Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

54 Tuttle Place
Middletown, Connecticut 06457
860 632-1500
FAX 860 632-7879

Memorandum

To: Nicole Dentamaro
Environmental/GIS Analyst

Date: March 10, 2008

Project No.: 40999.16

From: Dean Gustafson
Professional Soil Scientist

Re: Proposed Optasite Facility
497A Wickham Road
Glastonbury, Connecticut

Vanasse Hangen Brustlin, Inc. (VHB) has completed a determination of NEPA compliance for listed category item 7, significant change in surface features (e.g., wetland fill, etc.) for the following Site.

Project Site:

State: Connecticut
County: Hartford
Address: Wickham Road, Glastonbury
Latitude/Longitude Coordinates: N41°42'04.0" W72°33'50.5"
Size of Property: ±12.15 acres
Watershed: Hubbard Brook (basin # 4007)

The proposed Optasite communications facility and associated infrastructure (e.g., access drive, utilities, etc.) are located on the west side of a 12.15± acre property. A forested wetland system consisting of an unnamed, shallow perennial watercourse and associated bordering wetlands transects the property from south to north. Wetlands were identified and delineated by Kleinfelder, as detailed in the attached June 25, 2007 delineation report. The watercourse receives inputs from associated bordering hillside seeps as well as runoff from Route 2. Evidence of road runoff and stormwater inputs are apparent in the presence of alluvial (road) sand deposits on terraces above the eroded stream channel. The proposed access road would enter the property in the northeast corner, south of an existing driveway. The access road would generally follow the east and south property boundary lines, within a narrow forested strip adjacent to cleared areas, before entering the forested portion of the lot east of the riparian corridor. The access road would cross the watercourse (a 10± foot wide channel) and associated bordering wetlands for a distance of approximately 52 linear feet, before entering the facility compound located in uplands west of the riparian corridor.

The proposed wetland/watercourse crossing in support of Optasite's development includes placement of fill material to create a stable road base and placement of a 6-foot by 6-foot box culvert for the stream crossing. Improvements to the wetland crossing will result in permanent wetland fill of 2,852± square feet (SF) as reported by Clough Harbour & Associated LLP and shown on Sheet Number D01, Culvert Details (see attached).

Under NEPA compliance with respect to wetland/waterway impacts, in order to determine if a proposed project results in a "significant environmental effect" and as a result an Environmental Assessment (EA) would need to be prepared, a project is evaluated against the Corps' minimal impact threshold criteria to "Waters of the U.S." (e.g., wetlands, waterways, etc.). Generally, if a project is determined to satisfy the requirements of a Category 1 project (minimal impact and eligible without screening by reviewing agencies) under the Department of the Army Programmatic General Permit (PGP) State of Connecticut (effective May 311, 2006, expiration date May 31, 2011) it is not considered to result in a significant environmental effect and a Finding of No Significant Impact (FONSI) could be issued for the NEPA listed category item 7. In order to support this conclusion, a careful review of the PGP criteria for Category 1 is necessary.

For the proposed wetland/watercourse crossing improvements, the following criteria are required in order to be eligible under Category 1 of the PGP (refer to the PGP for further details).

> *Unconfined in-stream work, including construction, installation or removal of cofferdam structures or placement of fill, is limited to the period July 1 through September 30 except in instances where a specific written exception has been issued by the CT DEP.*
>
> *Less than 5,000 SF of Inland Waters, Waterway and/or Wetland Fill and Secondary Impacts. Fill impacts include all temporary and permanent fill and excavation discharges resulting from a single and complete project, see #5 of General Requirements. Secondary impacts include but are not limited include to impacts to inland waters, waterways or wetlands drained, dredged, flooded, cleared or degraded resulting from a single and complete project. (See 40 CFR 230.11 (g) and (h))*
>
> ***Driveway/Roadway Crossings.*** *The following are required for driveway/roadway crossings constructed on brooks, streams, rivers and their tributaries. These provisions do not apply to crossings of drainage ditches or waters with no definable channel.*
>
> - ***Driveway or Roadway crossings using a culvert provided:***
> - *the tributary watershed to the culvert is ≤ 1.0 sq. mile (640 acres),*
> - *the culvert gradient (slope) is no steeper than the streambed gradient immediately upstream or downstream of the culvert,*
> - *for a crossing constructed using a pipe culvert, the inverts are set such that ≥ 25% of the pipe or 12", whichever is less, is set below the streambed elevation,*
> - *the culvert is backfilled with natural substrate material matching upstream and downstream streambed substrate,*
> - *the structure does not otherwise impede the passage of fish and other aquatic organisms, and*
> - *the structure allows for continuous flow of the 50-year frequency storm flows.*

The proposed wetland/watercourse crossing design carefully considered these requirements (a.k.a., natural stream crossing design standards) in order to be compliant with a Category 1 determination. First, the wetland fill required to improve the existing wetland/watercourse crossing total 2,850 SF, less than the 5,000 SF trigger. Also, the tributary watershed to the existing culvert is approximately 48.7 acres, well below the 640 acre limit; refer to attached Hydrologic & Hydraulic Assessment report prepared by Clough Harbour & Associates LLP, dated November 21, 2007. In addition, the 6-foot by 6-foot box culvert will have a gradient no steeper than the existing upstream or downstream gradients and will be set 12 inches below the streambed elevation and backfilled with natural streambed substrate. The culvert proposed will not impede fish or aquatic organism movement and allow for unimpeded flow of the 50-year design storm.

As a result of careful adherence to the Corps' natural stream crossing design standards, the proposed wetland/watercourse impacts associated with Optasite's development are considered eligible under Category 1 of the PGP and therefore a Finding of No Significant Impact for NEPA listed category item 7 is provided.

Attachments

- Wetland & Watercourse Delineation Report, Kleinfelder, June 25, 2007
- Sheet No. D01 – Culvert Details, Clough Harbour & Associates LLP, 06/15/07
- Hydrologic & Hydraulic Assessment, Clough Harbour & Associates LLP, November 21, 2007

KLEINFELDER
EXPECT MORE®

June 25, 2007

Mr. Paul Lusitani
Clough Harbour & Associates, LLP.
2139 Silas Deane Highway
Suite 212
Rocky Hill, CT 06067-2336

RE: Wetland & Watercourse Delineation Report
618 Neipsic Road a.k.a. 497a Wickham Rd
Glastonbury, Connecticut

Dear Mr. Lusitani:

Kleinfelder East, Inc. (Kleinfelder) completed an on-site investigation to determine the presence or absence of wetlands and/or watercourses on the above referenced property (618 Neipsic Road a.k.a. 497a Wickham Rd, Glastonbury, CT), as requested and authorized. This investigation involved a wetland/watercourse delineation that was completed by a qualified staff soil scientist and conducted in accordance with the principles and practices noted in the United States Department of Agriculture (USDA) Soil Survey Manual (1993). The soil classification system of the National Cooperative Soil Survey was used in this investigation to identify the soil map units present on the project site.

INVESTIGATION

The project site was investigated on June 5, 2007, with a temperature in the mid-70s under partly sunny conditions. Soil types are identified by observing soil morphology (soil texture, color, structure, etc.). To observe the morphology of the soils, numerous test pits and/or hand borings (generally to a depth of at least two feet) are completed. Wetland and watercourse boundaries were identified with flags and hung from vegetation. These flags are labeled "Wetland Delineation", numbered consecutively, and generally spaced a maximum of approximately 50 feet apart. It is important to note that flagged wetland and watercourse boundaries are subject to change until verified by local, state, or federal regulatory agencies.

REGULATORY INFORMATION

Wetlands and watercourses are regulated by both state and federal law each with different definitions and regulatory requirements. Accordingly, the State may regulate waters that fall outside of federal jurisdiction; however, where federal jurisdiction exists concurrent State jurisdiction is almost always present.

State Regulation

Wetland determinations are based on the presence of poorly drained, very poorly drained, alluvial, or floodplain soils and submerged land. *Watercourses* are defined as "rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon the state or any portion thereof." *Intermittent watercourse* determinations are made based on the presence of a defined permanent channel and bank, and two of the following characteristics: (1) evidence of scour or deposits of recent alluvium or detritus, (2) the presence of standing or flowing water for a duration longer than a

particular storm incident, and (3) the presence of hydrophytic vegetation. (See Inland Wetlands and Watercourses Act §22a-38 CGS.)

Federal Regulation

The United States Army Corps of Engineers (ACOE) regulate "Waters of the Untied States" under Section 404 of the Clean Water Act, which includes adjacent/tributary wetlands and watercourses. The New England Region of the ACOE has issued guidance documents discussing how wetlands and/or watercourses can be as much as 500 or more feet from regulated Waters of the U.S. and still be regulated if the Corps finds scientific indicators (e.g. ecological/biological/hydrological) that provide connections to the jurisdictions wetland. This guidance distance has been developed by the Corps New England Region based on research suggesting home range and migratory distances of 54 palustrine/riparian (wetland and watercourse) reptiles, amphibians and mammals. Discontinuities between jurisdictional Waters of the U.S. and neighboring wetlands can cause isolation of those wetlands or watercourse, which in turn can eliminate federal jurisdiction. The Corps use a three (3) parameter approach to wetland delineation that includes soils, hydrology and vegetation. It is necessary to successfully observe all three in order for the area to be considered a federal wetland in addition to it being "adjacent" to Waters of the U.S. Disturbed and atypical conditions allow for some modification of this requirement and invoke professional judgment.

Generally, in accordance with the Connecticut Programmatic General Permit (PGP), the Corps requires a permit application for activities of one (1) acre or greater affecting federal jurisdictional wetland areas or if special wetlands occur (these are defined in the PGP document).

WETLAND AND WATERCOURSE SITE DESCRIPTION

Wetland classifications used to identify the type of wetland(s) occurring on the project site are based on guidance from the U.S. Fish and Wildlife Service (USFWS) (Cowardin et.al. 1979). These are further qualified with the Hydrogeomorphic Method of wetland classification (Brinson, 1993). Photographs of the wetland/watercourse and upland habitats are attached.

The on-site wetland that was delineated consisted of a lacustrine unconsolidated bottom and emergent wetland system (USFWS class: LUB1C and LEM2E) which is seasonally flooded. Surrounding this system was a palustrine forested - emergent wetland system (USFWS class: PFO1 and PEM1) that was associated with the stream. These wetlands were delineated using sequentially numbered flags 1-17 (open end), 50 (open end) – 118 (open end), and 150 (open end) – 175. This wetland area is situated along an unnamed stream which receives overland flow form both the surrounding uplands and runoff from State Route 2, which borders the wetland to south. Water flows in a generally southern direction and ends in a small pond at the northern end of the property associated with Hubbard Brook. The wetland system on-site consists of the immediate edges of the stream, as well as, other seasonally saturated areas surrounding the stream where water ponds during high flow events. In general, the majority of the stream has 1 to 2 inches of water, with the outside edges of turning the channel containing as much as 6 inches. The water which falls on the surrounding uplands during a rain event tends to flow directly into the stream, as well as, flatter areas with the uplands surrounding the stream. Vegetation in these areas is thick and consists mostly of facultative and wetter species.

TABLE 1: Predominate Vegetation within and adjacent to the wetlands (Common (*Scientific)* names)

TREES & SAPLINGS
Green ash (*Fraxinus pennsylvanica*)
Pin oak *(Quercus palustris)*
Red maple *(Acer rubrum)*
Red oak *(Quercus rubra)*
Sweet birch *(Betula lenta)*
White pine (*Pinus strobus)*
Atlantic White Cedar (Chamaecyparis thyoides)
Yellow birch *(Betula alleghaniensis)*
SHRUBS
Rosebay Rhododendron (*Rhododendron maximum)*
HERBS/VINES
Slender blue iris *(Iris prismatica)*
Cinnamon fern *(Osmunda cinnamomea)*
Sensitive fern (*Onoclea sensibilis*)
Skunk cabbage (*Symplocarpus foetidus*)
Virginia creeper *(Parthenocissus quinquefolia)*
*Denotes State non-native invasive species

SOIL MAP TYPES

A brief description of each soil map unit identified on the project site is presented below including information from the Untied States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil descriptions. Further information on these and other soils, please refer to the internet site at http://soils.usda.gov/technical/classification/osd/index.html). The soil survey map and soil identification pages for the project site are attached.

Upland Soils

Manchester (MgB) gravelly sandy loam, 3 to 45 percent slopes
The Manchester series consists of very deep, excessively drained soils formed in sandy and gravelly glacial outwash and stratified drift. They are nearly level to steep soils on outwash plains, terraces, kames, deltas and eskers. Slope ranges from 0 to 45 percent, approximately 3% on site. The soils formed in sandy and gravelly glaciofluvial materials and stratified drift derived mainly from a red sedimentary rocks and basalt. Diagnostic horizons in this pedon include an Ochric epipedon from 0 to 9 inches, a sandy-skeletal particle-size control section from 10 to 40 inches and no diagnostic subsoil.

Hartford sandy loam, 0 to 3 percent slopes
The Hartford series consists of very deep, somewhat excessively drained soils formed in sandy glacial outwash. They are nearly level to strongly sloping soils on plains and terraces. Slope ranges from 0 to 8 percent. Saturated hydraulic conductivity is high in the surface layer and subsoil and high or very high in the substratum. Diagnostic horizons in this pedon include an ochric epipedon from 0 to 8 inches (Ap horizon), and a cambic horizon in the zone from 8 to 26 inches (Bw1 and Bw2 horizons).

Wetland Soils

Saco (108) silt loam
Saco soils are nearly level soils on flood plains, along rivers and streams. They are in depressed areas. Slope ranges from 0 to 2 percent. The soils formed in recent silty alluvium derived mostly from granite, gneiss, schist, shale and sandstone. In places water is ponded on the surface from late fall through early

spring. Permeability is moderate in the silty layers and rapid or very rapid in the underlying sandy materials. These soils flood in the spring and after periods of heavy rainfall.

REFERENCES

1. Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. Tech. Rpt.WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

2. Cowardin, L.M., V. Carter, F.C. Golet, E.T. LaRoe. 1979. Classification of Wetland and Deepwater Habitats of the Untied States. US Government Printing Office. Washington D.C. GPO 024-010-00524-6.103 pp.

CLOSING

Thank for the opportunity to work with you on this project. Please contact me at (860) 683-4200 if you have any questions or require additional assistance.

Very truly yours,
Kleinfelder East, Inc.

Date:
2007.07.02
20:24:43 -04'00'

Paul Wheeler
Project Wetland Scientist

Date: 2007.07.02
20:24:12 -04'00'

Jeffrey R. Shamas, CE, SS, PWS
Natural Resources Program Manager

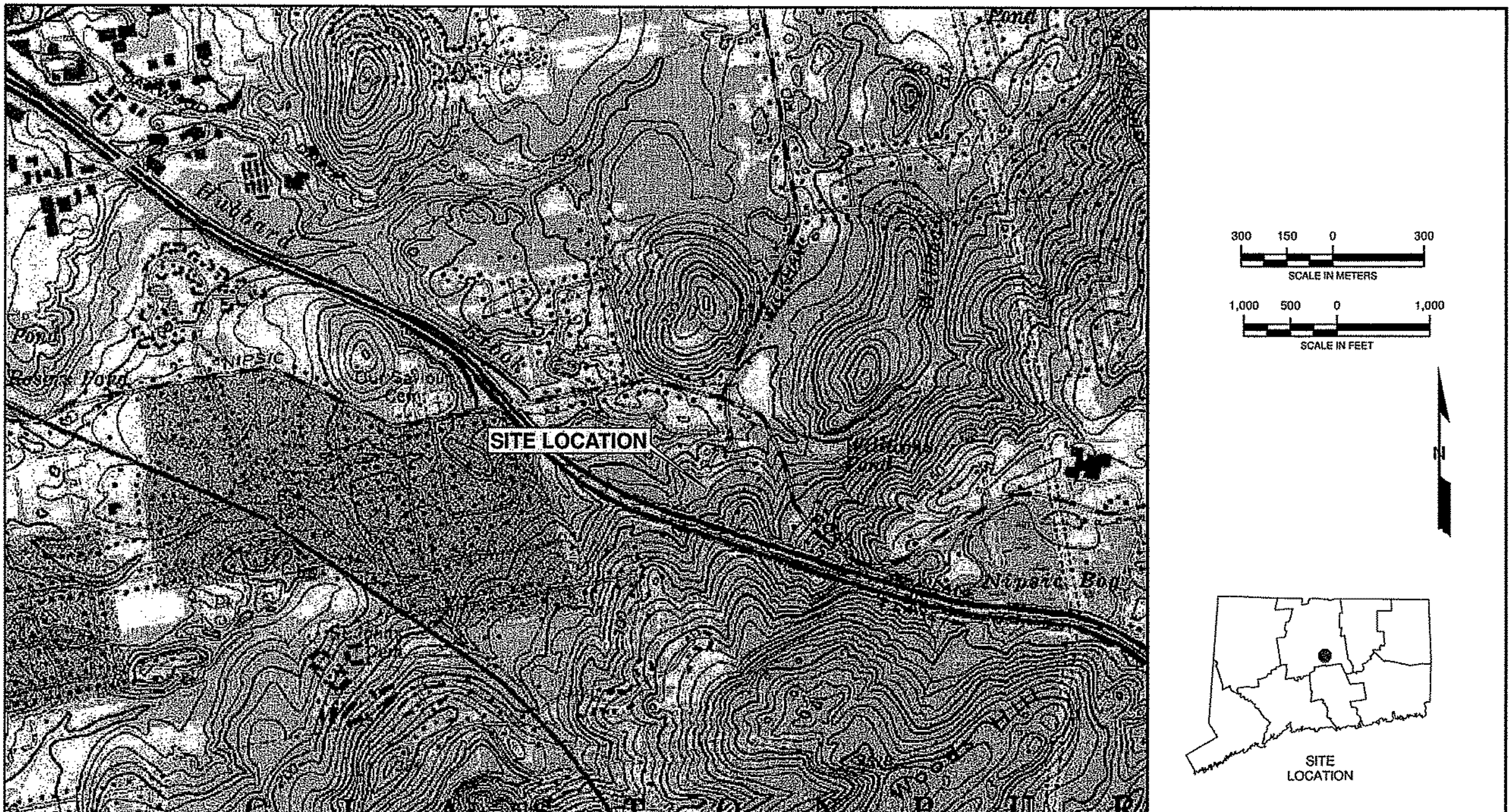
Attachments

Photographs

Cover types within Wetland Area

Stream and a portion of the associated wetland within the project Site

Site Location Map



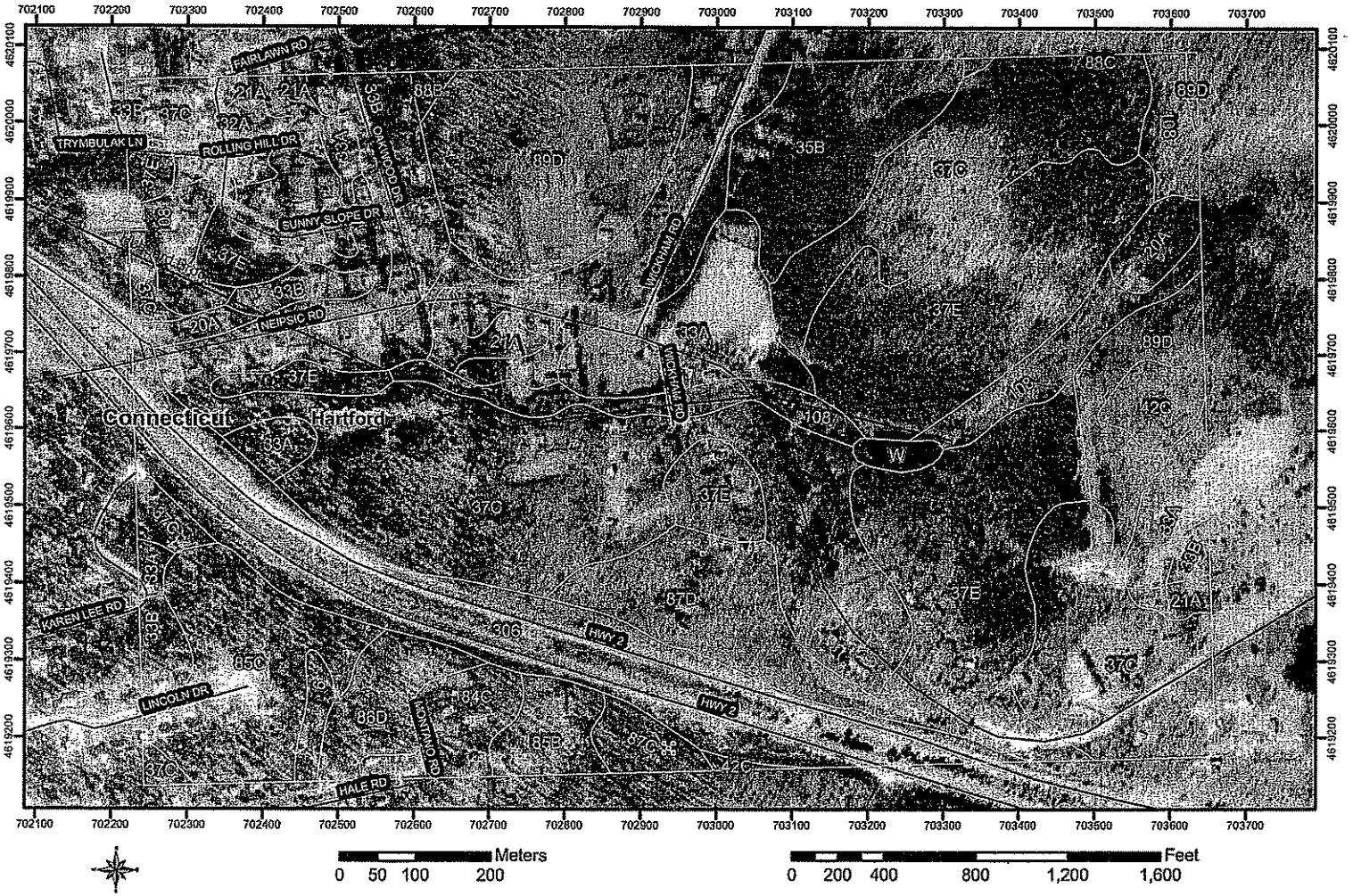
DRAWN BY: PW	**KLEINFELDER**	**SITE LOCATION MAP**	FIGURE
REVISED BY: PW	7 AIRPORT PARK BLVD LATHAM, NEW YORK 12110 PH. (518) 786-8750 FAX. (518) 786-8755 www.kleinfelder.com	CLOUGH HARBOUR & ASSOCIATES, LLP. 618 NEIPSIC ROAD a.k.a 497a WICKHAM ROAD HARTFORD COUNTY GLASTONBURY, CONNECTICUT	**1**
CHECKED BY: JS			
DATE: 6/8/07 / APPROVED BY: JS	SOURCE: CONNECTICUT DEP GIS DATA DEPOT		

G:\EPP Projects\Neipsic rd\Site_Location.mxd

Soil Survey Map and
Associated Information

SOIL SURVEY OF STATE OF CONNECTICUT

Neipsic Rd Soils



Neipsic Rd Soils

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 18

Soil Survey Area: State of Connecticut
Spatial Version of Data: 4
Soil Map Compilation Scale: 1:12000

Map comprised of aerial images photographed on these dates:
4/23/1990; 3/24/1997

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

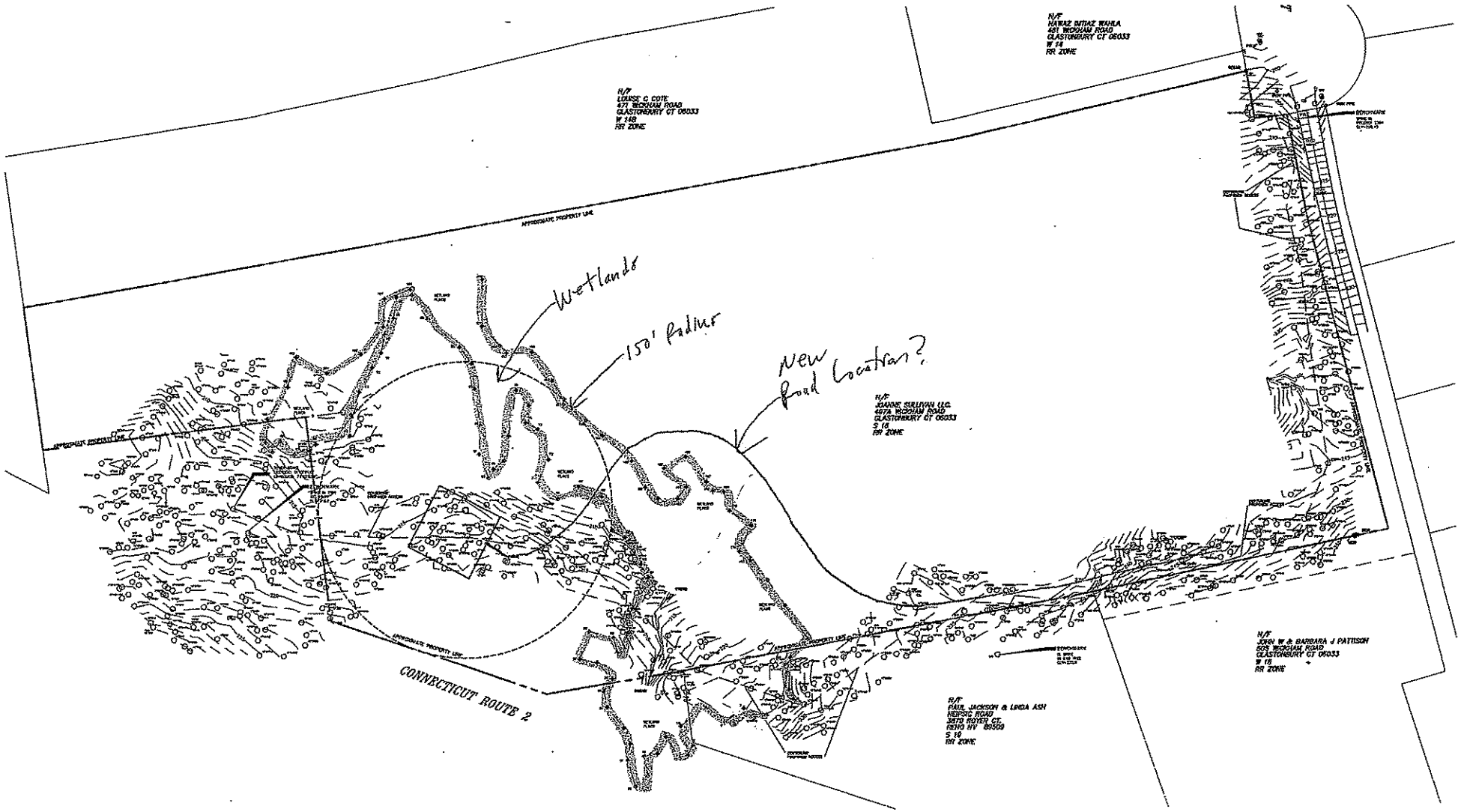
Map Unit Legend Summary

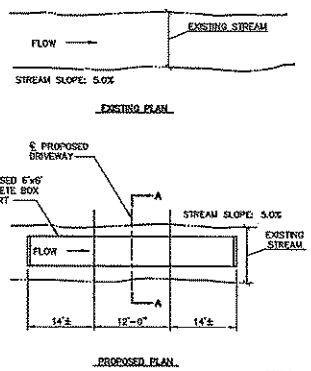
State of Connecticut

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6	Wilbraham and Menlo soils, extremely stony	1.3	0.4
20A	Ellington silt loam, 0 to 5 percent slopes	3.5	1.1
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	3.7	1.1
32A	Haven and Enfield soils, 0 to 3 percent slopes	1.8	0.5
33A	Hartford sandy loam, 0 to 3 percent slopes	17.6	5.4
33B	Hartford sandy loam, 3 to 8 percent slopes	11.9	3.7
35B	Penwood loamy sand, 3 to 8 percent slopes	12.2	3.8
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	105.4	32.4
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	52.7	16.2
42C	Ludlow silt loam, 2 to 15 percent slopes, extremely stony	3.2	1.0
84C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes	4.7	1.4
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	3.8	1.2
85C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes, very stony	13.7	4.2
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	5.2	1.6
87C	Wethersfield loam, 8 to 15 percent slopes	2.4	0.7
87D	Wethersfield loam, 15 to 25 percent slopes	10.7	3.3
88B	Wethersfield loam, 3 to 8 percent slopes, very stony	0.5	0.2
88C	Wethersfield loam, 8 to 15 percent slopes, very stony	0.1	0.0
89D	Wethersfield loam, 15 to 35 percent slopes, extremely stony	25.6	7.9
108	Saco silt loam	16.4	5.0

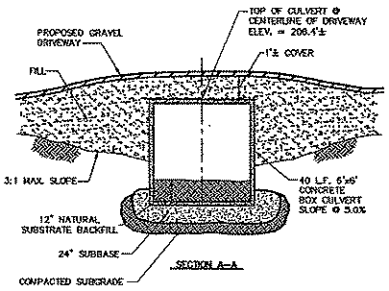
State of Connecticut

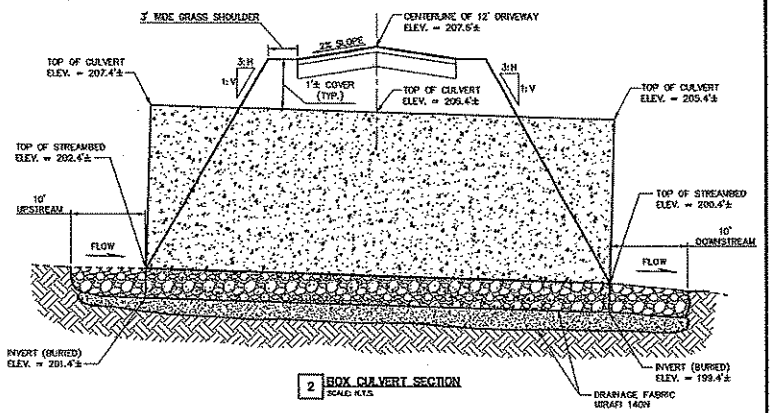
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
306	Udorthents-Urban land complex	28.3	8.7
W	Water	1.0	0.3


N/F
HAWAZ IMTIAZ WAHLA
481 WICKHAM ROAD
GLASTONBURY CT 06033
W 14
RR ZONE
N/F
LOUISE C COTE
471 WICKHAM ROAD
GLASTONBURY CT 06033
W 14B
RR ZONE
Wetlands
150' radius
New Road Location?
N/F
JOANNE SULLIVAN LLC.
497A WICKHAM ROAD
GLASTONBURY CT 06033
S 16
RR ZONE
CONNECTICUT ROUTE 2
N/F
PAUL JACKSON & LINDA ASH
HERSIG ROAD
3472 RIVER CT.
RENO NV 89509
S 16
RR ZONE
N/F
JOHN W & BARBARA J PATTISON
509 WICKHAM ROAD
GLASTONBURY CT 06033
W 16
RR ZONE

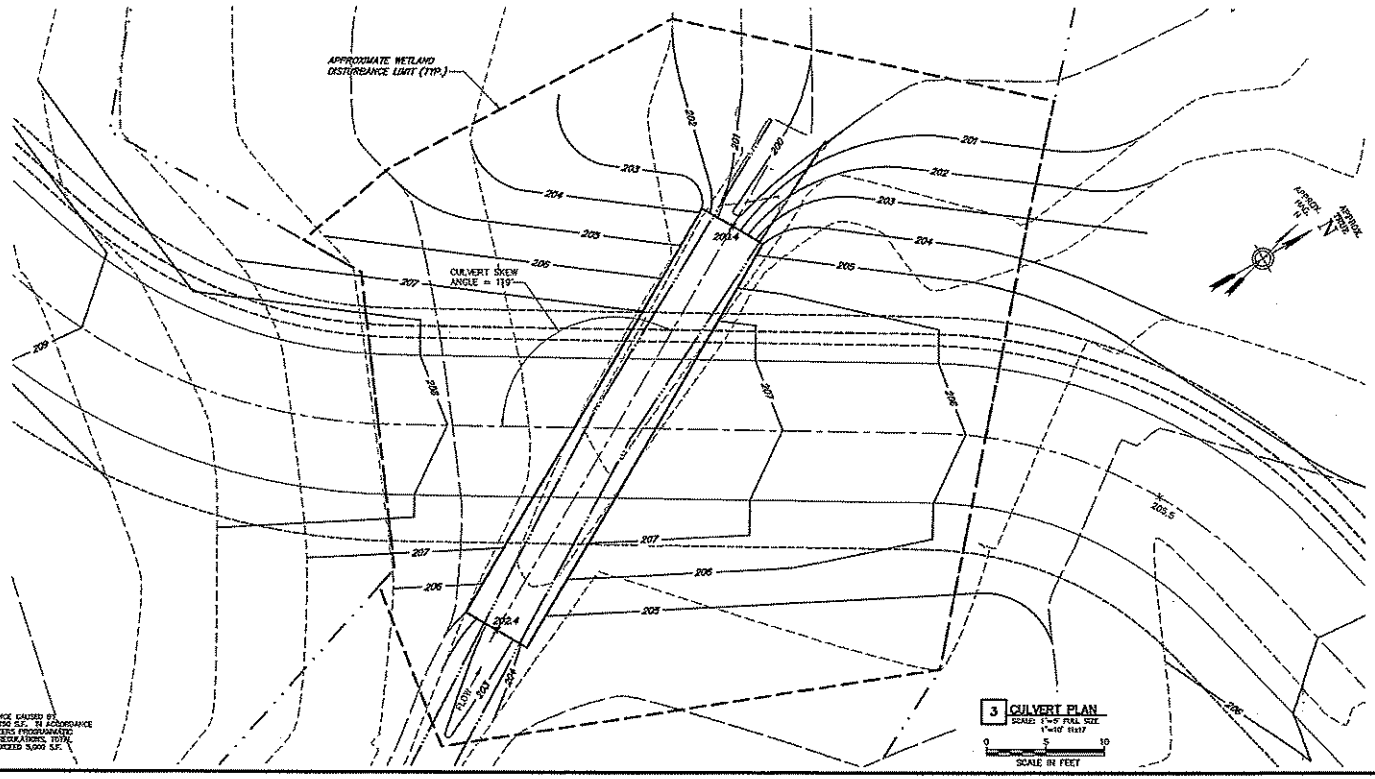


1 BOX CULVERT DETAIL
SCALE: N.T.S.





2 BOX CULVERT SECTION
SCALE: N.T.S.



3 CULVERT PLAN
SCALE: 1"=5' FULL SIZE
1"=10' HALF
0 5 10
SCALE IN FEET

NOTE:
APPROXIMATE WETLAND DISTURBANCE CAUSED BY CONSTRUCTION OF CULVERT IS 2,250 S.F. IN ACCORDANCE WITH THE ARMY CORPS OF ENGINEERS PROGRAMATIC GENERAL PERMIT – CATEGORY 1 (SECTION 10/404). WETLAND DISTURBANCE CANNOT EXCEED 5,000 S.F.

Optasite

OPTASITE TOWERS LLC
1 RESEARCH DRIVE, SUITE 200C
WESTBOROUGH, MA 01581

CHA

CLOUGH HARBOUR & ASSOCIATES LLP
2139 Silas Deane Highway, Suite 212, Rocky Hill, CT 06067-2328
Main: (860) 257-8201 • www.cloughharbour.com

CHA PROJECT NO:
15383 – 1010 – 1601

NO.	SUBMITTAL		
0	05/15/07	ISSUED FOR REVIEW	
	ENG. REVIEW	CHC REVIEW	APPD. TO OPS

SITE ID:
CT-999-0101

SITE NAME:
MONTANO

SITE ADDRESS:
497A WICKHAM ROAD
GLASTONBURY, CT
06033
HARTFORD COUNTY

SHEET TITLE
CULVERT DETAILS

SHEET NUMBER
D01

CLOUGH HARBOUR & ASSOCIATES LLP

November 21, 2007

Mr. Keith Coppins
Optasite Towers LLC
1 Research Drive, Suite 200C
Westborough, MA 01581

RE: Hydrologic & Hydraulic Assessment @ Montano Cell Site - 497A Wickham Road, Town of Glastonbury, Hartford County, Connecticut; CHA Project 15363-1010

Mr. Coppins:

Clough Harbour & Associates LLP (CHA) has completed the hydrologic and hydraulic evaluations for the above mentioned roadway crossing. The purpose of this letter report is to: (1) quantify the design flow rates for the contributing watershed; (2) evaluate the existing hydraulic conditions; and (3) specify the hydraulic opening (culvert size) of the proposed structure that is necessary to meet the Category 1 design standards of the U.S. Army Corps of Engineers Programmatic General Permit for Connecticut.

HYDROLOGIC EVALUATION

The culvert crossing under the roadway at 497A Wickham Road conveys an unnamed and unclassified tributary of Hubbard Brook (Class B/A waterway). The drainage area upstream of the crossing is approximately 48.7 acres (0.076 mi^2) (See Watershed Map). Aerial photos of the watershed show that it is primarily composed of forested and residential area, and is intersected by State Route 2. The USGS Glastonbury Quadrangle Map indicates that the predominant landform is moderately to steeply sloped hills, with elevations ranging from 500± ft along the northeastern watershed boundary to 200± ft at the upstream face of the proposed culvert location.

In order to evaluate the potential impacts associated with the development of the site, existing and proposed condition hydrographs were generated using a type III rainfall distribution. Rainfall amounts were referenced from Appendix B of the Connecticut Department of Transportation Drainage Manual dated October 2000. The 24-hour rainfall amounts for the 2-, 5-, 10-, 50-, and 100-year design storms in Hartford County are 3.2-, 4.1-,

4.7-, 6.2-, and 6.9-inches, respectively.

Runoff curve numbers and times of concentration were computed using standard NRCS TR-55 methodology. Additionally, peak stormwater flows and hydrographs for the existing and post development conditions were computed using the Haestad Method's Pondpack Hydrology Program (Version 10.0).

The results of the hydrologic analysis are presented in Table 1 below and detailed calculations are included in the technical appendix.

Table 1 - Summary of Design Flows

Design Point Location	Drainage Area	Watershed Area (acres)	Peak Discharges (ft^3/sec)				
			2-year	5-year	10-year	50-year	100-year
Montano Cell Site at 497A Wickham Road	DA-1A	4.92	1.0	2.5	3.8	7.5	9.4
	DA-1B	3.50	4.1	5.9	7.1	10.2	11.6
	DA-1C	40.28	16.3	31.6	43.0	74.7	90.6
	Totals:	*48.7*	*21.4*	*39.7*	*53.3*	*91.2*	*110.0*

HYDRAULIC EVALUATION

Basis of Design

In accordance with the engineering guidelines established by the Category 1 Requirements of the U.S. Army Corps of Engineers, driveway/roadway crossings constructed on brooks, streams, rivers and their tributaries must be designed to allow for continuous flow of the 50-year frequency storm flows. For a crossing constructed using a single box culvert, the inverts must be set a minimum of 12 inches below the streambed elevation and the culvert slope must also be no steeper than the streambed gradient immediately upstream or downstream of the culvert. The hydraulic performance of a culvert is commonly expressed as a ratio of depth of water measured from the invert of the culvert to the diameter or rise of the culvert (HW/D). As such, ConnDOT requirements specify that a HW/D ratio less than or equal to 1.5 must be used as a design standard for the culvert design.

CHA

Design Methodology

The roadway crossing for the Montano Cell Site at 497A Wickham Road was analyzed using Haestad Methods CulvertMaster Computer Software (Version 3.1). This program was used to compute the headwater elevation at the culvert, evaluating both inlet and outlet control equations. The required geometry and channel slope necessary for the hydraulic evaluation was based on a combination of record information and data obtained from a recent site visit. In addition, the results of the hydraulic analysis were based on the assumption of unobstructed flow through the culvert section.

HYDRAULIC RESULTS

Proposed Condition

Several shape and size options were investigated in order to maximize the hydraulic opening of the proposed culvert while minimizing the impact and cost. The most favorable solution is to use a 6' x 6' concrete box culvert. The results of the hydraulic analysis for the box culvert chosen are summarized in Table 2 below and indicate that the proposed culvert will convey the 50-year design storm with a HW/D ratio of 0.83.

Table 2 – Summary of the Proposed Condition Hydraulic Analysis @ Montano Cell Site

Hydraulic Design Parameters	Storm Event Recurrence Interval	
	50-year	100-year
HW/D ratio	0.83	0.85
Freeboard (ft)	1.0	0.9
Outlet Velocity (ft/sec)	12.5	12.6

RECOMMENDATIONS

Based on the hydraulic analysis, the proposed concrete box culvert has excess conveyance capacity during the 50-year design storm event. The proposed culvert will provide 36 ft^2 of cross-sectional opening (6ft^2 of which

will be submerged below the streambed) and will convey the 50-year design storm with a HW/D ratio of 0.83. Additionally, discharge velocities in the downstream channel will remain essentially unchanged from the existing to the proposed condition. In summary, the results of the analysis indicate that the proposed culvert design meets the Category 1 hydraulic design guidelines established by the U.S. Army Corps of Engineers, as well as requirement set forth by the Connecticut Department of Transportation.

We trust that this letter report meets your needs. However, should you have any questions or concerns, please feel free to contact our office.

Sincerely,

CLOUGH HARBOUR & ASSOCIATES LLP

Peter L. Lilholt, Jr., P.E.
Associate

CHA

Job File: W:\Optasite\Connecticut\15363\Sites\1010 Montano B-Glastonbury\Misc\Pondpack\OPT
Rain Dir: W:\Optasite\Connecticut\15363\Sites\1010 Montano B-Glastonbury\Misc\Pondpack\

JOB TITLE

Project Date: 11/12/2007
Project Engineer: KZD
Project Title: Existing Conditions
Project Comments:
Optasite Project
Glastonbury, CT

Table of Contents

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Glastonbury

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.2000	Synthetic Curve	TypeIII 24hr
5	4.1000	Synthetic Curve	TypeIII 24hr
10	4.7000	Synthetic Curve	TypeIII 24hr
50	6.2000	Synthetic Curve	TypeIII 24hr
100	6.9000	Synthetic Curve	TypeIII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
CULVERT_IN	JCT	2	2.307		12.3500	16.30		
CULVERT_IN	JCT	5	4.052		12.3500	31.59		
CULVERT_IN	JCT	10	5.363		12.3500	42.96		
CULVERT_IN	JCT	50	9.005		12.3000	74.70		
CULVERT_IN	JCT	100	10.836		12.3000	90.60		
CULVERT_OUT	JCT	2	3.009		12.4500	21.38		
CULVERT_OUT	JCT	5	5.152		12.4500	39.65		
CULVERT_OUT	JCT	10	6.754		12.4000	53.30		
CULVERT_OUT	JCT	50	11.186		12.4000	91.20		
CULVERT_OUT	JCT	100	13.409		12.4000	110.01		
DA-1A	AREA	2	.167		12.3500	1.00		
DA-1A	AREA	5	.333		12.3000	2.53		
DA-1A	AREA	10	.463		12.3000	3.78		
DA-1A	AREA	50	.842		12.2500	7.46		
DA-1A	AREA	100	1.038		12.2500	9.37		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DA-1B	AREA	2	.534		12.3500	4.14		
DA-1B	AREA	5	.768		12.3500	5.93		
DA-1B	AREA	10	.929		12.3500	7.14		
DA-1B	AREA	50	1.340		12.3500	10.18		
DA-1B	AREA	100	1.535		12.3500	11.59		
DA-1C	AREA	2	2.307		12.3500	16.30		
DA-1C	AREA	5	4.052		12.3500	31.59		
DA-1C	AREA	10	5.363		12.3500	42.96		
DA-1C	AREA	50	9.005		12.3000	74.70		
DA-1C	AREA	100	10.836		12.3000	90.60		
*DESIGN POINT	JCT	2	3.009		12.5000	21.38		
*DESIGN POINT	JCT	5	5.152		12.5000	39.65		
*DESIGN POINT	JCT	10	6.754		12.4500	53.30		
*DESIGN POINT	JCT	50	11.186		12.4500	91.20		
*DESIGN POINT	JCT	100	13.409		12.4500	110.01		
MID_CULVERT	JCT	2	2.841		12.4000	20.42		
MID_CULVERT	JCT	5	4.820		12.4000	37.46		
MID_CULVERT	JCT	10	6.291		12.4000	50.02		
MID_CULVERT	JCT	50	10.344		12.3500	84.88		
MID_CULVERT	JCT	100	12.371		12.3500	102.19		

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::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.2000	in
Slope	.067000	ft/ft
Avg.Velocity	.14	ft/sec

Segment #1 Time: .3052 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	180.00	ft
Slope	.028000	ft/ft
Unpaved		
Avg.Velocity	2.70	ft/sec

Segment #2 Time: .0185 hrs

Total Tc: .3237 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ====

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ====

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.2000	in
Slope	.030000	ft/ft
Avg.Velocity	.10	ft/sec

Segment #1 Time: .4209 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	710.00	ft
Slope	.080000	ft/ft
Unpaved		
Avg.Velocity	4.56	ft/sec

Segment #2 Time: .0432 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	.9500	sq.ft
Wetted Perimeter	4.50	ft
Hydraulic Radius	.21	ft
Slope	.070000	ft/ft
Mannings n	.0150	
Hydraulic Length	50.00	ft
Avg.Velocity	9.32	ft/sec

Segment #3 Time: .0015 hrs

Segment #4: Tc: TR-55 Channel

Flow Area	2.8000	sq.ft
Wetted Perimeter	11.70	ft
Hydraulic Radius	.24	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	1.74	ft/sec

Segment #4 Time: .0160 hrs

Segment #5: Tc: TR-55 Channel

Flow Area	2.7000	sq.ft
Wetted Perimeter	6.30	ft
Hydraulic Radius	.43	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	2.56	ft/sec

Segment #5 Time: .0108 hrs

Segment #6: Tc: TR-55 Channel

Flow Area	2.1000	sq.ft
Wetted Perimeter	5.10	ft
Hydraulic Radius	.41	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	2.50	ft/sec

Segment #6 Time: .0111 hrs

Segment #7: Tc: TR-55 Channel

Flow Area	1.7000	sq.ft
Wetted Perimeter	4.20	ft
Hydraulic Radius	.40	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	50.00	ft
Avg.Velocity	2.47	ft/sec

Segment #7 Time: .0056 hrs

Segment #8: Tc: TR-55 Channel

Flow Area	15.9000	sq.ft
Wetted Perimeter	1.50	ft
Hydraulic Radius	10.60	ft
Slope	.005000	ft/ft
Mannings n	.0240	
Hydraulic Length	95.00	ft
Avg.Velocity	21.18	ft/sec

Segment #8 Time: .0012 hrs

Total Tc: .5104 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ====

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ====

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

==== SCS Channel Flow ==========

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000	
Hydraulic Length	150.00	ft
2yr, 24hr P	3.2000	in
Slope	.100000	ft/ft
Avg.Velocity	.16	ft/sec

Segment #1 Time: .2600 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	130.00	ft
Slope	.080000	ft/ft
Unpaved		
Avg.Velocity	4.56	ft/sec

Segment #2 Time: .0079 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	270.00	ft
Slope	.190000	ft/ft
Unpaved		
Avg.Velocity	7.03	ft/sec

Segment #3 Time: .0107 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length	463.00	ft
Slope	.060000	ft/ft
Unpaved		
Avg.Velocity	3.95	ft/sec

Segment #4 Time: .0325 hrs

Segment #5: Tc: TR-55 Channel

Flow Area	15.9000	sq.ft
Wetted Perimeter	1.50	ft
Hydraulic Radius	10.60	ft
Slope	.005000	ft/ft
Mannings n	.0240	
Hydraulic Length	200.00	ft
Avg.Velocity	21.18	ft/sec

Segment #5 Time: .0026 hrs

Segment #6: Tc: TR-55 Channel

Flow Area	.9500	sq.ft
Wetted Perimeter	4.50	ft
Hydraulic Radius	.21	ft
Slope	.070000	ft/ft
Mannings n	.0150	
Hydraulic Length	50.00	ft
Avg.Velocity	9.32	ft/sec

Segment #6 Time: .0015 hrs

Segment #7: Tc: TR-55 Channel

Flow Area	2.8000	sq.ft
Wetted Perimeter	11.70	ft
Hydraulic Radius	.24	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	1.74	ft/sec

Segment #7 Time: .0160 hrs

Segment #8: Tc: TR-55 Channel

Flow Area	2.7000	sq.ft
Wetted Perimeter	6.30	ft
Hydraulic Radius	.43	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	2.56	ft/sec

Segment #8 Time: .0108 hrs

Segment #9: Tc: TR-55 Channel

Flow Area	2.1000	sq.ft
Wetted Perimeter	5.10	ft
Hydraulic Radius	.41	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	100.00	ft
Avg.Velocity	2.50	ft/sec

Segment #9 Time: .0111 hrs

Segment #10: Tc: TR-55 Channel

Flow Area	1.7000	sq.ft
Wetted Perimeter	4.20	ft
Hydraulic Radius	.40	ft
Slope	.033000	ft/ft
Mannings n	.0600	
Hydraulic Length	50.00	ft

Avg.Velocity 2.47 ft/sec

Segment #10 Time: .0056 hrs

Segment #11: Tc: TR-55 Shallow

Hydraulic Length	1253.00	ft
Slope	.100000	ft/ft

Unpaved

Avg.Velocity 5.10 ft/sec

Segment #11 Time: .0682 hrs

Total Tc: .4271 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ====

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ====

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

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==== SCS Channel Flow ==========

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

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RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious	98	1.427			98.00
HSG D - Woods	77	.839			77.00
HSG B - Woods	55	.358			55.00
HSG A - Woods	30	2.296			30.00
COMPOSITE AREA & WEIGHTED CN --->		4.920			59.56 (60)

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RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious	98	1.236			98.00
HSG D - Open Space	80	2.260			80.00
COMPOSITE AREA & WEIGHTED CN --->		3.495			86.36 (86)

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RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious	98	.515			98.00
HSG D -Residential -2Ac.	82	5.930			82.00
HSG C - Tree Farm	72	6.155			72.00
HSG D - Woods	77	3.095			77.00
HSG C - Woods	70	8.824			70.00
HSG B - Residential 2ac.	65	.177			65.00
HSG B - Tree Farm	58	.039			58.00
HSG B - Woods	55	15.549			55.00
COMPOSITE AREA & WEIGHTED CN --->		40.285			67.14 (67)

Index of Starting Page Numbers for ID Names

Culvert Calculator Report
Worksheet-50 Year

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	206.40	ft	Headwater Depth/Height	0.80	
Computed Headwater Elev	206.40	ft	Discharge	108.20	cfs
Inlet Control HW Elev.	206.02	ft	Tailwater Elevation	202.64	ft
Outlet Control HW Elev.	206.40	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	202.40	ft	Downstream Invert	201.40	ft
Length	40.00	ft	Constructed Slope	0.025000	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.44	ft
Slope Type	Steep		Normal Depth	1.14	ft
Flow Regime	Supercritical		Critical Depth	2.16	ft
Velocity Downstream	12.53	ft/s	Critical Slope	0.003927	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.00	ft
Section Size	6 x 5 ft		Rise	5.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	206.40	ft	Upstream Velocity Head	1.08	ft
Ke	0.70		Entrance Loss	0.76	ft

Inlet Control Properties					
Inlet Control HW Elev.	206.02	ft	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	30.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
Worksheet-100 Year

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	206.50	ft	Headwater Depth/Height	0.82	
Computed Headwater Eleva	206.50	ft	Discharge	112.29	cfs
Inlet Control HW Elev.	206.11	ft	Tailwater Elevation	202.85	ft
Outlet Control HW Elev.	206.50	ft	Control Type	Entrance Control	

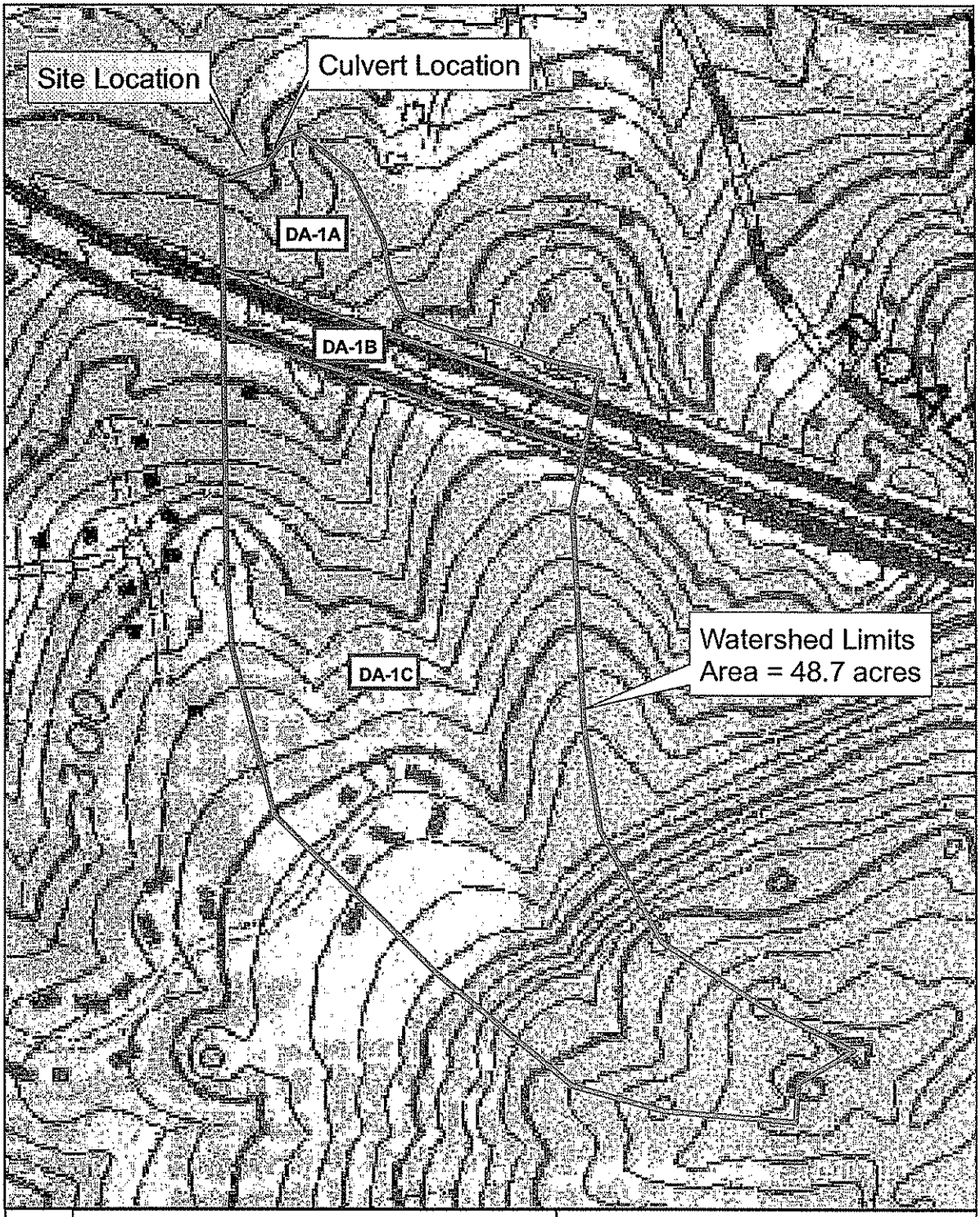
Grades					
Upstream Invert	202.40	ft	Downstream Invert	201.40	ft
Length	40.00	ft	Constructed Slope	0.025000	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.48	ft
Slope Type	Steep		Normal Depth	1.16	ft
Flow Regime	Supercritical		Critical Depth	2.22	ft
Velocity Downstream	12.63	ft/s	Critical Slope	0.003949	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.00	ft
Section Size	6 x 5 ft		Rise	5.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	206.50	ft	Upstream Velocity Head	1.11	ft
Ke	0.70		Entrance Loss	0.78	ft

Inlet Control Properties					
Inlet Control HW Elev.	206.11	ft	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	30.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				



N	CHA CLOUGH HARBOUR & ASSOCIATES LLP	**WATERSHED MAP**
	Scale 1" = 400'	**CHA File No: 15363-1010**
		OPTASITE- GLASTONBURY HARTFORD COUNTY, CONNECTICUT

SURVEY NOTES:

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300b-1 THROUGH 20-300b-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS INC. ON SEPTEMBER 26, 1996. THE BOUNDARY LINES SHOWN ON THIS PLAN WERE COMPILED FROM OTHER MAPS, RECORD RESEARCH OR OTHER SOURCES OF INFORMATION. IT IS NOT TO BE CONSTRUED AS HAVING BEEN OBTAINED AS THE RESULT OF A FIELD SURVEY, AND IS SUBJECT TO SUCH CHANGE AS AN ACCURATE FIELD SURVEY MAY DISCLOSE.

TYPE OF SURVEY: COMPILATION PLAN

BOUNDARY DETERMINATION CATEGORY: NONE

CLASS OF ACCURACY: HORIZONTAL CLASS A-2
VERTICAL CLASS V-2
TOPOGRAPHIC CLASS T-2

2. PROPERTY LINE SHOWN HEREON ARE FROM RECORD DEEDS PLOTS AND TAX MAPS AS OVERLAID ON ANY MONUMENTATION OR OTHER EVIDENCE THAT MAY HAVE BEEN LOCATED DURING THE TOPOGRAPHIC SURVEY. A PROPERTY SURVEY WAS NOT PERFORMED BY CLOUGH HARBOUR & ASSOCIATES LLP AND AS A RESULT THE PROPERTY LINES SHOWN ARE APPROXIMATE AND DO NOT PRESENT A PROPERTY/BOUNDARY OPINION.

3. BASE MAPPING PREPARED BY CLOUGH HARBOUR & ASSOCIATES LLP FROM A JUNE 2007 AND JULY 2007 FIELD SURVEY.

4. NORTH ORIENTATION IS TRUE NORTH BASED ON GPS OBSERVATIONS TAKEN AT THE TIME OF THE FIELD SURVEY.

5. UNDERGROUND UTILITIES, STRUCTURES AND FACILITIES, IF ANY, HAVE BEEN SHOWN FROM SURFACE LOCATIONS AND MEASUREMENTS OBTAINED FROM A FIELD SURVEY, THEREFORE THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. THERE MAY BE OTHER UTILITIES WHICH THE EXISTENCE OF ARE NOT KNOWN. SIZE, TYPE AND LOCATION OF ALL UTILITIES AND STRUCTURES MUST BE VERIFIED BY PROPER AUTHORITIES PRIOR TO ANY AND ALL CONSTRUCTION.

6. SUBJECT TO ANY STATEMENT OF FACTS THAT AN UP-TO-DATE ABSTRACT OF TITLE WOULD DISCLOSE.

7. SUBJECT TO ALL RIGHTS, EASEMENTS, COVENANTS OR RESTRICTIONS OF RECORD.

8. LATITUDE/LONGITUDE/ELEVATIONS WERE OBTAINED UTILIZING PACUETTE GPS AND BASE STATION, NEWINGTON CT. NAMED "CONC". LATITUDE/LONGITUDE ARE REFERENCED TO NAD83 CONNECTICUT ZONE, COORDINATES SHOWN, IF ANY, ARE EXPRESSED IN U.S. SURVEY FEET. ELEVATIONS ARE REFERENCED TO NAVD88. TOP OF STRUCTURE HEIGHT AS SHOWN, IF ANY, DETERMINED BY VERTICAL ANGLE OR BY ACTUAL LOCATION.
INFORMATION SHOWN BASED ON FAA 2C CERTIFICATION ACCURACY LEVEL DEFINED AS:
HORIZONTAL: ±50 FEET / 15 METERS
VERTICAL: ±20 FEET / 6 METERS

9. SITE FALLS WITHIN ZONE "C" DEFINED AS AREAS OF MINIMAL FLOODING AS SHOWN ON FLOOD INSURANCE RATE MAP, TOWN OF GLASTONBURY, CONNECTICUT, HARTFORD COUNTY, PANEL 3 OF 20, COMMUNITY PANEL NUMBER 090124 0003B, EFFECTIVE DATE: JUNE 15, 1978.

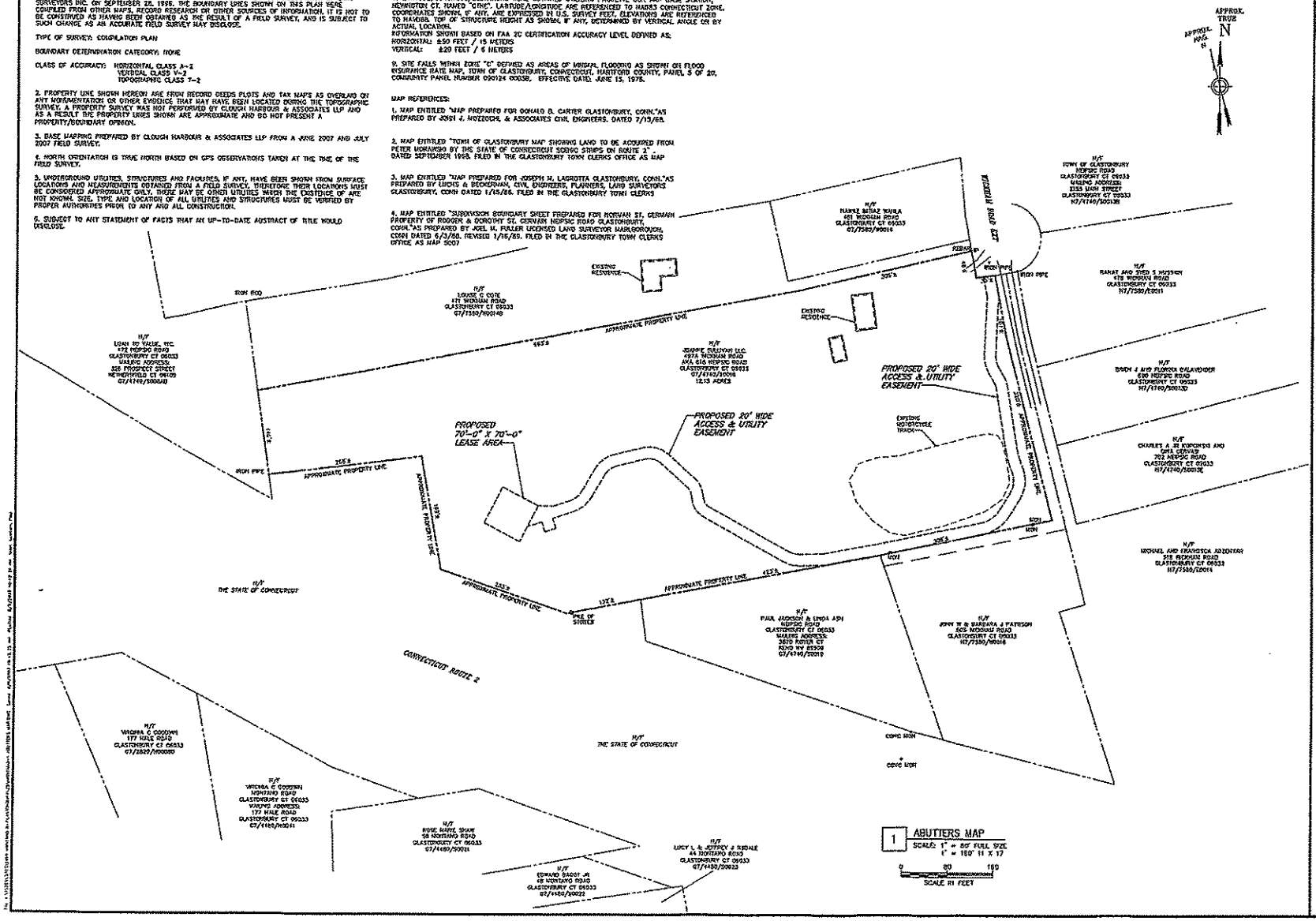
MAP REFERENCES:

1. MAP ENTITLED "MAP PREPARED FOR DONALD B. CARTER GLASTONBURY, CONN." AS PREPARED BY JOSEPH J. MOZZOCHI, & ASSOCIATES CIVIL ENGINEERS. DATED 7/13/68.

2. MAP ENTITLED "TOWN OF GLASTONBURY MAP SHOWING LAND TO BE ACQUIRED FROM PETER MORANDO BY THE STATE OF CONNECTICUT SCENIC STRIPS ON ROUTE 2". DATED SEPTEMBER 1968. FILED IN THE GLASTONBURY TOWN CLERKS OFFICE AS MAP

3. MAP ENTITLED "MAP PREPARED FOR JOSEPH M. LAGROTTA GLASTONBURY, CONN." AS PREPARED BY LYONS & BECKERMAN, CIVIL ENGINEERS, PLANNERS, LAND SURVEYORS GLASTONBURY, CONN DATED 1/15/86. FILED IN THE GLASTONBURY TOWN CLERKS

4. MAP ENTITLED "SUBDIVISION BOUNDARY SHEET PREPARED FOR NORMAN ST. GERMAIN PROPERTY OF ROGGER & DOROTHY ST. GERMAIN HOPSIC ROAD GLASTONBURY, CONN." AS PREPARED BY JOEL M. FULLER LICENSED LAND SURVEYOR MARLBOROUGH, CONN DATED 6/3/88. REVISED 1/16/89. FILED IN THE GLASTONBURY TOWN CLERKS OFFICE AS MAP 5007



1 ABUTTERS MAP
SCALE: 1" = 80' FULL SIZE
1" = 160' 11 X 17

0 80 160
SCALE IN FEET

Optasite
OPTASITE TOWERS LLC
1 RESEARCH DRIVE, SUITE 200C
WESTBOROUGH, MA 01581

CHA
CLOUGH HARBOUR & ASSOCIATES LLP
2129 Silas Deane Highway, Suite 210 - Rocky Hill, CT 06067-2339
Main: (860) 271-1127 - www.cloughharbour.com

CHA PROJECT NO
15363 - 1010 - 1501

NO.	SUBMITTAL	
0	09/09/07	ISSUED FOR REVIEW
	BY: PAL	CHK: PAL / APPD: JPS

SITE ID:
CT-999-0101
SITE NAME:
MONTANO
SITE ADDRESS:
497A WICKHAM ROAD
GLASTONBURY, CT
06033
HARTFORD COUNTY

SHEET TITLE
ABUTTERS MAP

SHEET NUMBER
A01

SURVEY NOTES:

1. THIS SURVEY WAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300b-1 THROUGH 20-300b-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS INC. ON SEPTEMBER 26, 1996. THE BOUNDARY LINES SHOWN ON THIS PLAN WERE COMPILED FROM OTHER MAPS, RECORD RESEARCH OR OTHER SOURCES OF INFORMATION. IT IS NOT TO BE CONSTRUED AS HAVING BEEN OBTAINED AS THE RESULT OF A FIELD SURVEY, AND IS SUBJECT TO SUCH CHANGE AS AN ACCURATE FIELD SURVEY MAY DISCLOSE.

TYPE OF SURVEY: COMPILATION PLAN

BOUNDARY DETERMINATION CATEGORY: NONE

CLASS OF ACCURACY: HORIZONTAL CLASS A-2
VERTICAL CLASS V-2
TOPOGRAPHIC CLASS T-2

2. PROPERTY LINE SHOWN HEREON ARE FROM RECORD DEEDS PLOTS AND TAX MAPS AS OVERLAID ON ANY MONUMENTATION OR OTHER EVIDENCE THAT MAY HAVE BEEN LOCATED DURING THE TOPOGRAPHIC SURVEY. A PROPERTY SURVEY WAS NOT PERFORMED BY CLOUGH HARBOUR & ASSOCIATES LLP AND AS A RESULT THE PROPERTY LINES SHOWN ARE APPROXIMATE AND DO NOT PRESENT A PROPERTY/BOUNDARY OPINION.

3. BASE MAPPING PREPARED BY CLOUGH HARBOUR & ASSOCIATES LLP FROM A APRIL 2007 AND JULY 2007 FIELD SURVEY.

4. NORTH ORIENTATION IS TRUE NORTH BASED ON GPS OBSERVATIONS TAKEN AT THE TIME OF THE FIELD SURVEY.

5. UNDERGROUND UTILITIES, STRUCTURES AND FACILITIES, IF ANY, HAVE BEEN SHOWN FROM SURFACE LOCATIONS AND MEASUREMENTS OBTAINED FROM A FIELD SURVEY, THEREFORE THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. THERE MAY BE OTHER UTILITIES WHICH THE EXISTENCE OF ARE NOT KNOWN. SIZE, TYPE AND LOCATION OF ALL UTILITIES AND STRUCTURES MUST BE VERIFIED BY PROPER AUTHORITIES PRIOR TO ANY AND ALL CONSTRUCTION.

6. SUBJECT TO ANY STATEMENT OF FACTS THAT AN UP-TO-DATE ABSTRACT OF TITLE WOULD DISCLOSE.

7. SUBJECT TO ALL RIGHTS, EASEMENTS, COVENANTS OR RESTRICTIONS OF RECORD.

8. LATITUDE/LONGITUDE/ELEVATIONS WERE OBTAINED UTILIZING PACQUETTE COR ARP BASE STATION, NEWINGTON CT, NAMED "CONE". LATITUDE/LONGITUDE ARE REFERENCED TO NAD83 CORRECTICUT ZONE. COORDINATES SHOWN, IF ANY, ARE EXPRESSED IN U.S. SURVEY FEET. ELEVATIONS ARE REFERENCED TO NAVD88. TOP OF STRUCTURE HEIGHT AS SHOWN, IF ANY, DETERMINED BY VERTICAL ANGLE OR BY ACTUAL LOCATION.
INFORMATION SHOWN BASED ON FAA 2C CERTIFICATION ACCURACY LEVEL DEFINED AS:
HORIZONTAL: ±50 FEET / 15 METERS
VERTICAL: ±20 FEET / 6 METERS

9. SITE FALLS WITHIN ZONE "C" DEFINED AS AREAS OF MINIMAL FLOODING AS SHOWN ON FLOOD INSURANCE RATE MAP, TOWN OF GLASTONBURY, CONNECTICUT, HARTFORD COUNTY, PANEL 9 OF 20, COMMUNITY PANEL NUMBER 090124 0009G. EFFECTIVE DATE: JUNE 15, 1978.

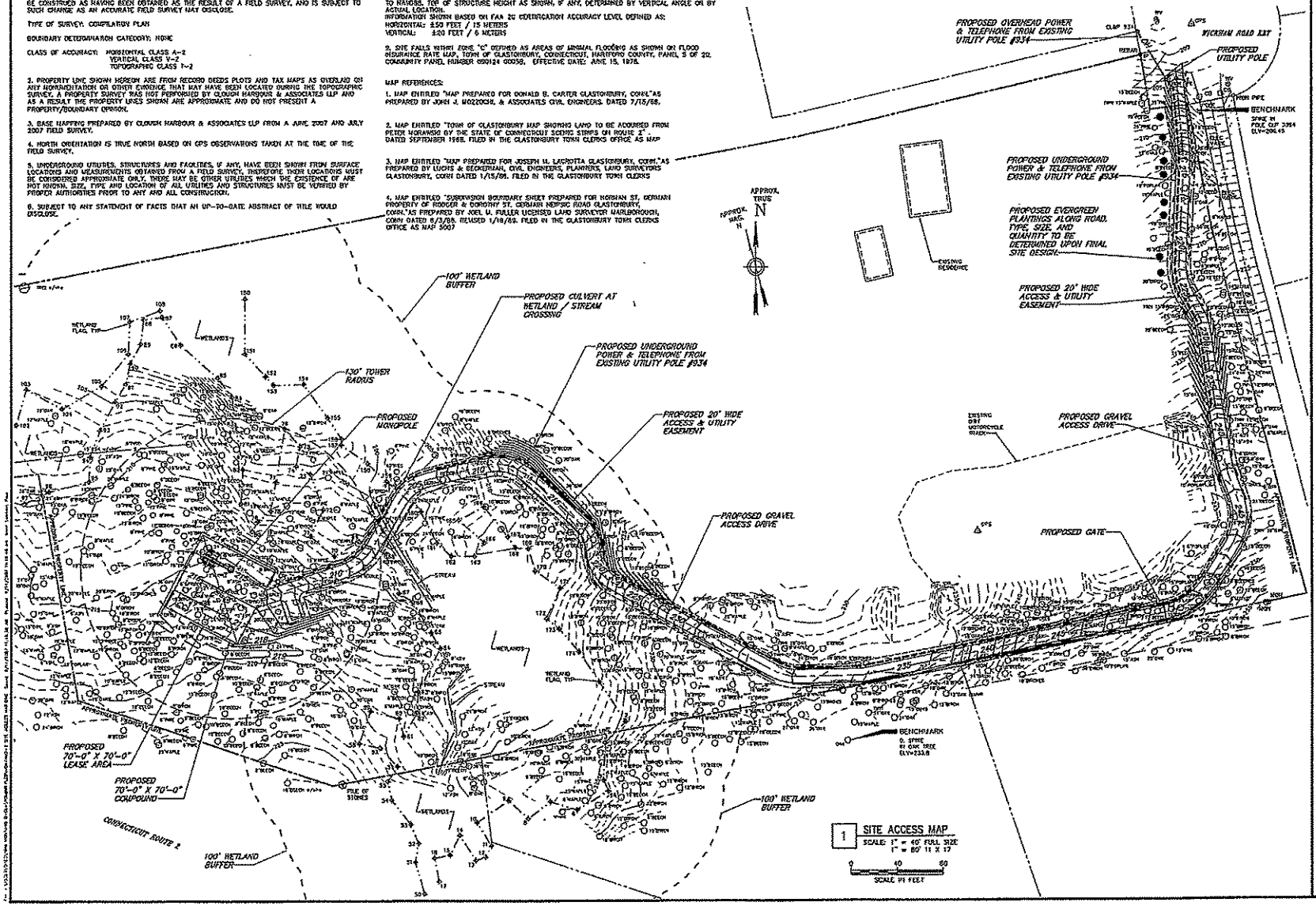
MAP REFERENCES:

1. MAP ENTITLED "MAP PREPARED FOR DONALD B. CARTER GLASTONBURY, CONN." AS PREPARED BY JOHN J. MOZZOCHI, & ASSOCIATES CIVIL ENGINEERS. DATED 7/15/68.

2. MAP ENTITLED "TOWN OF GLASTONBURY MAP SHOWING LAND TO BE ACQUIRED FROM PETER MORANSKI BY THE STATE OF CONNECTICUT SCENIC STRIPS ON ROUTE 2" . DATED SEPTEMBER 1968. FILED IN THE GLASTONBURY TOWN CLERKS OFFICE AS MAP

3. MAP ENTITLED "MAP PREPARED FOR JOSEPH M. LACROTTA GLASTONBURY, CONN." AS PREPARED BY LUCAS & BECKERMAN, CIVIL ENGINEERS, PLANNERS, LAND SURVEYORS GLASTONBURY, CONN DATED 1/15/88. FILED IN THE GLASTONBURY TOWN CLERKS

4. MAP ENTITLED "SUBDIVISION BOUNDARY SHEET PREPARED FOR NORMAN ST. GERMAIN PROPERTY OF ROGGER & DOROTHY ST. GERMAIN NORTH ROAD GLASTONBURY, CONN." AS PREPARED BY JOEL M. FULLER LICENSED LAND SURVEYOR MARLBOROUGH, CONN DATED 8/3/88. REVISED 1/18/89. FILED IN THE GLASTONBURY TOWN CLERKS OFFICE AS MAP 3007



1 SITE ACCESS MAP
SCALE: 1" = 40' FULL SIZE
1" = 80' 11 X 17
0 40 80
SCALE IN FEET

Optasite
OPTASITE TOWERS LLC
1 RESEARCH DRIVE, SUITE 200C
WESTBOROUGH, MA 01581

CHA
CLOUGH HARBOUR & ASSOCIATES LLP
2123 Silas Deane Highway, Suite 312 - Rocky Hill, CT 06067-2333
Voice: (860) 257-4237 - www.cloughharbour.com

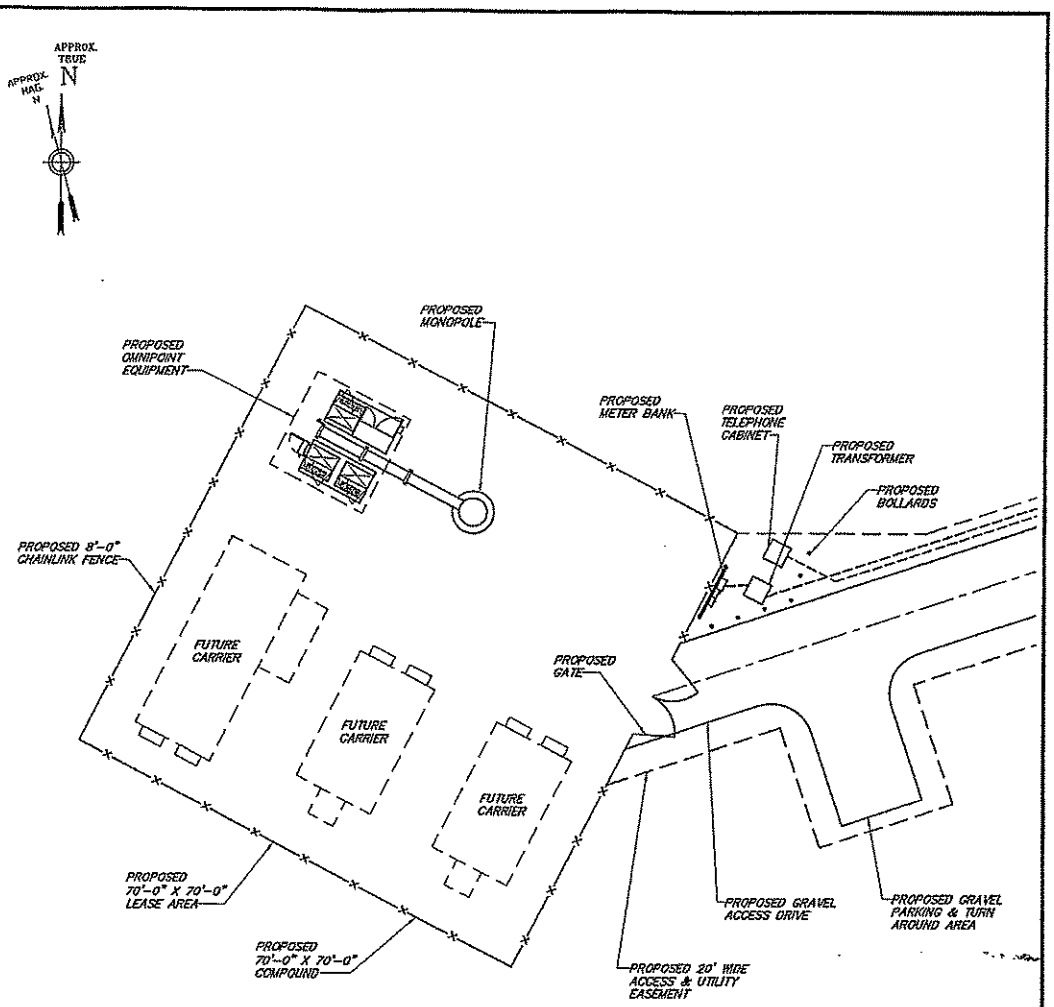
CHA PROJECT NO:
15393 - 1010 - 1601

NO.	SUBMITTAL		
0	09/28/07	ISSUED FOR REVIEW	
	BY: FJL	CHK: PAL	APP'D: JPS
1	09/11/07	CHANGED TOWER HEIGHT	
	BY: FJL	CHK: PAL	APP'D: JPS

SITE ID:
CT-999-0101
SITE NAME:
MONTANO
SITE ADDRESS:
497A WICKHAM ROAD
GLASTONBURY, CT
06033
HARTFORD COUNTY

SHEET TITLE
SITE ACCESS MAP

SHEET NUMBER
A02



1 COMPOUND PLAN
SCALE: 1" = 20'

0 10 20
SCALE IN FEET

BASEMAP NOTES:
1. BASEMAP INFORMATION OBTAINED FROM A SURVEY PERFORMED BY CLOUGH HARBOUR & ASSOCIATES LLP IN JUNE & JULY 2007.

CLOUGH HARBOUR & ASSOCIATES LLP
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CHA PROJ. NO. – 15383-1010

Optasite

OPTASITE TOWERS LLC
1 RESEARCH DRIVE, SUITE 200C
WESTBOROUGH, MA 01581

SITE ID:
CT-999-0101
SITE NAME:
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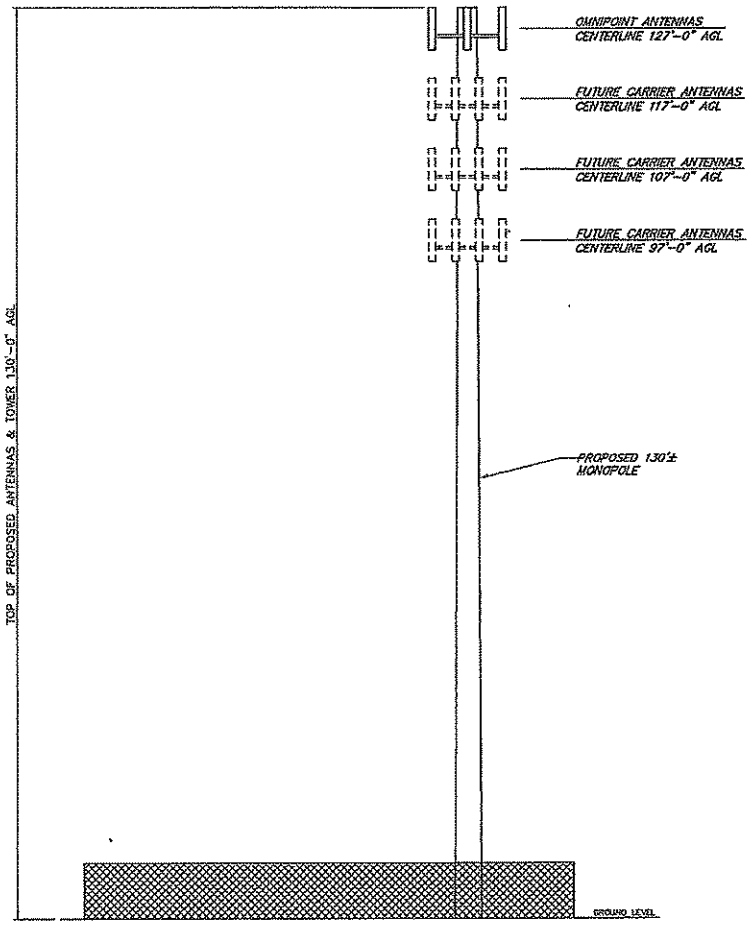
SITE ADDRESS:
497A WICKHAM ROAD
GLASTONBURY, CT 06033
HARTFORD COUNTY

SHEET TITLE:
COMPOUND PLAN

DATE:
08/09/07

REVISION:
0

File: T:\15383\SITES\1010 MONTANO G-GLASTONBURY,CT\MONTANO-3 EQUIPMENT PLAN.DWG Saved: 8/9/2007 10:43:42 AM Plotted: 8/9/2007 10:43:46 AM User: bottom, Paul



1 TOWER ELEVATION
SCALE: 1" = 20'

0 10 20
SCALE IN FEET

CLOUGH HARBOUR & ASSOCIATES LLP
2139 Silas Deane Highway, Suite 317 · Rocky Hill, CT 06067-2335
Voice (860) 257-4137 · www.cloughharbour.com

CHA PROJ. NO. = 15383-1010

Optasite

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1 RESEARCH DRIVE, SUITE 200C
WESTBOROUGH, MA 01581

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HARTFORD COUNTY

SHEET TITLE:
TOWER ELEVATION

DATE:
09/14/07

REVISION:
1

Fw: I:\15383\DWGS\1010 MONTANO G-GLASTONBURY\20\MONTANO-4 TOWER ELEVATION.DWG Saved: 9/14/2007 11:21:35 AM Plotted: 9/14/2007 11:21:39 AM User: bostrom, Paul