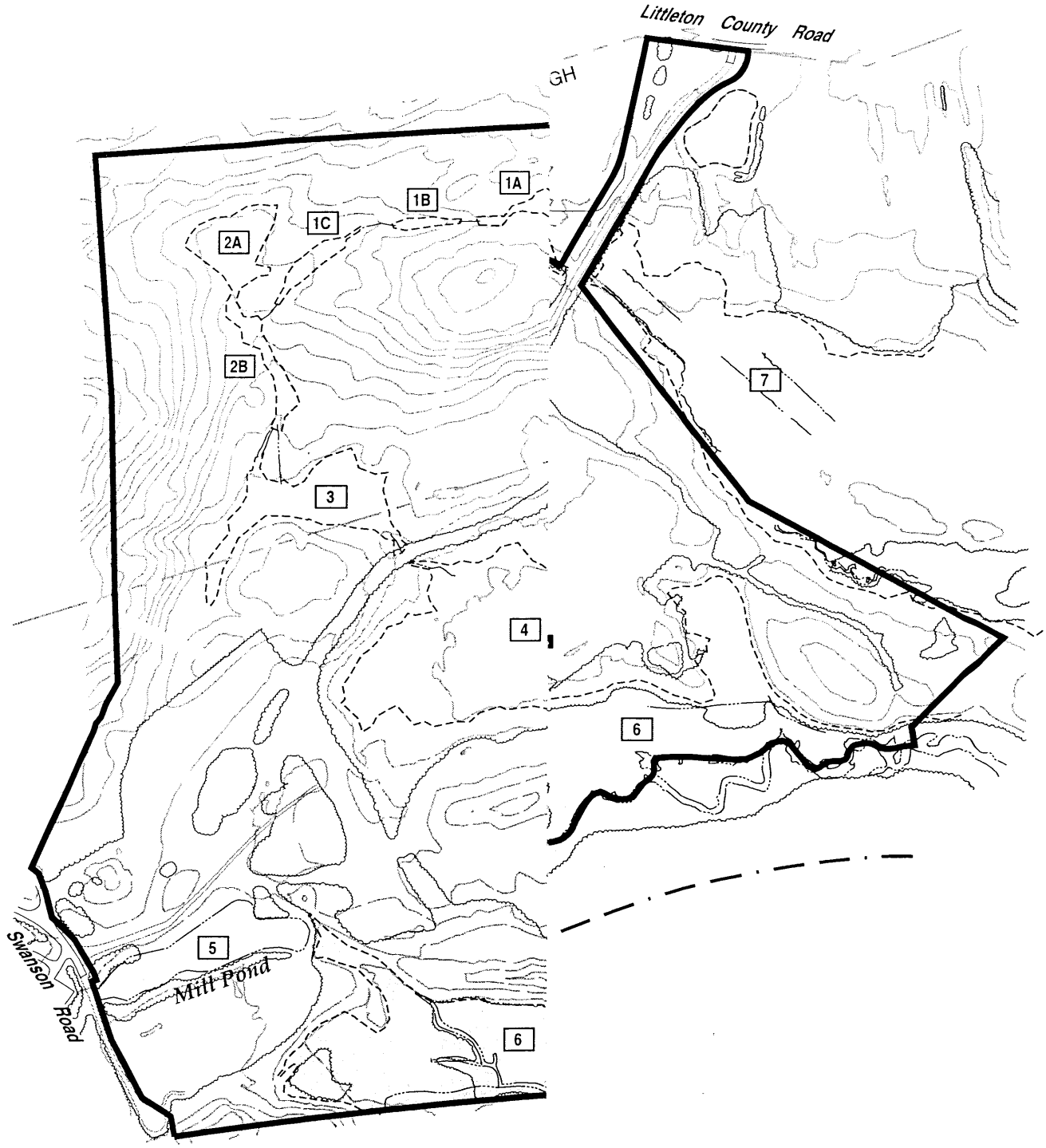
Studies to date indicate that Eastern Box turtle(s) nest in the same habitat type as Blanding's turtles. The one individual observed in 1998 nested in the same habitat patch as one of the Blanding's turtles, although closer to the treeline.

A.3 Spotted Turtle

Massachusetts Natural Heritage and Endangered Species Program fact sheet characterizes the spotted turtle, a Species of Special Concern, as a relatively small turtle ranging in size from 3 to 5 inches (8.0 to 12.5 cm). Adults have distinctive bright yellow circular spots that typically dot the black upper shell. Spotted turtles emerge from hibernation in early spring. Mating generally occurs in the water from March to May. In June, the female lays between two to eight eggs in sunny, well-drained soil in open meadows, fields, or along roadsides.

The range of the spotted turtle extends from Southern Maine and Quebec westward to Illinois and southeast to northern Florida. Spotted turtles prefer areas with aquatic vegetation and require a soft substrate. Within Massachusetts, the spotted turtle dwells in a variety of wetland habitats such as marshy meadows, bogs, small ponds and brooks, ditches, and other shallow unpolluted bodies of water. Red Maple (*Acer rubrum*) and Atlantic White Cedar (*Chamaecyparis thyoides*) swamps and woodland vernal pools also provide suitable habitat. The MNHESP Fact Sheet for this species identifies known populations in 139 municipalities.

Spotted turtles often bask during the daytime, especially in the early spring. Basking occurs on partially submerged logs, rocks, or tussocks of sedge, in overhanging vegetation, sphagnum mats, and brush piles, or along the water's edge. Spotted turtles may also be found on upland areas adjacent to wetlands.



Vanasse Hangen Brustlin, Inc.

Figure A-1

Blanding's and Box Turtle
Nest Site
Towermarc Golf Course
Boxborough, Massachusetts

A.3.1 Local Population

No spotted turtles are know to occur on the Towermarc property. One individual was observed east of the site, in Muddy Pond, in 1996. No spotted turtles have been observed in any wetlands on the Towermarc site during the years that Towermarc's consultants have been conducting investigations of the wetlands and waterways on the property. In 1998, these investigations included placing traps in Wetland 10 and the stream flowing out of Wetland 4. No spotted turtles were observed. It is Towermarc's conclusion that, while spotted turtles may occur in Muddy Pond, their habitat does not currently extend west of Beaver Brook.

A.3.2 Habitats

No spotted turtles are known to occur on the Towermarc site, and none of the on-site wetlands provide suitable year-round habitat for spotted turtles, as none of these wetlands have the requisite hydrology or emergent vegetation. Wetlands throughout the site are generally forested and have seasonally saturated soils, while turtle habitat is characterized by permanent standing water and the lack of a developed tree canopy.

Wetland 4, which consists of a red maple swamp and an intermittent stream, does not provide turtle habitat. Throughout this wetland, a well-developed tree canopy shades the ground and maintains cool temperatures in the stream. This wetland is also only seasonally saturated, not inundated, whereas spotted turtles are usually found in areas of shallow, permanent standing water.

Portions of the on-site areas of the Beaver Brook wetland system (Wetland 6) may provide suitable seasonal or permanent habitat for spotted turtles. Beaver Brook and the seasonally-inundated marsh and swamp areas are typical of habitats used by this species. The well-developed canopy in this area of Wetland 6 blocks sunlight and maintains cool temperatures on the ground. Suitable spotted turtle habitat is also provided by portions of Wetland 6 east of the project site, where Beaver Brook supports permanently flooded areas.

Wetland 10 may provide temporary habitat for spotted turtles. This small, isolated area contains standing water for several months of the year. This wetland, with a dense buttonbush (*Cephalanthus occidentalis*) stand, sedge tussocks, proximity to a larger wetland complex, and undisturbed shrub/sapling fringe, has many of the characteristics associated with spotted turtle habitat while inundated. However, this wetland is unlikely to provide suitable spotted turtle habitat during portions of the year when the wetland is dry.

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B

Integrated Pest Management Approach

Pest control activities at golf courses have changed dramatically over the past several decades as the potential environmental side-effects of over-application have been studied in relation to potential environmental and water quality issues. Today, golf course pest control is far less intense than the use of pesticides on suburban lawns. This is in part due to the selection of specific cultivars to suit each area, in part to a reactive rather than scheduled approach toward pesticide (includes insecticides, herbicides, nematicides, and other subcategories) application, and in part to the development of effective yet environmentally safe alternative pesticides. This new approach to turfgrass pest management is known as Integrated Pest Management (IPM).

Objectives

IPM is an approach to pest control which seeks to anticipate and address the full range of physical, cultural, and biological factors affecting the development of pest populations at a given site. This approach does not seek the eradication of pest populations; rather it seeks to prevent the growth of pest populations and/or disease infestations above acceptable threshold levels. To achieve these goals an IPM program incorporates a diverse range of control mechanisms including chemical pesticide applications. Given that this is a holistic approach to pest control, the implementation of an IPM program has the direct benefit of reducing the use of chemical pesticides in the maintenance program for the golf course.

The implementation of an IPM program requires the disciplined completion of a specific protocol of tasks. The results of each task are synthesized to ensure an integrated approach to decision making. The results of some tasks serve as base data on the characteristics of the site and local pest populations while the results of others serve as feedback concerning the effectiveness of the control program. Regardless of the ultimate application of the information generated, each task is critical to the successful implementation of IPM. Descriptions of the specific tasks, in sequential order, follow.

Specific IPM Elements

Turf management areas on a golf course for which an area-specific program must be implemented include greens, tees, fairways, roughs, and turf buffers. Each such area is exposed to different types and levels of use activity, different cultural practices,

and different pest susceptibilities. Turf species selection and the appropriate application of cultural and mechanical maintenance practices are critical first steps to ensure effective and efficient pest control.

Initial Information Gathering

The gathering of information on potential pest populations ensures that as the turf becomes established the superintendent has the knowledge and tools necessary to anticipate and address likely pest problems. The background information to be gathered during this task should include:

- Identification of likely pest species and information on their specific life cycles and their physical, cultural, and biological requirements.
- Identification of all applicable controls available for each identified pest species. these controls would include cultural, biological, and chemical options.
- Information on pest infestations and successful control strategies experiences in the area of the site.

There are many potential pests of turfgrass. Common ones include the fungal species Pythium and Rhizoctonia, the bacteria Xanthamonas, various insects and nematodes, weeds such as nutsedge, and mammals such as shrews, moles, and ground hogs. Sources of initial information include university extension services (the UMass Turfgrass Program), local exterminators, local lawn care professionals, and the Golf Course Superintendents association. Each of these potential sources will be consulted by the course superintendent.

Monitoring of Pest and Non-target Organisms

Monitoring consists of the frequent examination of each course management area to determine the status of pest and non-pest organisms. Information to be gathered includes the identification of species present, their level of activity, and extent of impact. Monitoring is essential if the superintendent is to be able to make early and accurate diagnoses of pest presence and threat prior to the pest reaching unacceptable levels.

Monitoring for weed, insect, and small animal pests can be done through visual inspection of the turf surface, thatch and root zones. The intensity of monitoring activities for weed and insect pests will be adjusted to reflect the life cycles of the potential pests. While turf will not display symptomatic signs before weed germination, symptoms of moderate insect infestations may be detectable. Accordingly, monitoring for insect pests will include sample censusing to both establish an action threshold and determine when the threshold is exceeded.

Monitoring for early disease and fungal detection is more difficult. Early detection often is impossible and the rapidity and severity of damage caused by such diseases as Pythium blight dictate the need for preventative applications of fungicides when and if environmental conditions are favorable for the development of the disease. A

number of diagnostic tools have become available in recent years to aid in the early detection of diseases. These tools range from simple predictor models using readily collected environmental data to diagnostic kits utilizing biochemical information.

Establishing Acceptable Damage Thresholds and Action Levels

As the objective of IPM is the control of pest population at acceptable levels, it is crucial that sound efforts be made to establish acceptability thresholds for each pest. The threshold of acceptability will vary for each pest and for each management area of a golf course. For example, greens are expected to support a higher quality turf than rough areas; accordingly, the acceptability threshold for a given pest on a green will be much lower than the threshold for a rough area. The setting of thresholds involves consideration of economics and the tolerance of patrons. The superintendent will establish appropriate thresholds based on these considerations.

Action levels are levels of synthesized information which indicate that damage thresholds are or are about to be exceeded. Such synthesized information will include weather and cultural data, the specific period of the pest life cycle, and the accumulated knowledge of previous experiences controlling the pest on the site. Although some guidance on the initial setting of action levels can be obtained, the levels thus established should be set very conservatively and adjusted upward only as site-specific history information has been developed.

Define Effective Treatments

The full range of potentially effective treatments for each pest will be identified and assessed as to its applicability to given situations. This range will include biological, cultural, and chemical treatments. Appropriate cultural practices which have the effect of reducing pest infestations to levels below the action level include modifying irrigation practices and applying topdressings such as compost or mineral mixes.

Biological control is defined as the regulation of pest populations by their natural enemies, including antagonists, parasites, and predators. Biological controls, if target-specific, can be effective. However, frequently this effectiveness is unpredictable. This unpredictability means that the superintendent will be taking a risk in selecting such treatment that may place the turf in jeopardy. For this reason a decision to select a biological control must be made early in order to provide an opportunity to implement other strategies. In general, biological control efforts have been targeted to insect pests. Research on biological control of disease and weed problems has only recently begun. One proven effective biological control is the use of the bacteria *Cacillus popilliae* to produce milky spore disease which, in turn, controls the growth of White grub populations. It has been suggested that predatory nematodes be considered for the control of Japanese beetle grubs and black cutworms. Other biological controllers of insect populations include such small mammals as moles and shrews. These small mammals, however, often cause more damage to the turf than the insects.

Chemical pesticide applications are essential elements of any effective IPM program. As with cultural and biological controls, chemical applications should be made only

as necessary to prevent pest infestations above acceptable thresholds and only if the application constitutes the best available control. Best available control refers to the control effort which will achieve the desired result at acceptable cost and minimum environmental impact relative to other available options. It is anticipated that a number of currently-available pesticides will be used in the maintenance of the turfgrass. Given the constantly evolving nature of the chemical industry, it is impossible to identify all the chemical pesticides which might be used over the life of the course, but the trend is toward the development of more target-specific and less environmentally-damaging pesticides for use in the turfgrass industry

The following guidelines are generally used to govern the use of chemical pesticides at a golf course:

- Pesticides are only one component of IPM and are used only to the extent that they represent the best available control either when used alone or in combination with other non-chemical controls
- Pesticides that are registered for use in Massachusetts are the only ones used
- Pesticides are stored, mixed, and disposed of in strict conformance with safety label directions
- New products are used only when they have been rigorously tested at university research stations and only if they represent the best available control relative to existing products.
- The decision to use specific pesticides is only made by the golf course superintendent based upon intimate knowledge of site-specific conditions
- Records are kept by the superintendent detailing the type and amount of the pesticide used, its effectiveness in controlling the specific condition, and the specific environmental conditions under which the pesticide was used.

Pesticides Typically Considered for Use

Chemical pesticide applications are essential elements of any effective IPM program. As with cultural and biological controls, chemical applications should be made only as necessary to prevent pest infestations above acceptable thresholds and only if the application constitutes the best available control. Best available control refers to the control effort which will achieve the desired result at acceptable cost and minimum environmental impact relative to other available options. Environmental impact in this context includes damage to non-target species, water quality, and air quality. It is anticipated that a number of commercially-available pesticides will be used in the maintenance of the Towermarc Golf Course and that yet to be developed pesticides eventually will be used when appropriate. Given the constantly evolving nature of the chemical industry, it is impossible to identify all the chemical pesticides to be employed over the life of the course. At best, a list of currently available and acceptable pesticides may be provided together with a set of operating guidelines for the use of these and future products.

C

2000 Construction Monitoring Protocol

Task 1: Monitoring

Consultant shall walk the perimeter of the siltation fence, identify any state-listed turtles found on the inside or outside of the construction fence and, after removing turtles from the construction area, record the following data for each animal:

- Sex
- Number of growth rings
- Plastron length and width
- Carapace length and width
- Weight
- Location found

Each turtle will be notched and coded with a unique identifying code painted onto the carapace. Captured turtles shall be released in an area designated by NHESP.

Monitoring shall be done twice a day from May 1 through July 10. Monitoring shall be done once a day from April 1 to May 1.

Task 2: Radio Telemetry

The consultant shall install 50 No. 3 Havahart traps and 50 pitfall traps along the perimeter of the silt fence by April 1, and shall monitor these traps once a day (AM) from April 1 through May 1, and twice a day (AM and late afternoon) from May 1 through July 10. The Client shall provide workers to dig pitfall traps under the direction of the consultant. Any state-listed turtles found in the traps or located adjacent to the construction fence shall have radio transmitters attached.
The Consultant shall, using radiotelemetry, determine the location on the site of all tagged turtles. This shall be done once a day from May 1 through July 10, and once a week from April 1 to May 1, and from July 10 through October 1.

Task 3: Reporting

The consultant shall prepare a brief bi-weekly report, submitted to the Client and the Natural Heritage Program, documenting the activity undertaken during the previous 2 weeks.

At the conclusion of the contract period, the Consultant shall prepare a summary report documenting the results of the monitoring and tracking program, including data and transmitter frequencies of each turtle found during the study. This report shall be submitted to the Client and the Natural Heritage Program by November 1, 2000.

ATTACHMENT C

Schedule of Commitments

Schedule	Commitment
Phase I	
By 1 April, 2000	Funds for initial 2-year research and monitoring program and 3-year post-construction monitoring committed ($240,000)
By 1 April, 2000	Construction barriers installed
1 April – 1 October	Year 1 Construction monitoring conducted by Owner* with a consultant approved NHESP.
Prior to Construction	Conservation Restrictions recorded
15 October – 1 April, 2001	Phase I Habitat enhancement areas completed
By 1 April, 2002	Phase I Construction completed (subdivision roadway, infrastructure, turtle migratory corridors, permanent roadway barriers)
	NHESP conducts construction monitoring during 2001
	NHESP initiates post-construction monitoring, 2002.
	Owner* installs protective signage at completion of construction, provides educational brochures for employees pre-approved by NHESP
2005	Owner* and NHESP assesses habitat enhancement area and determines if additional treatment required
2002-2006	Owner* submits annual inspection reports to NHESP by November 1 of each year.(5 years post-construction)
Phase IIA (golf course construction)**	
By 1 November of calendar year preceding construction	Owner provides NHESP with detailed design plans for golf course, including 26 acres nesting habitat, GPS coordinates for habitat centers. Owner provides funding for 2-year construction and 3-year post-construction monitoring ($227,500 if initiated in 2001). Draft Conservation Restriction for remaining golf course areas provided to NHESP. The actual funding for Phase IIA is dependent on the calendar year in which golf course construction commences as follows:
	Year: Funding Level (adjusted for inflation)
	2001: 227,500
	2002: 234,000
	2003: 240,500
	2004: 248,000
	2005: 255,500
	2006: 263,000
	2007: 271,000
By 1 April of construction year	Construction barriers installed. NHESP initiates monitoring.
Construction period	Owner completes construction, including nest habitat areas and wetland enhancement areas (inc. Vesenka Fire Pond)
Year 5 following completion of construction	Nest Habitat Maintenance
5 years post-construction	Owner submits annual inspection reports to NHESP by November 1 of each year.

* Towermarc or successor in title

** If no golf course is constructed, then the only Phase II obligations are the installation of construction and permanent turtle barriers.

PREPARED FOR:

TOWERMARC BOXBOROUGH LIMITED PARTNERSHIP, MANAGING VENTURER OF THE EQMARC JOINT VENTURE

260 FRANKLIN STREET
BOSTON, MA 02110

RECORD OWNER:

THE EQMARC JOINT VENTURE c/o TOWERMARC CORPORATION

19615/290 26782/41
18945/120 19981/299

5			
4			
3			
2	05/05/2000	REVISED TO ISSUE	
1	03/15/2000	ADDED GRAVEL REMOVAL AREA	
0	02/15/2000	PROGRESS ISSUE	
ISSUE	DATE	DESCRIPTION	
	MEB	DSB/MEB	RJB
FLD	CALC	DWN	CHK'D

N
PLAN No. 543 of 1980

N/F
D & M/CHU TECHNOLOGY, INC
22017/207

TOWN OF HARVARD (WORCESTER COUNTY)
TOWN OF BOXBOROUGH (MIDDLESEX COUNTY)

TOWN HARVARD LINE BOXBOROUGH

LITTLETON COUNTY ROAD

ROAD

N/F
THE EQMARC JOINT VENTURE
23461/332

N/F
THE EQMARC JOINT VENTURE
26782/41

N/F
THE EQMARC JOINT VENTURE
19615/290

N/F
HARVARD SPORTSMENS CLUB, INC.
9335/415

N/F
HARVARD SPORTSMENS CLUB, INC.
9068/10

N/F
TOWN OF BOXBOROUGH
10432/125

N/F
ROBERT B. & MARY L. LOVELACE
27773/357

N/F
NATURE CONSERVANCY OF MASSACHUSETTS
11449/434
10905/232

OPEN SPACE/ ACTIVE RECREATION AREA
434,403± SF
9.97± AC

OPEN SPACE/ PASSIVE RECREATION AREA
1,698,693± SF
39.0± AC

CONSERVATION RESTRICTION AREA
222,387± SF
5.11± AC

CONSERVATION RESTRICTION AREA
2,394,151± SF
54.96± AC

GRAVEL REMOVAL AREA
170,657± SF
3.92± AC

S41°08'48"W 1064.28'
N82°07'29"E 680.29'
S01°39'01"E 54.00'
S 42°19'W
N77°59'30"W 770.00'
S10°45'13"E 148.68'
S01°03'21"E 157.61'
S39°51'52"W 215.00'
N10°45'13"W 170.56'
S86°04'22"E 89.39'
N10°45'13"W 378.47'
R=100.00' L=157.08' Δ=90°00'00"
R=100.00' L=42.00' Δ=24°04'47"
R=100.00' L=115.08' Δ=65°55'13"
R=975.00' L=192.12' Δ=11°17'23"
S16°15'10"E 355.79'
N 74°40'57" W 382.54'
S 37°59'21" W 162.73'
S 41°42'40" W 162.66'
S 27°26'30" W 317.89'
N86°30'26"E 414.00'
S12°52'46"W 413.00'
60'± (60.00' TIE) S41°37'14"E
1660'±
1374.94' (TIE) S44°47'17"W
N 11°40'13"W 166.83'
S78°10'47"W
N78°10'47"E 99.96'
N78°10'47"E 640.49'
(INST. 641 OF 1/6/2000)
Δ=64°45'13" R=925.00' L=1045.40'
Δ=63°11'44" R=975.00' L=1101.91'
403.00' S84°25'36"W
S33°30'38"W 208.96'
N79°14'40"W 93.83'
N62°36'47"W
S78°10'54"W 134.54'
324.22' S63°29'33"W
N35°30'56"W 271.48' (TIE)
S38°18'42"E 536'±
536.25' (TIE)
S43°25'16"W 339.78' (TIE)
377'±
N60°02'46"W 851'±
851.03' (TIE)
1251.88' S58°33'E
S49°47'57"E 432.95'
N21°06'49"E 88.51'
N70°16'35"E 595.70'
N45°36'36"W 223.38'
1093.68
1093.68
1139.30' S82°07'29"W
1016.59'
355.17' N00°26'38"W
1291.88' N58°33'W

DRAINAGE EASEMENT-1
DRAINAGE EASEMENT-2
DRAINAGE EASEMENT-3
DRAINAGE EASEMENT-4
DRAINAGE EASEMENT-5
DRAINAGE EASEMENT-6
DRAINAGE EASEMENT-7
DRAINAGE EASEMENT-8
DRAINAGE EASEMENT-9
DRAINAGE EASEMENT-10
SEWER EASEMENT-1

BEAVER BROOK

FOR MONUMENTATION SEE DEFINITIVE PLAN ENTITLED: "DEFINITIVE PLAN FOR TOWERMARC BUSINESS PARK PHASE II IN BOXBOROUGH, MA" PREPARED BY BEALS AND THOMAS, INC., DATED: DECEMBER 23, 1988 LAST REVISED: JUNE 21, 1990. (5 SHEETS) AND "AMENDED DEFINITIVE PLAN FOR TOWERMARC BUSINESS PARK PHASE I IN BOXBOROUGH MA" PREPARED BY BEALS AND THOMAS, INC., DATED: JUNE 10, 1988 AND LAST REVISED: APRIL 28, 1997 (1 SHEET).

NOTES:

1.) THIS PLAN IS NOT TO BE USED FOR THE CONVEYANCING OF FEE. IT IS INTENDED TO BE USED FOR THE PURPOSE OF CREATING THE OPEN SPACE RECREATION, AND CONSERVATION AREAS SHOWN

2.) EXISTING INTERIOR LOT LINES ARE NOT SHOWN.

I HEREBY CERTIFY THAT:

1.) THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

2.) THIS PLAN SHOWS THE PROPERTY LINES THAT ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

COMMONWEALTH OF MASSACHUSETTS ROBERT JORDAN BUCKLEY No. 30326 REGISTERED LAND SURVEYOR

ROBERT J. BUCKLEY, PLS No. 30326

5/5/2000
DATE

RESTRICTION PLAN

TOWERMARC BUSINESS PARK
BOXBOROUGH, MA
(MIDDLESEX COUNTY)

PREPARED BY:

BEALS AND THOMAS, INC.

Civil Engineers-Landscape Architects
Land Surveyors-Planners-Wetland Scientists
Reservoir Corporate Center
144 Turnpike Road (Route 9)
Southborough, Massachusetts 01772
Tel.: 508-366-0560
Fax: 508-366-4391
(email) mail@btiweb.com
(website) http://www.btiweb.com

DATE: APRIL 5, 2000

METERS 0 25 50 100
0 75 150 300 450 FEET
SCALE: 1"= 150'

BTI JOB NO. W-0049.68	E-1
BTI FILE NO. 0049231B	
BTI DWG NO. 0049231	
REGISTRY SHEET	
SHEET No. 1 OF 1	

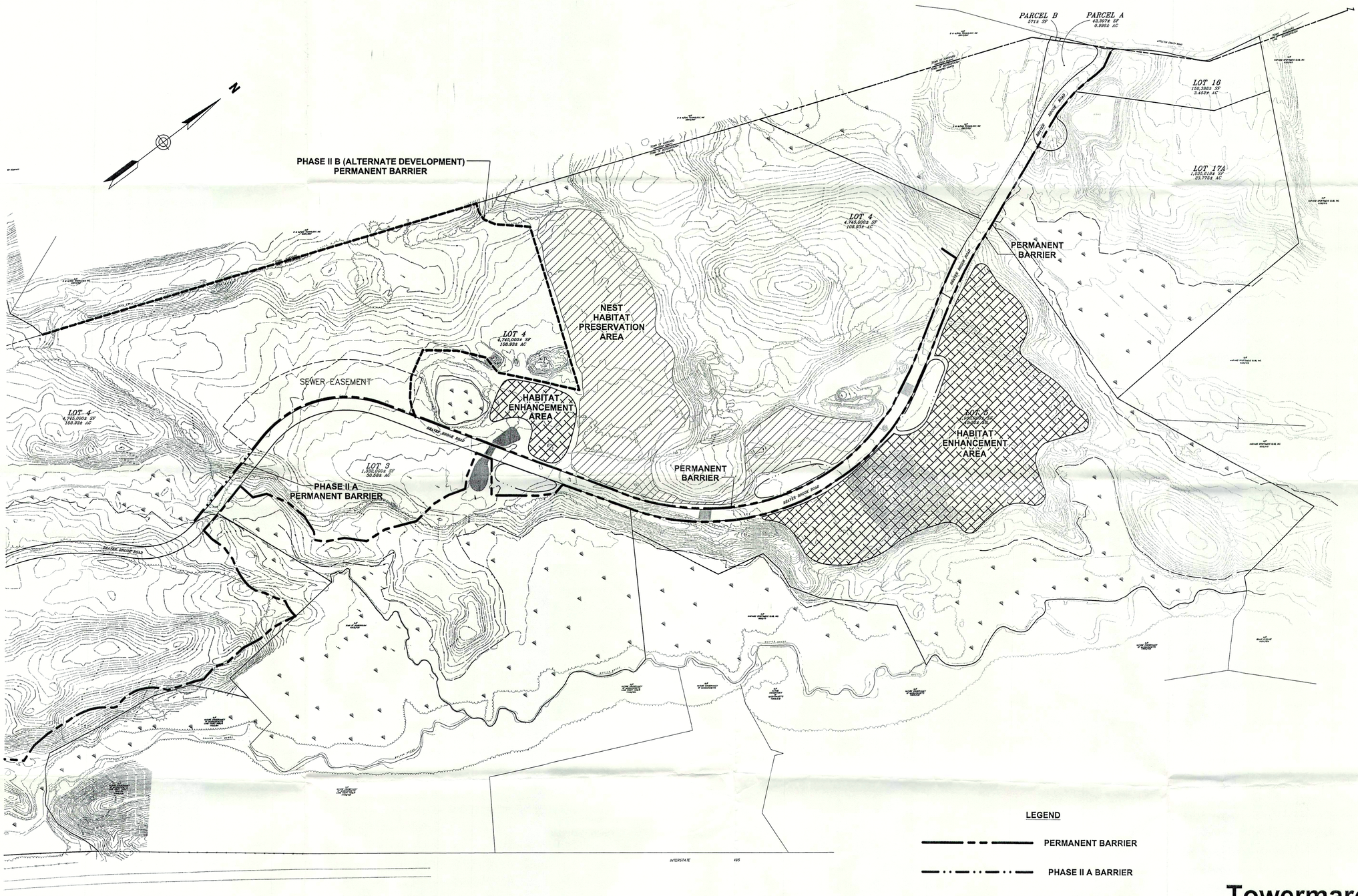
cad\ev\5625tpm.dwg

VHB

Vanasse Hangen Brustlin, Inc.

Transportation
Land Development
Environmental Services

101 Walnut Street, P.O. Box 9151
Watertown, Massachusetts 02471
617 924 1770 • FAX 617 924 2286



200 0 200 400
SCALE IN FEET

LEGEND

- PERMANENT BARRIER
- PHASE II A BARRIER
- PHASE II B BARRIER
- HABITAT ENHANCEMENT AREA
- HABITAT PRESERVATION AREA
- TURTLE MIGRATORY CORRIDOR

Towermarc Business Park
Conservation Plan
Turtle Protection Measures

Figure 5
Attachment G

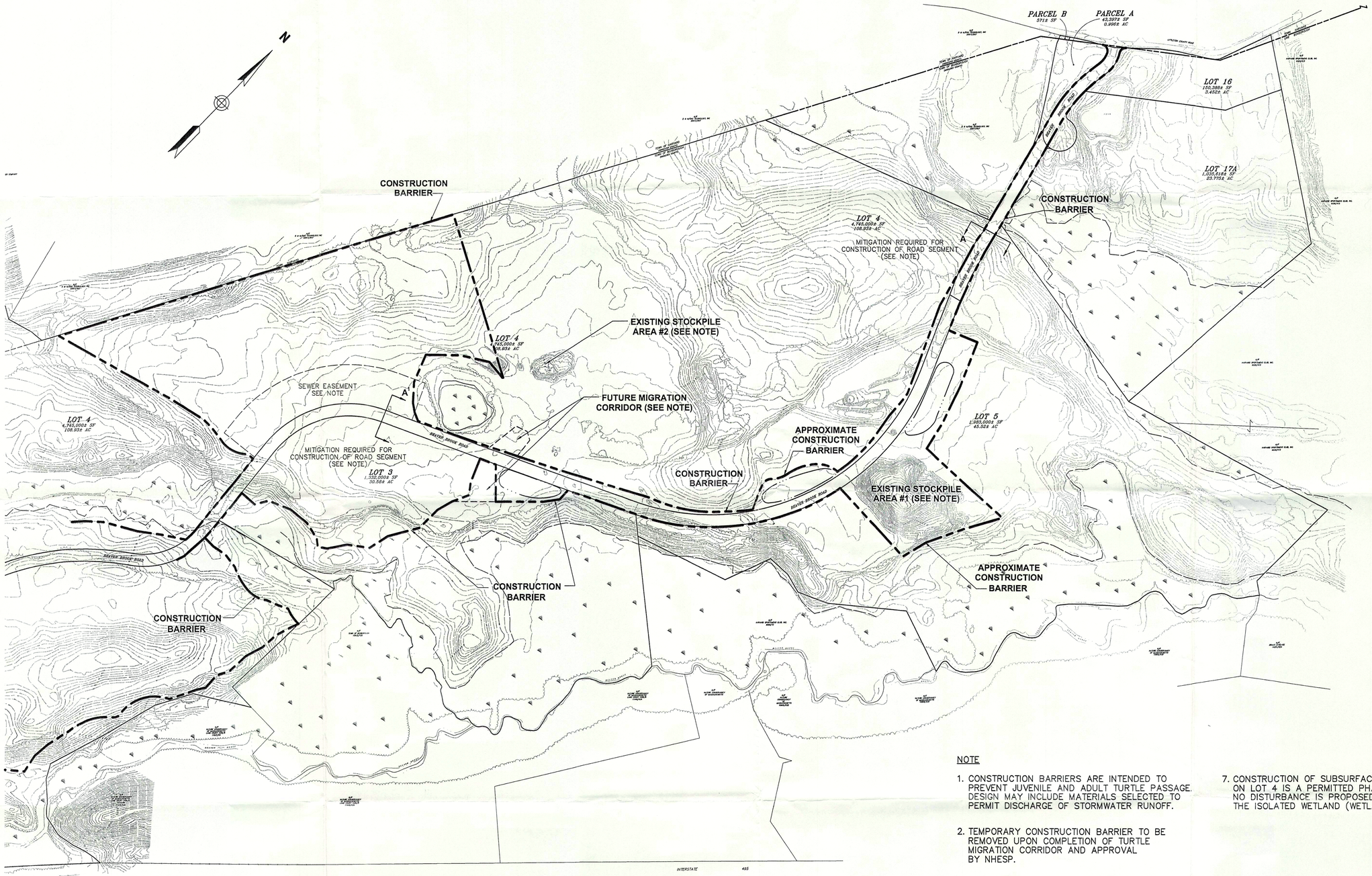
cad\ev\5625CB.dwg

VHB

Vanasse Hangen Brustlin, Inc.

Transportation
Land Development
Environmental Services

101 Walnut Street, P.O. Box 9151
Watertown, Massachusetts 02471
617 924 1770 • FAX 617 924 2286



LEGEND

- CONSTRUCTION BARRIER
- TEMPORARY CONSTRUCTION BARRIER (SEE NOTE)

200 0 200 400
SCALE IN FEET

NOTE

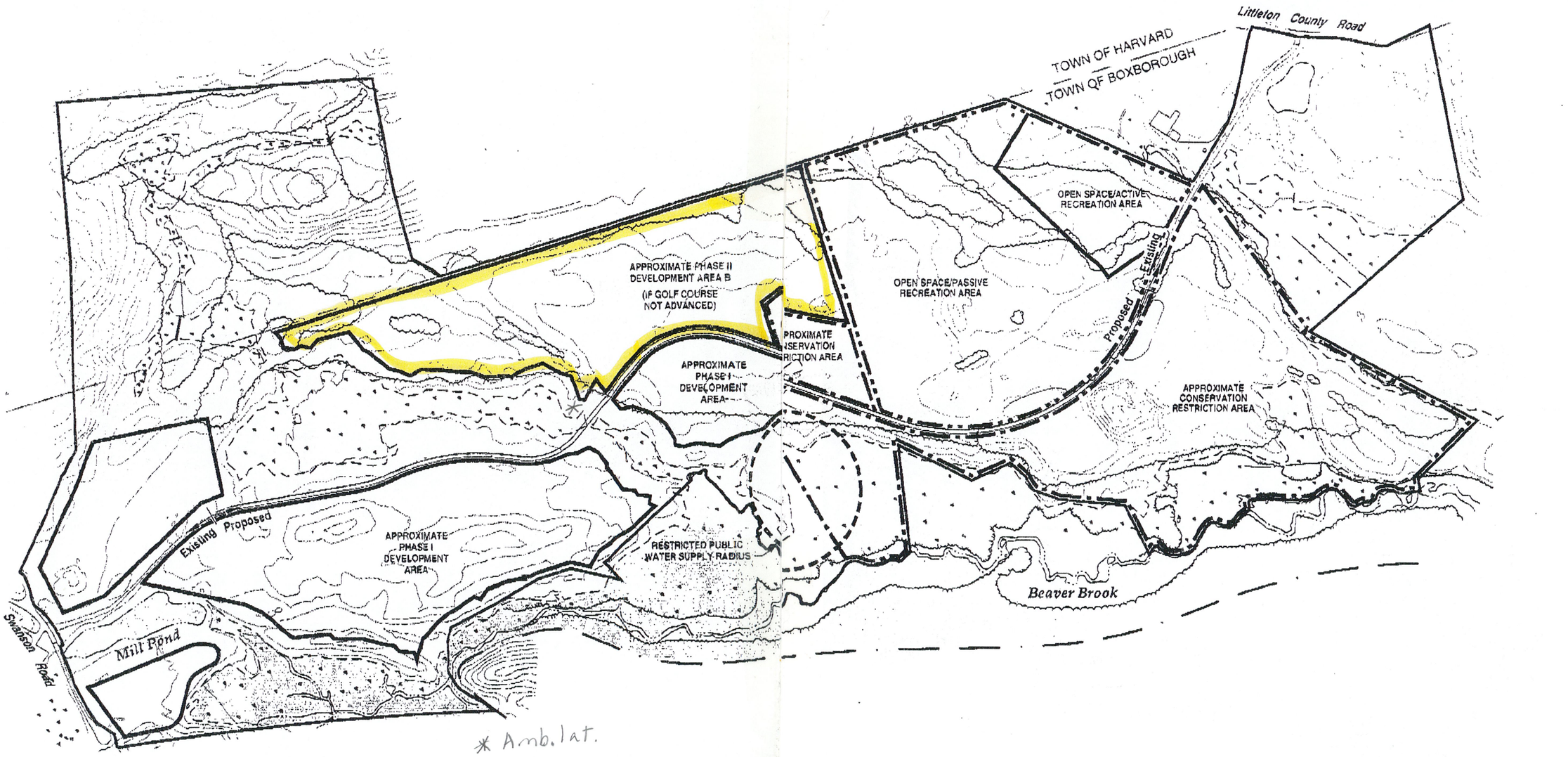
1. CONSTRUCTION BARRIERS ARE INTENDED TO PREVENT JUVENILE AND ADULT TURTLE PASSAGE. DESIGN MAY INCLUDE MATERIALS SELECTED TO PERMIT DISCHARGE OF STORMWATER RUNOFF.
2. TEMPORARY CONSTRUCTION BARRIER TO BE REMOVED UPON COMPLETION OF TURTLE MIGRATION CORRIDOR AND APPROVAL BY NHESP.
3. TEMPORARY CONSTRUCTION BARRIER TO BE CONSTRUCTED USING SIMILAR METHODS AND MATERIALS AS "CONSTRUCTION BARRIER".
4. EXISTING STOCKPILE AREA #1 MAY BE ACCESSED DURING CONSTRUCTION UNTIL APRIL 1, 2003.
5. EXISTING STOCKPILE AREA #2 MAY BE ACCESSED FROM SEPTEMBER 1, THROUGH APRIL 1, OR AT OTHER TIMES UPON CONSULTATION WITH NHESP.
6. CONSTRUCTION OF BEAVER BROOK ROAD BETWEEN A AND A' REQUIRES CONSTRUCTION OF 3 TURTLE MIGRATORY TUNNELS AS SHOWN ON TURTLE PROTECTION MEASURES PLAN, OR AS OTHERWISE APPROVED BY NHESP.
7. CONSTRUCTION OF SUBSURFACE SEWER DISPOSAL SYSTEM ON LOT 4 IS A PERMITTED PHASE I ACTIVITY NO DISTURBANCE IS PROPOSED WITHIN 100 FEET OF THE ISOLATED WETLAND (WETLAND 10).

Towermarc Business Park
Conservation Plan
Phase I
Construction Barriers

Figure 1
Attachment H

To NANCY PUTNAM	From CHRIS
Co./Dept.	Co. NHESP
Phone #	Phone #
Fax # 413-323-9623	Fax #

EV 06825 Graphics Figures 5626-CL1.dwg



* Amb. lat.

- Vegetated Wetland
- Project Site
- Limit of Clearing/Grading or Existing Treeline
- Limit of Bank
- Approximate De nt Activity Areas
- Approximate Co n Areas
- Approximate Re Open Space Are
- Restricted Public Water Supply Radius

Vanasse Hangen Brustlin, Inc.

Attachment I

Phase IIB Site Plan
Alternate Development
Towermarc Business Park / Golf Course
Boxborough, Massachusetts