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June 21, 2012

BY EMAIL & FEDEX
Ms. Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: Docket 412
SBA Towers III Development and Management Plan
Wewaka Brook Road, Bridgewater, Connecticut

Dear Ms. Roberts:

On behalf of SBA Towers III, please accept for review and Council approval this Development Management Plan ("D&M Plan") filing for the captioned Facility as approved in Docket 412.

Tower, Compound & Other Equipment

Enclosed are an original and fifteen (15) sets of 11" x 17" Development and Management Plan drawings prepared by CHA last revised on June 8, 2012 ("D&M Plan" or "Drawings") being filed in accordance with the Council's Decision and Order dated February 5, 2012. Two full-sized sets of the Drawings are also enclosed. The Drawings incorporate a 170' monopole as provided for in the Siting Council's Order No. 1 in this Docket. AT&T will mount twelve (12) panel antennas on a low profile platform at a centerline height of 167' as depicted on the Drawings. The proposed D&M Plan also includes plans for the site clearing, drainage, and erosion and sedimentation control measures consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control as amended. Enclosed please also find a geotechnical study (Attachment 1) as well as a structural design report (Attachment 2) for the tower and foundation. Specifications for AT&T's antennas and generator are provided as well (Attachments 3 and 4 respectively).

Vernal Pool Protection Program, Drainage Report & Army Corps of Engineers Determination

As required by the Siting Council's No. 3(a) in this Docket, a Drainage Report prepared by CHA dated February 2012 is included as Attachment 5 to this letter. Please note that due to size limitations this includes the report only and five (5) copies of the report along with its associated appendices are being included as bulk file items to the Siting Council with copies also provided to the Town of Bridgewater First Selectman and Attorney Keith Ainsworth. Please also note that Sheet EN-1 in the Drawings is a complete Vernal Pool Protection Program as per Siting Council

Order Number 3 sub parts (b) through (f). All-Points Technology Corporation P.C. (APT) will serve as the environmental monitor for this project to ensure that vernal pool protection measures are implemented properly. Finally, included as Attachment 6 please find the March 8, 2012 SBA's request for Army Corps of Engineers New England District review and the March 28, 2012 determination from the Army Corp stating that the proposed activities will only have minimal impact of waters of the United States including wetlands.[1]

Required Notifications

The construction director on this project is Shawn McCoy of SBA Communications Corporation. Mr. McCoy is located at 5900 Broken Sound Parkway NW, Boca Raton, Florida and can be reached by telephone at (561) 226-9366, and the local contact is Sean Gormley, Site Development Manager. Mr. Gormley is located at One Research Drive, Suite 200C, Westborough, MA and can be reached by telephone at (508) 366-5505x304.
We respectfully request that this matter be included on the Council's next available agenda for review and approval.

Thank you for your consideration of the enclosed.

Very truly yours,

Daniel M. Laub

Enclosures & Attachments

cc: Hon. William Stuart, First Selectman, Town of Bridgewater
Keith R. Ainsworth, Esq.
Sean Gormley, SBA
Dean Gustafson, APT
Paul Lusitani, CHA
Michele Briggs, AT&T
Christopher B. Fisher, Esq.

[1] Attendant attachments have not been included as that information was provided to the Siting Council as part of Docket 412.

CERTIFICATE OF SERVICE

I hereby certify that on this day, an original and fifteen copies of the foregoing was served on the Connecticut Siting Council electronically and by overnight delivery with copy to:

Town of Bridgewater
Represented by:
Keith R. Ainsworth, Esq.
Evans, Feldman & Ainsworth, LLC
261 Bradley Street
P.O. Box 1694
New Haven, CT 06510
krainsworth@snet.net

Town of Bridgewater
Represented by:
Hon. William Stuart, First Selectman
Town of Bridgewater
44 Main Street South
P.O. Box 06752
wstuart@bridgewatertownhall.org

Dated: June 21, 2012

Daniel M. Laub, Esq.

cc: Sean Gormley, SBA
Dean Gustafson, APT
Paul Lusitani, CHA
Michele Briggs, AT&T
Christopher B. Fisher, Esq.

Attachment 1

Date: **March 2, 2012**

Kelby Williams, EIT
Environmental Corporation of America
1375 Union Hill Industrial Court, Suite A
Alpharetta, GA 30004
Office: (770) 667-2040

Tower Engineering Professionals, Inc.
3703 Junction Boulevard
Raleigh, NC 27603
(919) 661-6351
Geotech@tepgroup.net

Subject: **Subsurface Exploration Report**

SBA Designation:	**Site Number:**	CT11934-S
	Site Name:	Bridgewater 4
Engineering Firm Designation:	**TEP Project Number:**	120651.10
Site Data:	**Wewaka Brook Road, Bridgewater, CT 06752 (Litchfield County)** **Latitude N*41° 30' 31.5"*, Longitude W*73° 21' 16.0"*** **170 Foot - Proposed Monopole Tower & Precast Concrete Bridge**	

Dear Ms. Williams,

Tower Engineering Professionals, Inc. is pleased to submit this **"Subsurface Exploration Report"** to evaluate subsurface conditions in the tower area as they pertain to providing support for the tower foundation.

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions in this report are based on the applicable standards of TEP's practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

TEP assumes the current ground surface elevation; tower location and subsequent centerline provided are correct and are consistent with the elevation and centerline to be used for construction of the structure. Should the ground surface elevation be altered and/or the tower location be moved or shifted TEP should be contacted to determine if additional borings are necessary.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The soil conditions may vary from what is represented in the boring log. While some transitions may be gradual, subsurface conditions in other areas may be quite different. Should actual site conditions vary from those presented in this report, TEP should be provided the opportunity to amend its recommendations as necessary.

We at *Tower Engineering Professionals, Inc.* appreciate the opportunity of providing our continuing professional services to you and Environmental Corporation of America. If you have any questions or need further assistance on this or any other projects please give us a call.

Report Prepared/Reviewed by: Cory A. Bauer / John D. Longest, P.E.

Respectfully submitted by:

Pete Jernigan, P.E.

3/2/2012

TABLE OF CONTENTS

1) PROJECT DESCRIPTION

Based on the preliminary drawings, it is understood a monopole communications tower will be constructed at the referenced site. The structure loads will be provided by the tower manufacturer. In addition the existing access road bridge structure will be replaced by a precast concrete bridge. The structure loads will be provided by the bridge manufacturer.

2) SITE EXPLORATION

The field exploration included the performance of six soil test borings (B-1, B-2, B-3, B-4, B-5 and B-6) to the planned depth of 35 to 36.5 feet (bgs) at the approximate centerline of the proposed bridge corners, to the planned depth 36 feet (bgs) at the approximate centerline of the access road west of the proposed bridge and to the auger refusal depth of 8 feet (bgs) at the approximate centerline of the proposed monopole tower. The borings were performed by an ATV mounted drill rig using continuous flight hollow stem augers to advance the hole. Split-spoon samples and Standard Penetration Resistance Values (N-values) were obtained in accordance with ASTM D 1586 at a frequency of 1 sample every 5 feet to the termination of the bridge and road borings and 2 samples to auger refusal in the tower boring.

The Split-spoon samples were transported to the TEP laboratory where they were classified by a Geotechnical Engineer in general accordance with the Unified Soil Classification System (USCS), using visual-manual identification procedures (ASTM D 2488).

Diamond-bit core drilling procedures were used to help determine the character and continuity of the rock in boring B-6. The core drilling procedures were in accordance with ASTM Specification D-2113. Rock core samples of the materials penetrated were protected and retained in a swivel-mounted inner tube of the core barrel. Upon completion of the drill run, the core barrel was brought to the surface and samples removed and placed in standard boxes. The samples were classified by a Geotechnical Engineer and the "Recovery" and "Rock Quality Designation" were determined.

The "Recovery" is the ratio of the sample length obtained to the length drilled, expressed as a percent. The "Rock Quality Designation" (RQD) is the percent of the recovered rock samples in lengths of four or more inches, compared to the total length of the core run. This designation is generally applied to samples of NWX size (2-1/8 inch diameter) or larger and to samples described as moderately hard or harder. The percent recovery and RQD are related to rock soundness and continuity. Generalized rock descriptions, percent recovery, and the RQD value are shown on the boring log.

A Boring Location Plan showing the approximate boring locations, the Boring Logs presenting the subsurface information obtained and a brief guide to interpreting the boring logs are included in the Appendix.

3) SITE CONDITIONS

The site is located off Wewaka Brook Road in Bridgewater, Litchfield County, Connecticut. The proposed tower and compound are to be located in a wooded area on a ridge. The ground topography is sloping. The proposed precast concrete bridge is to be located in a clearing along the access road. The ground topography is relatively flat to slightly sloping.

4) SUBSURFACE CONDITIONS

The following description of subsurface conditions is brief and general. For more detailed information, the individual Boring Logs contained in Appendix B - Boring Logs may be consulted.

4.1) Soil

The USCS classification of the materials encountered in the boring include SP-SM, SP, SW-SM, SM and Gneiss. The Standard Penetration Resistance ("N" Values) recorded in the materials ranged from 5 blows per foot to 100 blows per 1 inch of penetration.

4.2) Rock

Gneiss was encountered at a depth of 8 feet (bgs) in boring B-1. Refusal of auger advancement was encountered at a depth of 8 feet (bgs) in boring B-1.

4.3) Subsurface Water

Subsurface water was encountered at a depth of 4 to 9 feet (bgs) in borings B-1, B-3 and B-6 at the time of drilling. It should be noted the subsurface water level will fluctuate during the year, due to seasonal variations and construction activity in the area.

4.4) Frost

The TIA frost depth for Litchfield County Connecticut is 40 inches.

5) TOWER FOUNDATION DESIGN

Based on the boring data, it is the opinion of TEP that a pier extending to a single large mat foundation can used to support the new tower. The following presents TEP's conclusions and recommendations regarding the foundation type.

5.1) Shallow Foundation

The foundation should bear a minimum of 3.5 feet below the ground surface to penetrate the frost depth and with sufficient depth to withstand the overturning of the tower. To resist the overturning moment, the weight of the concrete and any soil directly above the foundation can be used. A friction factor of 0.50 can be utilized at this depth. The values are based on the current ground surface elevation.

Table 1A –Shallow Foundation Analysis Parameters – Boring B-6

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2,3] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	4	SM	1975	-	31	117
4	8	SM	11175	-	45	122
8	13	Gneiss[3]	67,300[4]	-	45	145

Notes:
1) The bearing values provided are net allowable with a minimum factor of safety of 2 with anticipated settlement less than 1 inch. Bearing may be increased by 1/3 for transient loading (e.g. wind or earthquake loading)
2) These values should be considered ultimate soil parameters
3) In cases where the shear failure is likely to develop along planes of discontinuity or through highly fractured rock masses cohesion cannot be relied upon to provide resistance to failure
4) Due to the fractured nature of the rock sample. Cohesion of the rock cannot be relied upon for strength parameters. Indicated layers have been evaluated as a granular material

Table 1B – Rock Parameters – Boring B-6

Depth		Rock	Recovery (%)	Rock Quality Designation (%)	Unconfined Compressive Strength (psi)	Grout/Rock[1,2] Bond Stress (psi)	Effective Unit Weight (pcf)
Top	Bottom						
8	13	Gneiss	100	70	8830	875	145

Notes:
1) These values should be considered ultimate rock parameters. A minimum factor of safety of 4 should be utilized
2) The rock encountered is not considered competent, see section 5.2 for design recommendations

5.2) Rock Anchor Foundations

Rock anchor design considerations are being provided should they become necessary for foundation installation. The rock anchors should consist of high strength grouted rock bolts (tensioned anchors). The anchors should extend into the competent rock and have the embedment necessary to resist the applied loads. Group effects can cause significant reductions in calculated resistance. Considerations for group effects should be given for rock anchor designs that utilize multiple closely spaced anchors. Competent rock was not encountered at the time of the exploration. Rock competency is typically estimated based on compressive strength of the intact rock, RQD value, joint spacing, condition of the joints, and ground water conditions.

Embedment depths for cement grout bonded rock anchors are often determined by using the rock cone method. Unlike a mechanical anchor, a bonded anchor must include a bond length in the embedment depth. The bond length allows the applied tensile load to be transferred to the surrounding rock. Therefore the embedment depth of a pre-stressed bonded rock anchor is made up of the free-stress length and the bond length.

Bond resistance values are typically estimated from the unconfined compressive strength of the rock. However, design values obtained from laboratory tests on small specimens should be adjusted to account for scale effects. For bond resistance values, TEP recommends an ultimate value of 875 psi be used for design. TEP recommends that a factor of safety of 4 be utilized given the limited extent of the boring. The bond resistance value should be applied to rock that is considered competent. Rock samples with near 100% recovery, RQD values greater than 75%, slightly rough to very rough rock surfaces and joint gaps less than 1 mm can be considered competent. TEP recommends that 50% of all rock anchor or a minimum of 4 be proof loaded to 80% of their design load to verify their adequacy.

6) TOWER SOIL RESISTIVITY

Soil resistivity was performed at the TEP laboratory in accordance with ASTM G187-05 (Standard Test Method for Measurement of Soil Resistivity Using the Two Electrode Soil Box Method). Test results indicated a result of 145,000 ohms/cm.

7) TOWER CONSTRUCTION CONSIDERATIONS - SHALLOW FOUNDATION

7.1) Excavation

The boring data indicates excavation to the expected subgrade level for the shallow foundation will extend through sand and rock. A large tracked excavator should be able to remove the soil materials with minimal difficulty. A large tracked excavator with rock teeth and/or a pneumatic hammer will be necessary to remove the rock materials with difficulty. TEP anticipates the depth to the surface of the rock will vary outside of the boring location.

Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. It is the responsibility of the contractor for site safety. This information is provided as a service and under no circumstance should TEP be assumed responsible for construction site safety.

7.2) Dewatering/Foundation Evaluation/Subgrade Preparation

As previously discussed, subsurface water was encountered in the boring at a depth of 4 feet (bgs). Therefore, dewatering (using pumped sumps or well points) may be required for construction purposes at this site. The subsurface water level should be kept below the bottom level of any excavation. After dewatering and excavation to the design elevation for the footing, the materials should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer prior to reinforcement and concrete placement. This evaluation should include probing, shallow hand auger borings and dynamic cone penetrometer testing (ASTM STP-399) to help verify that suitable residual material lies directly under the foundation and to determine the need for any undercut and replacement of unsuitable materials. Loose surficial material should be compacted in the excavation prior to reinforcement and concrete placement to stabilize surface soil that may have become loose during the excavation process. TEP recommends a 6-inch layer of compacted crushed stone be placed just after excavation to aid in surface stability.

7.3) Rock Anchor Installation

Rock anchor materials verification and installation should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer during installation to verify compliance with materials manufacturer and foundation design specifications.

7.4) Fill Placement and Compaction

Backfill materials placed above the shallow foundation to the design subgrade elevation should not contain more than 5 percent by weight of organic matter, waste, debris or any otherwise deleterious materials. To be considered for use, backfill materials should have a maximum dry density of at least 100 pounds per cubic foot as determined by standard Proctor (ASTM D 698), a Liquid Limit no greater than 40, a Plasticity Index no greater than 20, a maximum particle size of 4 inches, and 20 percent or less of the material having a particle size between 2 and 4 inches. Because small handheld or walk-behind compaction equipment will most likely be used, backfill should be placed in thin horizontal lifts not exceeding 6 inches (loose).

Fill placement should be monitored by a qualified Materials Technician working under the direction of a Geotechnical Engineer. In addition to the visual evaluation, a sufficient amount of in-place field density tests should be conducted to confirm the required compaction is being attained.

7.5) Reuse of Excavated Soil

The sand that meets the above referenced criteria can be utilized as backfill based on dry soil and site conditions at the time of construction.

8) BRIDGE FOUNDATION DESIGN

Based on the information provided to TEP, the existing bridge structure will be replaced by a precast concrete bridge. TEP was not provided with bridge drawings or plans. TEP assumes the bridge will be supported on shallow foundations. TEP would like the opportunity to review the precast bridge plans when available to provide any revisions to the geotechnical report.

8.1) Shallow Foundation

The foundations should bear a minimum of 3.5 feet below the ground surface to penetrate the frost depth.

Table 1C –Shallow Foundation Analysis Parameters – Boring B-1

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	5	SP-SM	1850	-	32	117
5	9	SW-SM/Boulder[4]	8875[5]	-	41	120
9	15	SP	20200	-	45	60
15	20	SP	23625	-	45	60
20	25	SP	25800	-	45	60
25	30	SP-SM	27225	-	45	60

Table 1D –Shallow Foundation Analysis Parameters – Boring B-2

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SW-SM	7300	-	45	122
5	9.5	SW-SM	8825	-	40	120
9.5	15	SP-SM	9050	-	40	58
15	20	SP-SM	21350	-	45	60
20	25	SP-SM	33375	-	45	60
25	30	SP-SM	33075	-	45	60

Table 1E –Shallow Foundation Analysis Parameters – Boring B-3

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	5	SM	1850	-	32	117
5	7.4	SW-SM/Boulder[4]	8375[5]	-	41	120
7.4	15	SP-SM	8925	-	41	58
15	20	SP-SM	11125	-	42	58
20	25	SP-SM	12150	-	45	60
25	30	SW-SM	12825	-	45	60

Table 1F –Shallow Foundation Analysis Parameters – Boring B-4

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SM	1575	-	31	117
5	10	SM	5800	-	34	55
10	15	SP-SM	17325	-	45	60
15	20	SP-SM	22625	-	45	60
20	25	SP-SM	24700	-	45	60
25	30	SP-SM	26075	-	45	60

Table 1G –Shallow Foundation Analysis Parameters – Boring B-5

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SP-SM	1625	-	32	117
5	10	SP-SM	10275	-	45	56
10	15	SP-SM	15100	-	45	60
15	20	SP-SM	17125	-	45	60
20	25	SP-SM	18725	-	45	60
25	30	SP-SM	19750	-	45	60

Notes:

1. The bearing values provided are net allowable with a minimum factor of safety of 2 with anticipated settlement less than 1 inch. Bearing may be increased by 1/3 for transient loading (e.g. wind or earthquake loading)
2. These values should be considered ultimate soil parameters
3. Subsurface water level is based on an average groundwater elevation in nearby borings
4. Classifications are based on soil layers in additional borings in relatively close proximity
5. In order to bear on this layer, soils should be verified
6. $K_0 = 1-\sin\phi$
7. $K_a = \tan^2(45-\phi) = 1/K_p$

9) BRIDGE CONSTRUCTION CONSIDERATIONS - SHALLOW FOUNDATION

9.1) Excavation

The boring data indicates excavation to the expected subgrade level for the bridge foundations will extend through sand. A large tracked excavator should be able to remove the soil materials with minimal difficulty. Boulders and bedrock outcroppings are common to this geographic region and may be encountered outside of the boring locations.

Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. It is the responsibility of the contractor for site safety. This information is provided as a service and under no circumstance should TEP be assumed responsible for construction site safety.

9.2) Dewatering/Foundation Evaluation/Subgrade Preparation

As previously discussed, subsurface water was encountered in borings B-1 and B-3 at a depth of 7.4 to 9 feet (bgs) and anticipated to be at 5 feet (bgs) in borings B-4 and B-5. Therefore, dewatering (using pumped sumps or well points) may be required for construction purposes at this site. The subsurface water level should be kept below the bottom level of any excavation. After dewatering and excavation to the design elevation for the footing, the materials should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer prior to reinforcement and concrete placement. This evaluation should include probing, shallow hand auger borings and dynamic cone penetrometer testing (ASTM STP-399) to help verify that suitable residual material lies directly under the foundation and to determine the need for any undercut and replacement of unsuitable materials. Loose surficial material should be compacted in the excavation prior to reinforcement and concrete placement to stabilize surface soil that may have become loose during the excavation process. TEP recommends a 6-inch layer of compacted crushed stone be placed just after excavation to aid in surface stability. TEP recommends a proper drainage system be installed to divert water away from underneath and behind abutments and foundations.

9.3) Fill Placement and Compaction

Backfill materials placed above the shallow foundation to the design subgrade elevation should not contain more than 5 percent by weight of organic matter, waste, debris or any otherwise deleterious materials. To be considered for use, backfill materials should have a maximum dry density of at least 100 pounds per cubic foot as determined by standard Proctor (ASTM D 698), a Liquid Limit no greater than 40, a Plasticity Index no greater than 20, a maximum particle size of 4 inches, and 20 percent or less of the material having a particle size between 2 and 4 inches and have a friction angle of at least 30 degrees. Because small handheld or walk-behind compaction equipment will most likely be used, backfill should be placed in thin horizontal lifts not exceeding 6 inches (loose).

Fill placement should be monitored by a qualified Materials Technician working under the direction of a Geotechnical Engineer. In addition to the visual evaluation, a sufficient amount of in-place field density tests should be conducted to confirm the required compaction is being attained.

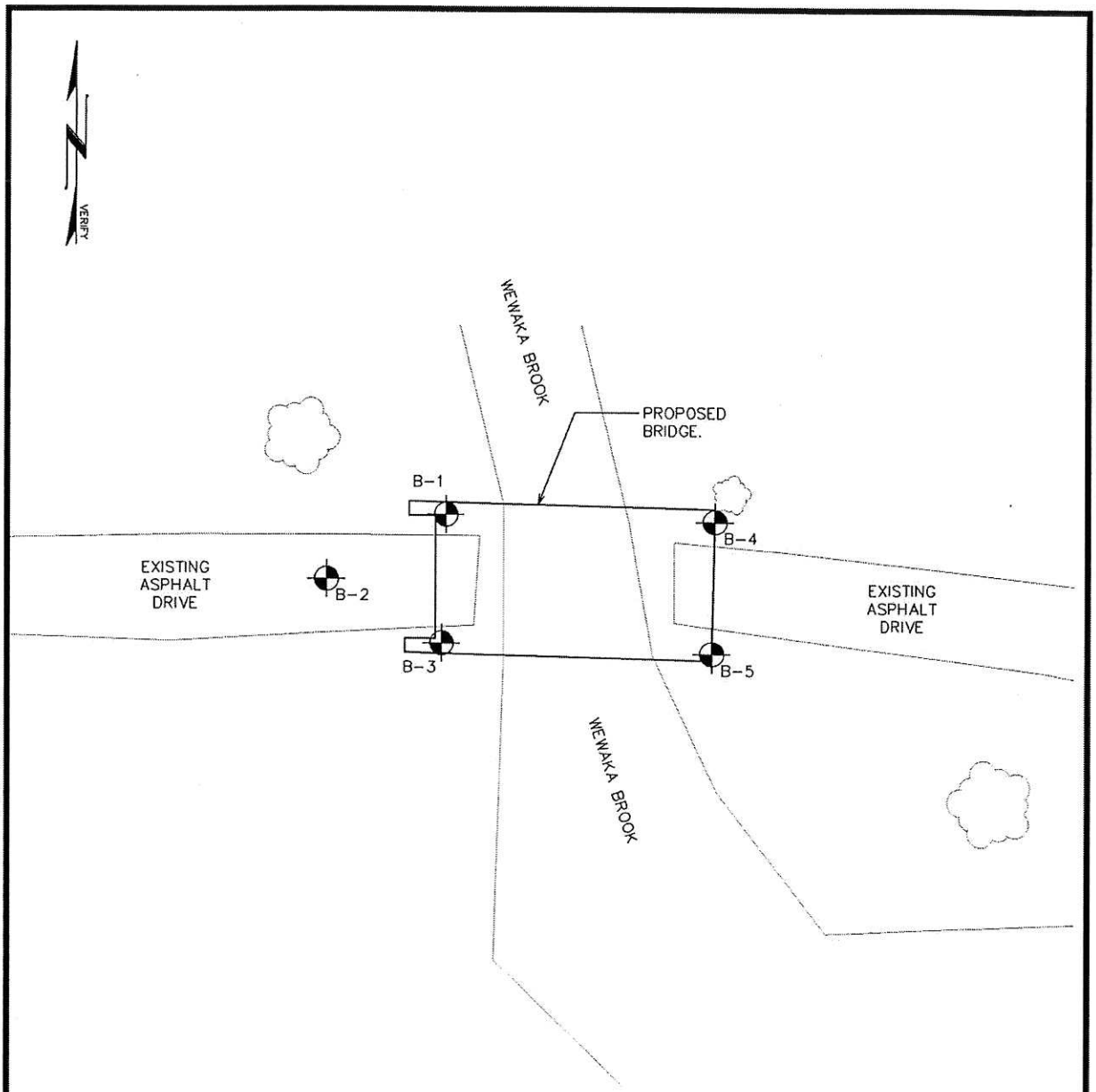
9.4) Reuse of Excavated Soil

The sand that meets the above referenced criteria can be utilized as backfill based on dry soil and site conditions at the time of construction.

If variability in the subsurface materials is encountered, a representative of the Geotechnical Engineer should verify that the design parameters are valid during construction. Modification to the design values presented above may be required in the field.

APPENDIX A

BORING LAYOUTS



BORING LAYOUT

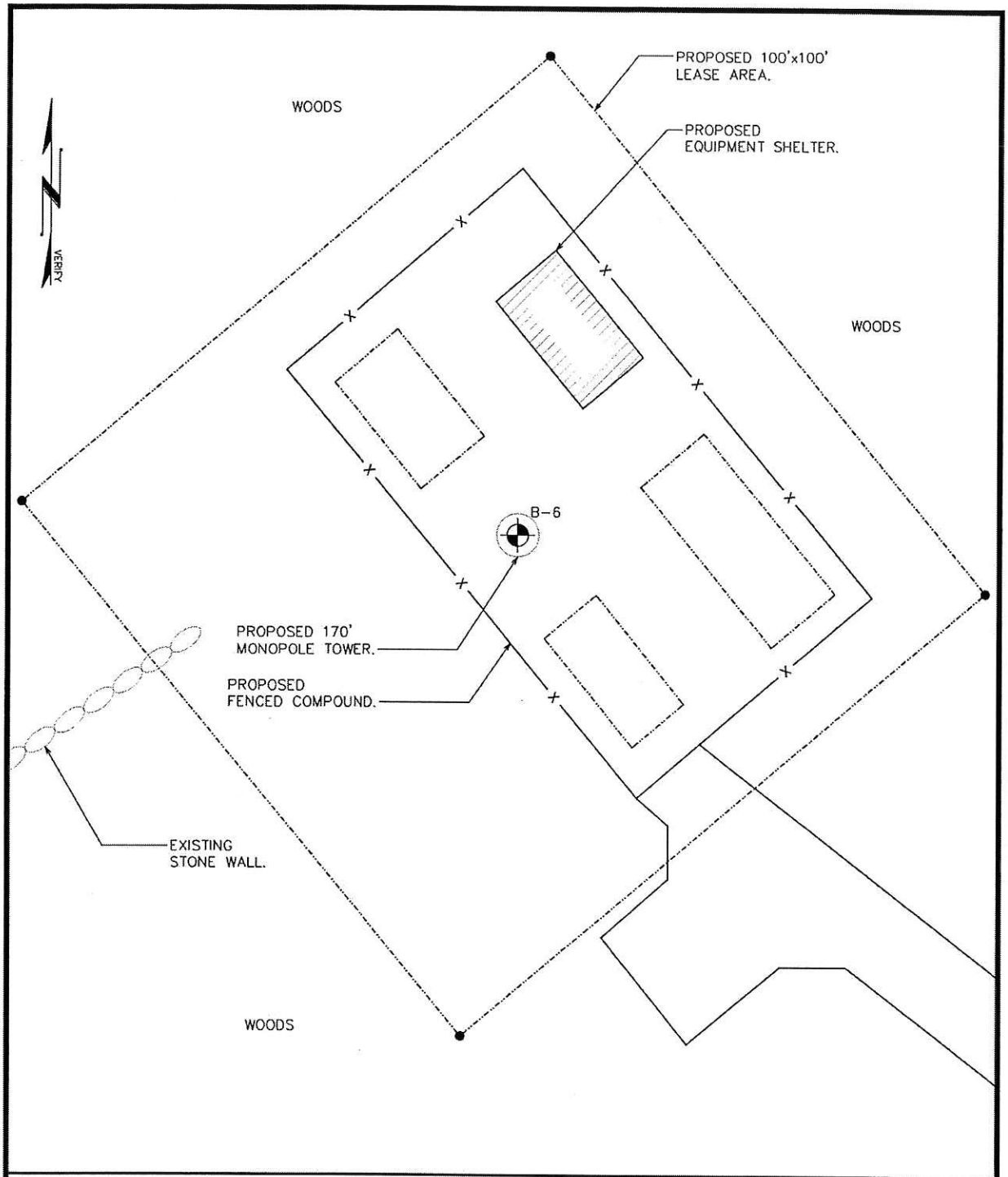
SCALE: N.T.S.

PREPARED BY:
TOWER ENGINEERING PROFESSIONALS
3703 JUNCTION BOULEVARD
RALEIGH, NC 27603-5263
(919) 661-6351
www.tepgroup.net

PREPARED FOR:
SBA
SBA COMMUNICATIONS CORPORATION
5900 BROKEN SOUND PARKWAY
BOCA RATON, FL 33486
OFFICE: (561) 226-9523

PROJECT INFORMATION:
BRIDGEWATER 4
SITE #: CT11934-S
WEWAKA BROOK ROAD
BRIDGEWATER, CT 06752
(LITCHFIELD COUNTY)

REVISION: 0
TEP JOB #: 120651.10
SHEET NUMBER:
C-1



BORING LAYOUT

SCALE: N.T.S.

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SBA

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OFFICE: (561) 226-9523

PROJECT INFORMATION:

BRIDGEWATER 4
SITE #: CT11934-S

WEWAKA BROOK ROAD
BRIDGEWATER, CT 06752
(LITCHFIELD COUNTY)

REVISION: 0
TEP JOB #: 120651.10
SHEET NUMBER:
C-1

APPENDIX B

BORING LOGS

Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Key to Log of Boring

Sheet 1 of 1

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1. **Elevation, feet:** Elevation (MSL, feet)
2. **Depth, feet:** Depth in feet below the ground surface.
3. **Sample Type:** Type of soil sample collected at the depth interval shown.
4. **Sample Number:** Sample identification number.
5. **Sampling Resistance, blows/foot:** Number of blows to advance driven sampler foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. **Relative Consistency:** Relative consistency of the subsurface material.
7. **USCS Symbol:** USCS symbol of the subsurface material.
8. **Graphic Log:** Graphic depiction of the subsurface material encountered.
9. **MATERIAL DESCRIPTION:** Description of material encountered. May include consistency, moisture, color, and other descriptive text.
10. **REMARKS AND OTHER TESTS:** Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

TYPICAL MATERIAL GRAPHIC SYMBOLS

- Well graded GRAVEL (GW)
- Poorly graded GRAVEL (GP)
- Well graded GRAVEL with Silt (GW-GM)
- Well graded GRAVEL with Clay (GW-GC)
- Poorly graded GRAVEL with Silt (GP-GM)
- Poorly graded GRAVEL with Clay (GP-GC)
- Silty GRAVEL (GM)
- Clayey GRAVEL (GC)
- Well graded SAND (SW)
- Poorly graded SAND (SP)
- Well graded SAND with Silt (SW-SM)
- Well graded SAND with Clay (SW-SC)
- Poorly graded SAND with Silt (SP-SM)
- Poorly graded SAND with Clay (SP-SC)
- Silty SAND (SM)
- Clayey SAND (SC)
- SILT, SILT w/SAND, SANDY SILT (ML)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- SILT, SILT w/SAND, SANDY SILT (MH)
- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- SILT, SILT with SAND, SANDY SILT (ML-MH)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- SILTY CLAY (CL-ML)
- Lean CLAY/PEAT (CL-OL)
- Fat CLAY/SILT (CH-MH)
- Fat CLAY/PEAT (CH-OH)
- Silty SAND to Sandy SILT (SM-ML)
- Silty SAND to Sandy SILT (SM-MH)
- Clayey SAND to Sandy CLAY (SC-CL)
- Clayey SAND to Sandy CLAY (SC-CH)
- SILT to CLAY (CL/ML)
- Silty to Clayey SAND (SC/SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- 2-inch-OD unlined split spoon (SPT)
- 2.5-inch-OD Modified California w/ brass liners
- 3-inch-OD California w/ brass rings
- Shelby Tube (Thin-walled, fixed head)
- Grab Sample
- Bulk Sample
- Pitcher Sample
- Other sampler

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting a given time)
- Minor change in material properties within a stratum
- Inferred or gradational contact between strata
- ? Queried contact between strata

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure 1 thru 6

O:\10651_Bridgewater\Geotech\Boring B-1.bgs [Basic Boring Log.tpl]

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-1** Sheet 1 of 1

Date(s) Drilled: February 21, 2012	Logged By: Cory Bauer	Checked By: John Longest
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type:	Total Depth of Borehole: 35 feet bgs
Drill Rig Type: ATV	Drilling Contractor: TEP	Approximate Surface Elevation: 489 feet AMSL
Groundwater Level and Date Measured: 9 feet ATD	Sampling Method(s): SPT	Hammer Data: 140 lb, 30 in drop, Auto Hammer
Borehole Backfill: Cuttings	Location: Approximate centerline of the proposed northwest bridge support	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
489	0								
			S1	7	Loose	SP-SM		Dark brown, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
484	5		S2	50/0"				No Recovery	Driller Note: Bouncing on Boulder
								(ATD)	
479	10		S3	88/8"	Very Dense	SP		Light brown and light gray, fine to medium, poorly graded SAND (SP), wet	
474	15		S4	68		SP		with mica, trace silt, gray, moist	
469	20		S5	97/11"					
464	25		S6	147/11"	Very Dense	SP-SM		Gray, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
459	30		S7	159					
454	35							Bottom of Boring at 35 feet bgs	Driller Note: Attempted to sample, sppon broke in hole
449	40								

Q:\10651 Bridgewater\Geotech\Boring B-1.bgs [Basic Boring Log.tpl]

Figure 1

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-2** Sheet 1 of 1

Date(s) Drilled: February 21, 2012	Logged By: Cory Bauer	Checked By: John Longest
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type:	Total Depth of Borehole: 36 feet bgs
Drill Rig Type: ATV	Drilling Contractor: TEP	Approximate Surface Elevation: 491 feet AMSL
Groundwater Level and Date Measured: Not Encountered ATD	Sampling Method(s): SPT	Hammer Data: 140 lb, 30 in drop, Auto Hammer
Borehole Backfill: Cuttings	Location: Approximate centerline of the proposed access road west of the proposed bridge	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
491	0		S1	55	Very Dense	SW-SM		Brown, fine to medium, well graded SAND (SW-SM), with silt, with gravel, moist	
486	5		S2	21	Medium Dense	SW-SM		to medium dense, wet	
481	10		S3	23	Medium Dense	SP-SM		Brown and gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
476	15		S4	60	Very Dense	SP-SM		to very dense, gray	
471	20		S5	113					
466	25		S6	159/9"					
461	30		S7	100/5"					
456	35		S9	100/6"					
451	40							Bottom of Boring at 36 feet bgs	

Q:\0651_Bridgewater\Geotech\Boring B-2.bgs [Basic Boring Log.tpl]

Figure 2

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-3** Sheet 1 of 1

Date(s) Drilled: February 20, 2012	Logged By: Cory Bauer	Checked By: John Longest
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type:	Total Depth of Borehole: 35.5 feet bgs
Drill Rig Type: ATV	Drilling Contractor: TEP	Approximate Surface Elevation: 489 feet AMSL
Groundwater Level and Date Measured: 7.4 feet ATD	Sampling Method(s): SPT	Hammer Data: 140 lb, 30 in drop, Auto Hammer
Borehole Backfill: Cuttings	Location: Approximate centerline of the proposed southwest bridge support	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
489	0		S1	6	Loose	SM		Dark brown, fine silty SAND (SM), trace roots, trace gravel, moist	
484	5		S2	50/2"				No Recovery (ATD)	Driller Note: Bouncing on boulder
479	10		S3	23	Medium Dense	SP-SM		Light brown, fine to medium, poorly graded SAND (SP-SM), with silt, wet	
474	15		S4	24		SP-SM		trace gravel	
469	20		S5	70	Very Dense	SP-SM		to very dense, with mica, no gravel, moist, gray	
464	25		S6	100/6"	Very Dense	SW-SM		Gray, fine to medium, well graded SAND (SW-SM), with fine to coarse gravel, with silt, with mica, moist	
459	30		S7	100/5"	Very Dense	SP-SM		Gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
454	35		S9	100/5"				Bottom of Boring at 35.5 feet bgs	
449	40								

Q:\0651_Bridgewater\Geotech\Boring B-3.bgs [Basic Boring Log.tpl]

Figure 3

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-4** Sheet 1 of 1

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **36.5 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **486 feet AMSL**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed northeast bridge support**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
486	0		S1	5	Loose	SM		Dark brown, fine silty SAND (SM), trace roots, moist	
481	5		S2	10		SM		no roots	
476	10		S3	48	Dense	SP-SM		Gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
471	15		S4	63	Very Dense	SP-SM		to very dense	
466	20		S5	64					
461	25		S6	72					
456	30		S7	105					
451	35		S9	156					
446	40							Bottom of Boring at 36.5 feet bgs	

Figure 4

Q:\0651_Bridgewater\Geotech\Boring B-4.bgs [Basic Boring Log.tpl]

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-5** Sheet 1 of 1

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **36.5 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **486 feet AMSL**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed southeast bridge support**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
486	0		S1	6	Loose	SP-SM		Dark brown, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
481	5		S2	29	Medium Dense	SP-SM		to medium dense, with mica, gray	
476	10		S3	47	Dense	SP-SM		to dense	
471	15		S4	41					
466	20		S5	51	Very Dense	SP-SM		to very dense	
461	25		S6	91		SP-SM		light gray and light brown	
456	30		S7	158		SP-SM		gray	
451	35		S9	142					
446	40							Bottom of Boring at 36.5 feet bgs	

Figure 5

O:\0651_Bridgewater\Geotech\Boring B-5.bgs [Basic Boring Log.tpl]

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-6** Sheet 1 of 1

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **13 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **583 feet AMSL**
Groundwater Level and Date Measured **4 feet ATD**	Sampling Method(s) **SPT, Other**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed monopole tower**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
583	0		S1	5	Loose	SM		Brown, fine silty SAND (SM), trace gravel, trace roots, moist	
								(ATD) ▽	
578	5		S2	100/1"				No Recovery	Driller Note: Steady grinding
						GNEISS		Auger Refusal at 8 feet bgs-Rock Core-Gray, moderately fractured GNEISS (Recovery 100%, Rock Quality Designation 70%, Unconfined Compressive Strength 8830 psi)	Rec=100%, RQD=70%
573	10		R1						
568	15							Bottom of Boring at 13 feet bgs	

Q:\0651_Bridgewater\Geotech\Boring B-6.bgs [Basic Boring Log.tpl]

Figure 6

Attachment 2

Sabre Industries™
Towers and Poles

Structural Design Report

170' Monopole
Site: Bridgewater 4, CT
Site Number: CT11934-S

prepared for: SBA NETWORK SERVICES INC
by: Sabre Towers & Poles ™

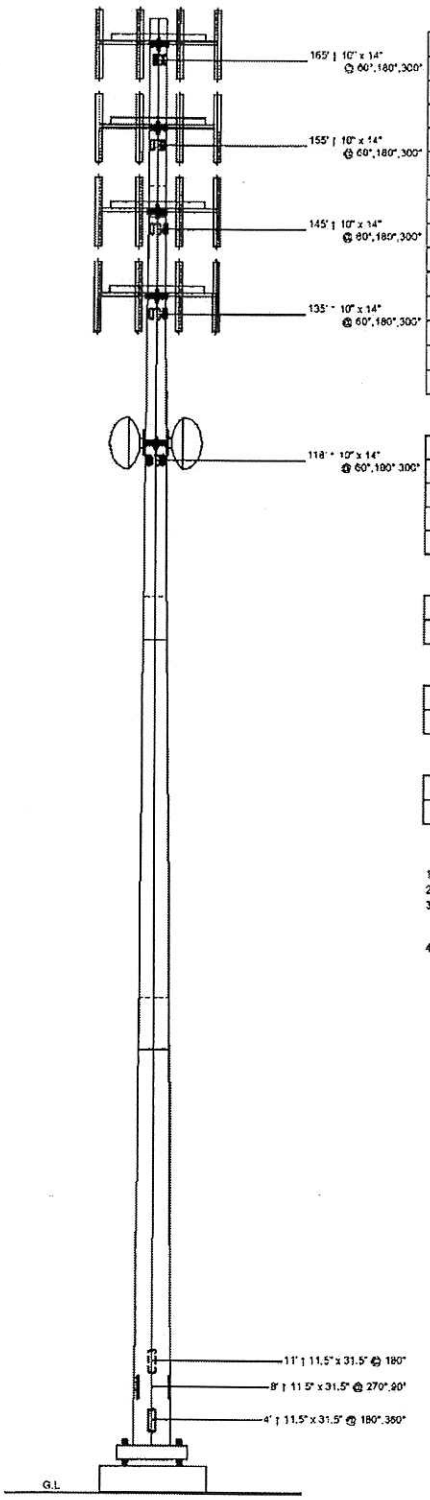
Job Number: 55137

March 8, 2012

3/8/12

Monopole by JDS
Foundation by RFB
Approved by KJT

Section	1	2	3	4
Length (ft)	23' - 6"	53' - 8"	53' - 6"	53' - 3"
Number Of Sides	18			
Thickness (in)	3/16"	5/16"	3/8"	7/16"
Lap Splice (ft)	A	5' - 0"	8' - 0"	
Top Diameter (in)	22.25"	25.48225"	33.73975"	41.68225"
Bottom Diameter (in)	26.5505"	35.27975"	43.53225"	51.427"
Taper (in/ft)	0.183			
Grade	A572-65			
Weight (lbs)	1434	8079	8855	14264



Designed Appurtenance Loading

Elev	Description	Tx-Line
167	L.P. Platform (Monopole Only) - 14' w/ Handrail	
167	(6) TMAs	
167	(12) DB848H90E-XY Panel Antennas	(24) 1 5/8"
157	L.P. Platform (Monopole Only) - 14' w/ Handrail	
157	(6) TMAs	
157	(12) DB848H90E-XY Panel Antennas	(18) 1 5/8"
147	L.P. Platform (Monopole Only) - 14' w/ Handrail	
147	(6) TMAs	
147	(9) DB848H90E-XY Panel Antennas	(18) 1 5/8"
137	L.P. Platform (Monopole Only) - 14' w/ Handrail	
137	(6) TMAs	
137	(9) DB848H90E-XY Panel Antennas	(18) 1 5/8"
120	(2) Dish Mount (Monopole Only) - Pipe Mount (up to 6' Dish)	
120	(2) 6' Solid Dishes w/ Radome	(12) 1 5/8"

Load Case Reactions

Description	Axial (kips)	Shear (kips)	Moment (ft-k)	Deflection (ft)	Sway (deg)
3s Gusted Wind	61.8	38.5	5023	17.3	10.59
3s Gusted Wind 0.9 Dead	46.8	38.5	4888	16.8	10.17
3s Gusted Wind&Ice	94.6	6.5	889	3	1.87
Service Loads	50.1	7.8	1003	3.4	2.1

Base Plate Dimensions

Shape	Width	Thickness	Bolt Circle	Bolt Qty	Bolt Diameter
Square	60.25"	2.75"	56"	20	2.25"

Anchor Bolt Dimensions

Length	Diameter	Hole Diameter	Weight	Type	Finish
84"	2.25"	2.625"	2737	A615-75	Galv-18"

Material List

Display	Value
A	3' - 9"

Notes

1) Full Height Step Bolts
2) Antenna Feed Lines Run Inside Pole
3) The Monopole was designed for a basic wind speed of 100 mph with 0" of radial ice, and 40 mph with 1" of radial ice, in accordance with ANSI/TIA-222-G, Structure Class II, Exposure Category C, Topographic Category 1
4) All dimensions are above ground level, unless otherwise specified.

3/8/12

Sabre Industries
Towers and Poles

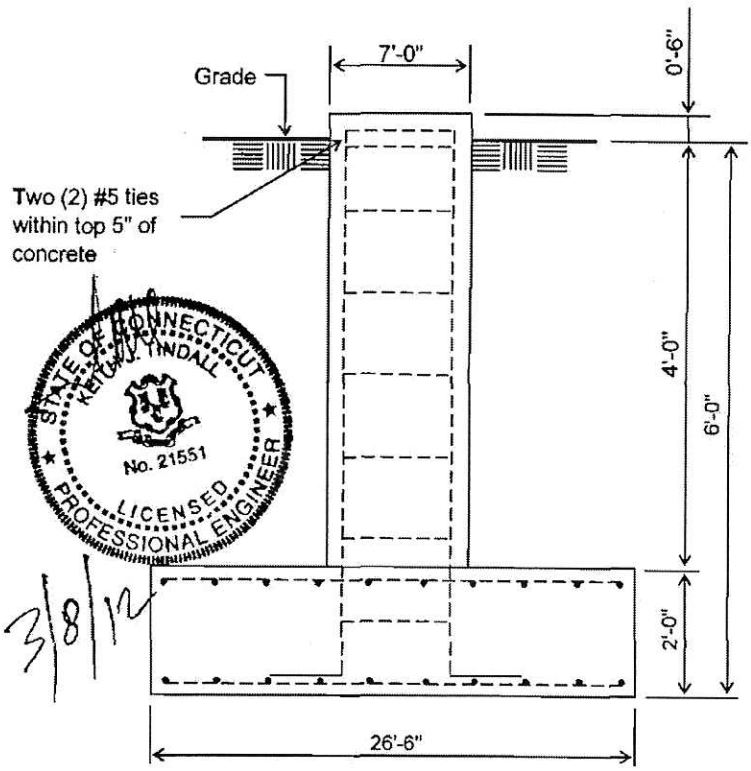
Sabre Communications Corporation
2101 Murray Street
P.O Box 658
Sioux City, IA 51102-0658
Phone (712) 258-3660
Fax (712) 258-8250

Job:	55137
Customer:	SBA NETWORK SERVICES INC
Site Name:	Bridgewater 4, CT CT11934-S
Description:	170' Monopole
Date:	2/1/2012 By: JDS

Sabre Industries
Towers and Poles

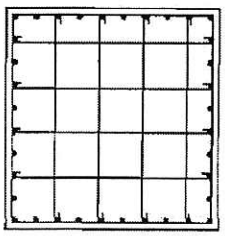
Customer: SBA NETWORK SERVICES INC
Site: Bridgewater 4, CT CT11934-S

170' Monopole at
100 mph Wind with no ice and 40 mph Wind with 1 in. Ice per ANSI/TIA-222-G.
Antenna Loading per Page 1



3/8/12

ELEVATION VIEW
(60.19 Cu. Yds. each)
(1 REQUIRED; NOT TO SCALE)



Typical pier cross-section

Notes:

1). Concrete shall have a minimum 28-day compressive strength of 4000 PSI, in accordance with ACI 318-05

2). Rebar to conform to ASTM specification A615 Grade 60.

3). All rebar to have a minimum of 3" concrete cover.

4). All exposed concrete corners to be chamfered 3/4".

5). The foundation design is based on the geotechnical report by TEP project no. 120651.10, dated: 3/2/12

6). See the geotechnical report for compaction requirements, if specified.

7). The foundation is based on the following factored loads:
Moment (kip-ft) = 5023.33
Axial (kips) = 61.624
Shear (kips) = 38.455

Rebar Schedule per Pad and Pier	
Pier	(36) #9 vertical rebar w/hooks at bottom w/#5 ties, two within top 5" of top of pier then 12" C/C
Pad	(40) #8 horizontal rebar evenly spaced each way top and bottom (160 Total)

8). This is a design drawing only. Please see final construction drawings for all installation details.

9). The foundation is designed for a 15% increase in loads shown in note 7.

SABRE COMMUNICATIONS CORP	JOB: 00-55137	01-Feb-12 09:40
2101 Murray Street	SBA NETWORK SERVICES INC	Ph 712.258.6690
Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

TOP	DIAMETER	22.25 in.	[22.59 in. Point-Point]
BOTTOM	DIAMETER	51.43 in.	[52.22 in. Point-Point]
POLE	HEIGHT	169.00 ft.	18 SIDED FLAT ORIENTATION
BASE	HEIGHT	1.00 ft.	ABOVE GROUND
E-MODULUS		29000 ksi	[12000 ksi SHEAR MODULUS]

APPURTENANCES

ATTACH POINTS:

NO.	X,ft	Qty	Description	Status
1	166.00	1	14' LP Platform with Handrail (R	Future Appurt
2	156.00	1	14' LP Platform with Handrail (R	Future Appurt
3	146.00	1	14' LP Platform with Handrail (R	Future Appurt
4	136.00	1	14' LP Platform with Handrail (R	Future Appurt
5	119.00	2	Pipe Mount (up to 6' Dish)	Future Appurt

Some wind forces may have been derived from full-scale wind tunnel tests.

Pole Section	Bottom X,ft.	Thick in.	Connect Type	LAP in.	Taper in/ft	Length ft.	Weight lbs	Steel Spec	Pole Finish
1	23.50	.18750	SLIP-JNT	45.	.1830	23.50	1152	A572-65	GALVANIZE
2	73.25	.31250	SLIP-JNT	60.	.1830	53.50	5429	A572-65	GALVANIZE
3	121.75	.37500	SLIP-JNT	72.	.1830	53.50	8289	A572-65	GALVANIZE
4	169.00	.43750	C-WELD		.1830	53.25	11603	A572-65	GALVANIZE

SECTION PROPERTIES

X,ft	UP,ft	D,in	T,in	Area in^2	Iz in^4	IxIy in^4	SxSy in^3	w/t	d/t	F_y(ksi)	
169.00	.00	22.25	.1875	13.13	1614	807	71.4	19.16	118.7	65.00	TOP
166.00	3.00	22.80	.1875	13.46	1738	869	75.1	19.68	121.6	65.00	
161.00	8.00	23.71	.1875	14.00	1958	979	81.3	20.54	126.5	65.00	P01
156.00	13.00	24.63	.1875	14.55	2196	1098	87.8	21.40	131.4	65.00	
151.00	18.00	25.54	.1875	15.09	2450	1225	94.5	22.26	136.2	65.00	P02
149.25	19.75	25.86	.1875	15.28	2544	1272	96.9	22.56	137.9	65.00	Slip-B01
146.00	23.00	26.08	.3125	25.56	4288	2144	161.9	12.95	83.5	65.00	
145.50	23.50	26.18	.3125	25.65	4334	2167	163.1	13.01	83.8	65.00	P03
140.50	28.50	27.09	.3125	26.56	4812	2406	174.9	13.52	86.7	65.00	Slip-T02
136.00	33.00	27.91	.3125	27.38	5270	2635	185.9	13.99	89.3	65.00	
131.00	38.00	28.83	.3125	28.28	5810	2905	198.5	14.50	92.3	65.00	P04
126.00	43.00	29.74	.3125	29.19	6388	3194	211.5	15.02	95.2	65.00	
121.00	48.00	30.66	.3125	30.10	7002	3501	224.9	15.54	98.1	65.00	
119.00	50.00	31.03	.3125	30.46	7258	3629	230.4	15.74	99.3	65.00	
114.00	55.00	31.94	.3125	31.37	7926	3963	244.4	16.26	102.2	65.00	P05
109.00	60.00	32.86	.3125	32.28	8636	4318	258.9	16.78	105.1	65.00	
104.00	65.00	33.77	.3125	33.18	9384	4692	273.7	17.29	108.1	65.00	
100.75	68.25	34.36	.3125	33.77	9894	4947	283.5	17.63	110.0	65.00	
95.75	73.25	34.65	.3750	40.80	12112	6056	344.2	14.53	92.4	65.00	Slip-B02
90.75	78.25	35.57	.3750	41.89	13106	6553	362.9	14.96	94.9	65.00	Slip-T03
85.75	83.25	36.48	.3750	42.98	14156	7078	382.1	15.39	97.3	65.00	
80.75	88.25	37.40	.3750	44.07	15262	7631	401.9	15.82	99.7	65.00	
75.75	93.25	38.31	.3750	45.16	16420	8210	422.0	16.25	102.2	65.00	
70.75	98.25	39.23	.3750	46.25	17636	8818	442.7	16.68	104.6	65.00	
65.75	103.25	40.14	.3750	47.33	18912	9456	463.9	17.11	107.1	65.00	
60.75	108.25	41.06	.3750	48.42	20248	10124	485.6	17.54	109.5	65.00	
55.75	113.25	41.97	.3750	49.51	21644	10822	507.8	17.97	111.9	65.00	
53.25	115.75	42.43	.3750	50.06	22366	11183	519.1	18.19	113.2	65.00	
48.25	120.75	42.60	.4375	58.54	26288	13144	607.8	15.40	97.4	65.00	Slip-B03
47.25	121.75	42.78	.4375	58.80	26630	13315	613.0	15.48	97.8	65.00	
42.25	126.75	43.70	.4375	60.07	28394	14197	639.9	15.85	99.9	65.00	Slip-T04
37.25	131.75	44.61	.4375	61.34	30234	15117	667.4	16.22	102.0	65.00	
32.25	136.75	45.53	.4375	62.61	32150	16075	695.5	16.58	104.1	65.00	
27.25	141.75	46.44	.4375	63.88	34148	17074	724.1	16.95	106.1	65.00	
22.25	146.75	47.36	.4375	65.15	36228	18114	753.4	17.32	108.2	65.00	
17.25	151.75	48.27	.4375	66.42	38388	19194	783.2	17.69	110.3	65.00	
12.25	156.75	49.19	.4375	67.69	40632	20316	813.6	18.06	112.4	65.00	
7.25	161.75	50.10	.4375	68.96	42966	21483	844.6	18.43	114.5	65.00	
2.25	166.75	51.02	.4375	70.23	45384	22692	876.1	18.80	116.6	65.00	
.00	169.00	51.43	.4375	70.80	46500	23250	890.5	18.96	117.5	65.00	BASE

SABRE COMMUNICATIONS CORP	JOB: 00-55137	01-Feb-12 09:40
2101 Murray Street	SBA NETWORK SERVICES INC	Ph 712.258.6690
Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

CASE - 1: 3s Gusted Wind — ANSI-TIA-222-G

WIND OLF	1.60	GUSTED WIND (3sec)	100.0 mph	160.9 kph	
VERTICAL OLF	1.20	EXP-CAT/STRUC CLASS	C-II		
DESIGN ICE	.00 in	EXP-POWER COEFF.	.2105		
GUST FACTOR (Gh)	1.10	REFERENCE HEIGHT	900.0 ft		
FORCE COEFF (Cf)	.65	PRESSURE @ 32.7 ft	42.8 psf	2048.2 Pa	
IMPORTANCE FAC (I)	1.00	BASE ABOVE Grd	1.0		
DIRECTION FAC (Kd)	.95	CREST HEIGHT	.0 ft		
TOPOGRAPHIC CAT	1				

APPURTENANCES — Sabre Areas

#	Qty	Description	Center Line Elev-Ft	WEIGHT each Lbs	AREA each Ft^2	Tx-CABLE Type	Qty	#/Ft	WIND Psf	FORCES Tra-Y Kips	Ax-Z Kips	MOM. Lg-X Ft-K
_ 1	1	14' LP Platform with Handrail (R	166.0	1704	86.5				60.5	5.23	-2.0	-7.8
	12	DB848H90E-XY.	166.0	28		1 5/8"	24	1.04	60.3		-5.4	
	6	TMA	166.0	8		None	1	.00	60.3		-.1	
_ 2	1	14' LP Platform with Handrail (R	156.0	1704	86.5				59.7	5.16	-2.0	-7.7
	12	DB848H90E-XY.	156.0	28		1 5/8"	18	1.04	59.6		-3.9	
	6	TMA	156.0	8		None	1	.00	59.6		-.1	
_ 3	1	14' LP Platform with Handrail (R	146.0	1704	71.9				58.9	4.24	-2.0	-6.4
	9	DB848H90E-XY.	146.0	28		1 5/8"	18	1.04	58.7		-3.6	
	6	TMA	146.0	8		None	1	.00	58.7		-.1	
_ 4	1	14' LP Platform with Handrail (R	136.0	1704	71.9				58.0	4.17	-2.0	-6.3
	9	DB848H90E-XY.	136.0	28		1 5/8"	18	1.04	57.9		-3.4	
	6	TMA	136.0	8		None	1	.00	57.9		-.1	
5	2	Pipe Mount (up to 6' Dish)	119.0	49	.1				56.3	.01	-.1	.0
	2	6' SOLID DISH W/ RADOME	119.0	330	24.4	1 5/8"	12	1.04	56.3	2.75	-2.6	

RESULTS

X, ft	Kzt	WIND psf	ICE in	FORCES,kips ShearX	ShearY	AxiaZ	MOMENTS,ft-kips BendX	BendY	TorqZ	F'y ksi	Inter 4.8.2
169.00	1.00	39.37	.00	.0	.01	-.1	.0	.0	.0	78.84	.000
166.00	1.00	39.23	.00	.0	6.86	-6.7	-8.2	.0	.0	78.24	.026
161.00	1.00	38.98	.00	.0	7.40	-7.0	-43.1	.0	.0	77.22	.099
156.00	1.00	38.72	.00	.0	13.99	-12.3	-87.8	.0	.0	76.21	.188
151.00	1.00	38.46	.00	.0	14.27	-12.5	-157.8	.0	.0	75.20	.309
149.25	1.00	38.36	.00	.0	14.51	-12.8	-182.8	.0	.0	74.84	.349
146.00	1.00	38.19	.00	.0	19.85	-17.9	-236.3	.0	.0	82.55	.246
145.50	1.00	38.16	.00	.0	20.13	-18.4	-246.2	.0	.0	82.55	.254
140.50	1.00	37.88	.00	.0	20.57	-19.1	-346.8	.0	.0	82.55	.330
136.00	1.00	37.62	.00	.0	26.02	-24.4	-445.6	.0	.0	82.55	.400
131.00	1.00	37.33	.00	.0	26.44	-25.1	-575.8	.0	.0	82.55	.481
126.00	1.00	37.03	.00	.0	26.85	-25.8	-707.9	.0	.0	82.55	.553
121.00	1.00	36.72	.00	.0	27.13	-26.3	-842.5	.0	.0	82.55	.617
119.00	1.00	36.59	.00	.0	30.54	-29.1	-896.7	.0	.0	82.55	.642
114.00	1.00	36.26	.00	.0	30.92	-30.0	-1049.2	.0	.0	82.26	.709
109.00	1.00	35.93	.00	.0	31.29	-30.8	-1203.3	.0	.0	81.65	.773
104.00	1.00	35.58	.00	.0	31.60	-31.7	-1360.0	.0	.0	81.04	.831
100.75	1.00	35.34	.00	.0	31.97	-33.0	-1462.5	.0	.0	80.65	.867
95.75	1.00	34.97	.00	.0	32.41	-34.6	-1622.5	.0	.0	82.55	.773
90.75	1.00	34.58	.00	.0	32.81	-35.8	-1785.0	.0	.0	82.55	.807
85.75	1.00	34.17	.00	.0	33.18	-36.9	-1949.2	.0	.0	82.55	.836
80.75	1.00	33.75	.00	.0	33.54	-38.1	-2115.0	.0	.0	82.55	.862
75.75	1.00	33.30	.00	.0	33.89	-39.2	-2282.5	.0	.0	82.27	.889
70.75	1.00	32.84	.00	.0	34.24	-40.4	-2451.7	-.1	.0	81.76	.915
65.75	1.00	32.34	.00	.0	34.58	-41.6	-2623.3	-.1	.0	81.25	.940
60.75	1.00	31.81	.00	.0	34.91	-42.8	-2795.8	-.1	.0	80.75	.963
55.75	1.00	31.25	.00	.0	35.16	-43.9	-2970.8	-.1	.0	80.24	.985
53.25	1.00	30.96	.00	.0	35.43	-45.2	-3058.3	-.1	.0	79.99	.995
48.25	1.00	30.33	.00	.0	35.64	-46.4	-3235.8	-.1	.0	82.55	.871
47.25	1.00	30.20	.00	.0	35.85	-47.6	-3270.8	-.1	.0	82.55	.873
42.25	1.00	29.52	.00	.0	36.18	-49.3	-3450.0	-.1	.0	82.55	.882
37.25	1.00	28.76	.00	.0	36.47	-50.8	-3630.8	-.1	.0	82.31	.893
32.25	1.00	27.93	.00	.0	36.76	-52.3	-3813.3	-.1	.0	81.88	.904
27.25	1.00	26.98	.00	.0	37.03	-53.8	-3997.5	-.1	.0	81.44	.916
22.25	1.00	25.90	.00	.0	37.31	-55.3	-4182.5	-.1	.0	81.01	.926
17.25	1.00	24.61	.00	.0	37.59	-56.9	-4369.2	-.1	.0	80.57	.935
12.25	1.00	23.65	.00	.0	37.86	-58.5	-4556.7	-.1	.0	80.14	.944
7.25	1.00	23.65	.00	.0	38.14	-60.1	-4746.7	-.1	.0	79.71	.953
2.25	1.00	23.65	.00	.0	38.34	-61.3	-4936.7	-.1	.0	79.27	.960
.00	1.00	23.65	.00	.0	38.46	-61.6	5023.3	.1	.0	79.08	.964

SABRE COMMUNICATIONS CORP	JOB: 00-55137	01-Feb-12 09:40
2101 Murray Street	SBA NETWORK SERVICES INC	Ph 712.258.6690
Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

DISPLACEMENTS

ELEV	DEFLECTION feet				ROTATION, degrees			
X, ft	X	Y	Z	XY-Result	X	Y	Z	XY-Result
169.00	.00	17.28	-1.19	17.28<10.22%>	-10.59	.00	.00	10.59

SABRE COMMUNICATIONS CORP	JOB: 00-55137	01-Feb-12 09:40
2101 Murray Street	SBA NETWORK SERVICES INC	Ph 712.258.6690
Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

CASE - 2: 3s Gusted Wind 0.9 Dead — ANSI-TIA-222-G

WIND OLF	1.60	GUSTED WIND (3sec)	100.0 mph	160.9 kph	
VERTICAL OLF	.90	EXP-CAT/STRUC CLASS	C-II		
DESIGN ICE	.00 in	EXP-POWER COEFF.	.2105		
GUST FACTOR (Gh)	1.10	REFERENCE HEIGHT	900.0 ft		
FORCE COEFF (Cf)	.65	PRESSURE @ 32.7 ft	42.8 psf	2048.2 Pa	
IMPORTANCE FAC (I)	1.00	BASE ABOVE Grd	1.0		
DIRECTION FAC (Kd)	.95	CREST HEIGHT	.0 ft		
TOPOGRAPHIC CAT	1				

APPURTENANCES — Sabre Areas

#	Qty	Description	Center Line Elev-Ft	WEIGHT each Lbs	AREA each Ft^2	Tx-CABLE Type	Tx-CABLE Qty	Tx-CABLE #/Ft	WIND Psf	FORCES Tra-Y Kips	FORCES Ax-Z Kips	MOM. Lg-X Ft-K
_ 1	1	14' LP Platform with Handrail (R	166.0	1704	86.5				60.5	5.23	-1.5	-7.8
	12	DB848H90E-XY.	166.0	28		1 5/8"	24	1.04	60.3		-4.0	
	6	TMA	166.0	8		None	1	.00	60.3		.0	
_ 2	1	14' LP Platform with Handrail (R	156.0	1704	86.5				59.7	5.16	-1.5	-7.7
	12	DB848H90E-XY.	156.0	28		1 5/8"	18	1.04	59.6		-2.9	
	6	TMA	156.0	8		None	1	.00	59.6		.0	
_ 3	1	14' LP Platform with Handrail (R	146.0	1704	71.9				58.9	4.24	-1.5	-6.4
	9	DB848H90E-XY.	146.0	28		1 5/8"	18	1.04	58.7		-2.7	
	6	TMA	146.0	8		None	1	.00	58.7		.0	
_ 4	1	14' LP Platform with Handrail (R	136.0	1704	71.9				58.0	4.17	-1.5	-6.3
	9	DB848H90E-XY.	136.0	28		1 5/8"	18	1.04	57.9		-2.5	
	6	TMA	136.0	8		None	1	.00	57.9		.0	
5	2	Pipe Mount (up to 6' Dish)	119.0	49	.1				56.3	.01	-.1	.0
	2	6' SOLID DISH W/ RADOME	119.0	330	24.4	1 5/8"	12	1.04	56.3	2.75	-1.9	

RESULTS

X, ft	Kzt	WIND psf	ICE in	FORCES,kips ShearX	ShearY	AxiaZ	MOMENTS,ft-kips BendX	BendY	TorqZ	F'y ksi	Inter 4.8.2
169.00	1.00	39.37	.00	.0	.01	-.1	.0	.0	.0	78.84	.000
166.00	1.00	39.23	.00	.0	6.47	-4.8	-8.2	.0	.0	78.24	.024
161.00	1.00	38.98	.00	.0	6.99	-5.0	-41.1	.0	.0	77.22	.093
156.00	1.00	38.72	.00	.0	13.28	-8.8	-83.8	.0	.0	76.21	.177
151.00	1.00	38.46	.00	.0	13.56	-9.0	-150.3	.0	.0	75.20	.292
149.25	1.00	38.36	.00	.0	13.79	-9.2	-173.9	.0	.0	74.84	.330
146.00	1.00	38.19	.00	.0	18.85	-12.9	-225.1	.0	.0	82.55	.232
145.50	1.00	38.16	.00	.0	19.12	-13.3	-234.5	.0	.0	82.55	.240
140.50	1.00	37.88	.00	.0	19.55	-13.8	-330.1	.0	.0	82.55	.312
136.00	1.00	37.62	.00	.0	24.75	-17.6	-424.3	.0	.0	82.55	.378
131.00	1.00	37.33	.00	.0	25.18	-18.2	-548.1	.0	.0	82.55	.455
126.00	1.00	37.03	.00	.0	25.61	-18.8	-674.0	.0	.0	82.55	.524
121.00	1.00	36.72	.00	.0	25.90	-19.2	-802.1	.0	.0	82.55	.585
119.00	1.00	36.59	.00	.0	29.22	-21.2	-854.2	.0	.0	82.55	.609
114.00	1.00	36.26	.00	.0	29.64	-21.9	-1000.0	.0	.0	82.26	.673
109.00	1.00	35.93	.00	.0	30.04	-22.6	-1148.3	.0	.0	81.65	.735
104.00	1.00	35.58	.00	.0	30.39	-23.2	-1298.3	.0	.0	81.04	.791
100.75	1.00	35.34	.00	.0	30.77	-24.2	-1397.5	.0	.0	80.65	.825
95.75	1.00	34.97	.00	.0	31.24	-25.5	-1550.8	.0	.0	82.55	.737
90.75	1.00	34.58	.00	.0	31.67	-26.5	-1707.5	.0	.0	82.55	.769
85.75	1.00	34.17	.00	.0	32.09	-27.3	-1865.8	.0	.0	82.55	.798
80.75	1.00	33.75	.00	.0	32.50	-28.2	-2025.8	.0	.0	82.55	.823
75.75	1.00	33.30	.00	.0	32.91	-29.1	-2188.3	.0	.0	82.27	.849
70.75	1.00	32.84	.00	.0	33.31	-30.0	-2353.3	.0	.0	81.76	.876
65.75	1.00	32.34	.00	.0	33.71	-31.0	-2519.2	-.1	.0	81.25	.900
60.75	1.00	31.81	.00	.0	34.10	-31.9	-2688.3	-.1	.0	80.75	.924
55.75	1.00	31.25	.00	.0	34.40	-32.8	-2858.3	-.1	.0	80.24	.945
53.25	1.00	30.96	.00	.0	34.71	-33.8	-2945.0	-.1	.0	79.99	.955
48.25	1.00	30.33	.00	.0	34.95	-34.7	-3118.3	-.1	.0	82.55	.837
47.25	1.00	30.20	.00	.0	35.20	-35.6	-3153.3	-.1	.0	82.55	.839
42.25	1.00	29.52	.00	.0	35.59	-37.0	-3329.2	-.1	.0	82.55	.849
37.25	1.00	28.76	.00	.0	35.95	-38.1	-3506.7	-.1	.0	82.31	.860
32.25	1.00	27.93	.00	.0	36.30	-39.3	-3686.7	-.1	.0	81.88	.872
27.25	1.00	26.98	.00	.0	36.66	-40.5	-3868.3	-.1	.0	81.44	.883
22.25	1.00	25.90	.00	.0	37.01	-41.7	-4051.7	-.1	.0	81.01	.894
17.25	1.00	24.61	.00	.0	37.36	-42.9	-4236.7	-.1	.0	80.57	.904
12.25	1.00	23.65	.00	.0	37.72	-44.1	-4423.3	-.1	.0	80.14	.914
7.25	1.00	23.65	.00	.0	38.08	-45.4	-4611.7	-.1	.0	79.71	.923
2.25	1.00	23.65	.00	.0	38.34	-46.3	-4802.5	-.1	.0	79.27	.931
.00	1.00	23.65	.00	.0	38.46	-46.6	4888.3	.1	.0	79.08	.935

DISPLACEMENTS

ELEV	DEFLECTION feet				ROTATION, degrees			
X, ft	X	Y	Z	XY-Result	X	Y	Z	XY-Result
169.00	.00	16.64	-1.10	16.64< 9.85%>	-10.17	.00	.00	10.17

SABRE COMMUNICATIONS CORP	JOB: 00-55137	01-Feb-12 09:40
2101 Murray Street	SBA NETWORK SERVICES INC	Ph 712.258.6690
Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

CASE - 3: 3s Gusted Wind&Ice — **ANSI-TIA-222-G**

WIND OLF		1.00	GUSTED WIND (3sec)	40.0 mph	64.4 kph
VERTICAL OLF		1.20	EXP-CAT/STRUC CLASS	C-II	
DESIGN ICE		1.00 in	EXP-POWER COEFF.	.2105	
GUST FACTOR	(Gh)	1.10	REFERENCE HEIGHT	900.0 ft	
FORCE COEFF	(Cf)	1.20	PRESSURE @ 32.7 ft	4.3 psf	204.8 Pa
IMPORTANCE FAC	(I)	1.00	BASE ABOVE Grd	1.0	
DIRECTION FAC	(Kd)	.95	CREST HEIGHT	.0 ft	
TOPOGRAPHIC CAT		1			

APPURTENANCES — **Sabre Areas**

#	Qty	Description	Center Line Elev-Ft	WEIGHT each Lbs	AREA each Ft^2	Tx-CABLE Type	Qty	#/Ft	WIND Psf	FORCES Tra-Y Kips	Ax-Z Kips	MOM. Lg-X Ft-K
_ 1	1	14' LP Platform with Handrail (R	166.0	1874	122.2				6.0	.74	-9.5	-1.1
	12	DB848H90E-XY.	166.0	55		1 5/8"	24	1.04	6.0		-9.8	
	6	TMA	166.0	11		None	1	.00	6.0		-.4	
_ 2	1	14' LP Platform with Handrail (R	156.0	1874	122.0				6.0	.73	-9.4	-1.1
	12	DB848H90E-XY.	156.0	55		1 5/8"	18	1.04	6.0		-8.3	
	6	TMA	156.0	11		None	1	.00	6.0		-.4	
_ 3	1	14' LP Platform with Handrail (R	146.0	1874	99.1				5.9	.58	-9.3	-.9
	9	DB848H90E-XY.	146.0	55		1 5/8"	18	1.04	5.9		-6.8	
	6	TMA	146.0	11		None	1	.00	5.9		-.4	
_ 4	1	14' LP Platform with Handrail (R	136.0	1874	98.9				5.8	.57	-9.2	-.9
	9	DB848H90E-XY.	136.0	55		1 5/8"	18	1.04	5.8		-6.6	
	6	TMA	136.0	11		None	1	.00	5.8		-.4	
5	2	Pipe Mount (up to 6' Dish)	119.0	53	.1				5.6	.00	-.1	.0
	2	6' SOLID DISH W/ RADOME	119.0	838	25.1	1 5/8"	12	1.04	5.6	.28	-2.6	

RESULTS

X, ft	Kzt	WIND psf	ICE in	FORCES,kips ShearX	ShearY	AxiaZ	MOMENTS,ft-kips BendX	BendY	TorqZ	F'y ksi	Inter 4.8.2
169.00	1.00	7.27	2.36	.0	.01	-.2	.0	.0	.0	78.84	.000
166.00	1.00	7.24	2.35	.0	1.24	-13.1	-1.2	.0	.0	78.24	.017
161.00	1.00	7.20	2.34	.0	1.36	-13.8	-7.5	.0	.0	77.22	.030
156.00	1.00	7.15	2.34	.0	2.55	-25.4	-15.4	.0	.0	76.21	.056
151.00	1.00	7.10	2.33	.0	2.61	-25.9	-28.1	.0	.0	75.20	.078
149.25	1.00	7.08	2.33	.0	2.67	-26.3	-32.7	.0	.0	74.84	.086
146.00	1.00	7.05	2.32	.0	3.59	-36.2	-42.3	.0	.0	82.55	.061
145.50	1.00	7.04	2.32	.0	3.65	-36.8	-44.0	.0	.0	82.55	.063
140.50	1.00	6.99	2.31	.0	3.75	-37.9	-62.3	.0	.0	82.55	.077
136.00	1.00	6.95	2.31	.0	4.68	-48.0	-80.0	.0	.0	82.55	.093
131.00	1.00	6.89	2.30	.0	4.77	-49.0	-103.4	.0	.0	82.55	.108
126.00	1.00	6.84	2.29	.0	4.85	-50.1	-127.3	.0	.0	82.55	.120
121.00	1.00	6.78	2.28	.0	4.90	-50.8	-151.4	.0	.0	82.55	.131
119.00	1.00	6.76	2.28	.0	5.31	-54.3	-161.3	.0	.0	82.55	.137
114.00	1.00	6.69	2.27	.0	5.37	-55.4	-187.8	.0	.0	82.26	.148
109.00	1.00	6.63	2.26	.0	5.44	-56.6	-214.7	.0	.0	81.65	.159
104.00	1.00	6.57	2.25	.0	5.49	-57.6	-241.8	.0	.0	81.04	.169
100.75	1.00	6.52	2.24	.0	5.55	-59.2	-259.7	.0	.0	80.65	.176
95.75	1.00	6.46	2.23	.0	5.62	-61.1	-287.4	.0	.0	82.55	.155
90.75	1.00	6.38	2.22	.0	5.69	-62.7	-315.5	.0	.0	82.55	.161
85.75	1.00	6.31	2.20	.0	5.75	-64.1	-343.9	.0	.0	82.55	.165
80.75	1.00	6.23	2.19	.0	5.80	-65.5	-372.7	.0	.0	82.55	.170
75.75	1.00	6.15	2.18	.0	5.86	-67.0	-401.7	.0	.0	82.27	.174
70.75	1.00	6.06	2.16	.0	5.91	-68.5	-431.0	.0	.0	81.76	.179
65.75	1.00	5.97	2.15	.0	5.96	-70.0	-460.5	.0	.0	81.25	.183
60.75	1.00	5.87	2.13	.0	6.01	-71.6	-490.3	.0	.0	80.75	.187
55.75	1.00	5.77	2.11	.0	6.04	-72.9	-520.3	.0	.0	80.24	.191
53.25	1.00	5.72	2.10	.0	6.08	-74.5	-535.4	.0	.0	79.99	.193
48.25	1.00	5.60	2.08	.0	6.11	-75.9	-565.8	.0	.0	82.55	.168
47.25	1.00	5.58	2.08	.0	6.14	-77.3	-571.9	.0	.0	82.55	.168
42.25	1.00	5.45	2.05	.0	6.18	-79.4	-602.7	.0	.0	82.55	.170
37.25	1.00	5.31	2.03	.0	6.22	-81.3	-633.6	.0	.0	82.31	.172
32.25	1.00	5.16	2.00	.0	6.26	-83.1	-664.7	.0	.0	81.88	.174
27.25	1.00	4.98	1.97	.0	6.29	-85.0	-695.9	.0	.0	81.44	.176
22.25	1.00	4.78	1.93	.0	6.33	-87.0	-727.4	.0	.0	81.01	.177
17.25	1.00	4.54	1.88	.0	6.36	-88.9	-759.1	.0	.0	80.57	.179
12.25	1.00	4.37	1.83	.0	6.39	-90.9	-790.8	.0	.0	80.14	.180
7.25	1.00	4.37	1.74	.0	6.43	-92.9	-822.8	.0	.0	79.71	.182
2.25	1.00	4.37	1.59	.0	6.45	-94.3	-855.0	.0	.0	79.27	.183
.00	1.00	4.37	1.41	.0	6.47	-94.6	869.2	.0	.0	79.08	.183

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Sioux City, IA 51101	Bridgewater 4, CT	Fx 712.258.8250

DISPLACEMENTS

ELEV	DEFLECTION feet				ROTATION, degrees			
X, ft	X	Y	Z	XY-Result	X	Y	Z	XY-Result
169.00	.00	3.04	-.05	3.04< 1.80%>	-1.87	.00	.00	1.87

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CASE - 4: Service Loads — ANSI-TIA-222-G

WIND OLF	1.00	GUSTED WIND (3sec)	60.0 mph	96.6 kph	
VERTICAL OLF	1.00	EXP-CAT/STRUC CLASS	C-II		
DESIGN ICE	.00 in	EXP-POWER COEFF.	.2105		
GUST FACTOR (Gh)	1.10	REFERENCE HEIGHT	900.0 ft		
FORCE COEFF (Cf)	.65	PRESSURE @ 32.7 ft	8.6 psf	412.3 Pa	
IMPORTANCE FAC (I)	1.00	BASE ABOVE Grd	1.0		
DIRECTION FAC (Kd)	.85	CREST HEIGHT	.0 ft		
TOPOGRAPHIC CAT	1				

APPURTENANCES — Sabre Areas

#	Qty	Description	Center Line Elev-Ft	WEIGHT each Lbs	AREA each Ft^2	Tx-CABLE Type	Qty	#/Ft	WIND Psf	FORCES Tra-Y Kips	Ax-Z Kips	MOM. Lg-X Ft-K
_ 1	1	14' LP Platform with Handrail (R	166.0	1704	86.5				12.2	1.05	-1.7	-1.6
	12	DB848H90E-XY.	166.0	28		1 5/8"	24	1.04	12.1		-4.5	
	6	TMA	166.0	8		None	1	.00	12.1		.0	
_ 2	1	14' LP Platform with Handrail (R	156.0	1704	86.5				12.0	1.04	-1.7	-1.6
	12	DB848H90E-XY.	156.0	28		1 5/8"	18	1.04	12.0		-3.3	
	6	TMA	156.0	8		None	1	.00	12.0		.0	
_ 3	1	14' LP Platform with Handrail (R	146.0	1704	71.9				11.9	.85	-1.7	-1.3
	9	DB848H90E-XY.	146.0	28		1 5/8"	18	1.04	11.8		-3.0	
	6	TMA	146.0	8		None	1	.00	11.8		.0	
_ 4	1	14' LP Platform with Handrail (R	136.0	1704	71.9				11.7	.84	-1.7	-1.3
	9	DB848H90E-XY.	136.0	28		1 5/8"	18	1.04	11.7		-2.8	
	6	TMA	136.0	8		None	1	.00	11.7		.0	
5	2	Pipe Mount (up to 6' Dish)	119.0	49	.1				11.3	.00	-.1	.0
	2	6' SOLID DISH W/ RADOME	119.0	330	24.4	1 5/8"	12	1.04	11.3	.55	-2.1	

RESULTS

X, ft	Kzt	WIND psf	ICE in	FORCES,kips ShearX	ShearY	AxiaZ	MOMENTS,ft-kips BendX	BendY	TorqZ	F'y ksi	Inter 4.8.2
169.00	1.00	7.93	.00	.0	.00	-.1	.0	.0	.0	78.84	.000
166.00	1.00	7.90	.00	.0	1.35	-6.4	-1.7	.0	.0	78.24	.011
161.00	1.00	7.85	.00	.0	1.46	-6.7	-8.5	.0	.0	77.22	.025
156.00	1.00	7.79	.00	.0	2.77	-11.9	-17.4	.0	.0	76.21	.047
151.00	1.00	7.74	.00	.0	2.82	-12.1	-31.2	.0	.0	75.20	.070
149.25	1.00	7.72	.00	.0	2.87	-12.3	-36.1	.0	.0	74.84	.078
146.00	1.00	7.69	.00	.0	3.92	-17.2	-46.8	.0	.0	82.55	.056
145.50	1.00	7.68	.00	.0	3.98	-17.6	-48.7	.0	.0	82.55	.057
140.50	1.00	7.63	.00	.0	4.07	-18.1	-68.6	.0	.0	82.55	.073
136.00	1.00	7.57	.00	.0	5.15	-23.1	-88.2	.0	.0	82.55	.088
131.00	1.00	7.52	.00	.0	5.23	-23.6	-113.9	.0	.0	82.55	.104
126.00	1.00	7.45	.00	.0	5.31	-24.1	-140.1	.0	.0	82.55	.118
121.00	1.00	7.39	.00	.0	5.37	-24.4	-166.6	.0	.0	82.55	.131
119.00	1.00	7.37	.00	.0	6.05	-27.0	-177.3	.0	.0	82.55	.136
114.00	1.00	7.30	.00	.0	6.13	-27.6	-207.6	.0	.0	82.26	.150
109.00	1.00	7.23	.00	.0	6.21	-28.1	-238.3	.0	.0	81.65	.162
104.00	1.00	7.16	.00	.0	6.27	-28.7	-269.3	.0	.0	81.04	.174
100.75	1.00	7.11	.00	.0	6.35	-29.6	-289.7	.0	.0	80.65	.181
95.75	1.00	7.04	.00	.0	6.44	-30.8	-321.4	.0	.0	82.55	.161
90.75	1.00	6.96	.00	.0	6.52	-31.7	-353.6	.0	.0	82.55	.168
85.75	1.00	6.88	.00	.0	6.60	-32.4	-386.2	.0	.0	82.55	.173
80.75	1.00	6.79	.00	.0	6.68	-33.2	-419.2	.0	.0	82.55	.179
75.75	1.00	6.70	.00	.0	6.75	-33.9	-452.5	.0	.0	82.27	.184
70.75	1.00	6.61	.00	.0	6.83	-34.7	-486.3	.0	.0	81.76	.189
65.75	1.00	6.51	.00	.0	6.90	-35.6	-520.4	.0	.0	81.25	.194
60.75	1.00	6.40	.00	.0	6.98	-36.4	-554.9	.0	.0	80.75	.199
55.75	1.00	6.29	.00	.0	7.03	-37.1	-589.8	.0	.0	80.24	.203
53.25	1.00	6.23	.00	.0	7.09	-38.1	-607.4	.0	.0	79.99	.206
48.25	1.00	6.11	.00	.0	7.14	-39.0	-642.9	.0	.0	82.55	.180
47.25	1.00	6.08	.00	.0	7.19	-39.9	-650.0	.0	.0	82.55	.180
42.25	1.00	5.94	.00	.0	7.26	-41.2	-685.9	.0	.0	82.55	.182
37.25	1.00	5.79	.00	.0	7.33	-42.2	-722.3	.0	.0	82.31	.185
32.25	1.00	5.62	.00	.0	7.40	-43.3	-758.9	.0	.0	81.88	.187
27.25	1.00	5.43	.00	.0	7.46	-44.4	-795.8	.0	.0	81.44	.189
22.25	1.00	5.21	.00	.0	7.53	-45.5	-833.2	.0	.0	81.01	.192
17.25	1.00	4.96	.00	.0	7.59	-46.6	-870.8	.0	.0	80.57	.194
12.25	1.00	4.76	.00	.0	7.66	-47.8	-909.2	.0	.0	80.14	.196
7.25	1.00	4.76	.00	.0	7.73	-49.0	-946.7	.0	.0	79.71	.197
2.25	1.00	4.76	.00	.0	7.78	-49.8	-985.8	.0	.0	79.27	.199
.00	1.00	4.76	.00	.0	7.80	-50.1	1003.3	.0	.0	79.08	.200

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DISPLACEMENTS

ELEV	DEFLECTION feet				ROTATION, degrees				MicroW
X, ft	X	Y	Z	XY-Result	X	Y	Z	XY-Result	AlloW
169.00	.00	3.44	-.05	3.44< 2.04%>	-2.10	.00	.00	2.10	

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SHAPE: 18 SIDED POLYGON with FLAT-FLAT ORIENTATION
BOLTS: QUADRANT SPACED BOLTS 6.00 in. ON CENTER
LOCATE:

POLE DATA

DIAMETER	= 51.43 in.	BASE	AXIAL FORCE	= -61.6 kips	Vert
PLATE	= .4375 in.	ACTIONS	SHEAR X	= 27.2 kips	Long
TAPER	= .1830 in/ft		SHEAR Y	= 27.2 kips	Tran
POLE Fy	= 65.00 ksi		X-AXIS MOM	= 3551.5 ft-kips	Tran
			Y-Axis MOM	= 3551.5 ft-kips	Long
			Z-Axis MOM	= .0 ft-kips	Vert

DESIGN CASE = 1 3s Gusted Wind

Design: ANY Orientation Reactions at 45.00 deg to X-AXIS

BOLT LOADS

	AXIAL - COMPRESSION	= 210.94 kips		
	AXIAL - TENSION	= 204.78 kips		
	SHEAR	= 2.72 kips		
AXIAL	STRESS	= 64.91 ksi		
SHEAR	STRESS	= .89 ksi		
YIELD	STRENGTH Fy	= 75.00 ksi		
ULT.	STRENGTH Fu	= 100.00 ksi		
ALLOW	STRESS Fa [.80 x 1.00]	= 80.00 ksi	Interaction	
	SHEAR Fv [.80 x .40]	= 32.00 ksi	.833	TIA-G
	TENSION AREA REQUIRED	= 2.64 in^2		
	TENSION AREA FURNISHED	= 3.25 in^2		
	ROOT AREA FURNISHED	= 3.07 in^2		

A615 ::: ANCHOR BOLT DESIGN USED					
20	Bolts on a	58.000	in.	Bolt Circle	SHIP
2.250	in. Diameter	67.13	in.	Embedded	(lbs)
12.00	in. Exposed	84.00	in.	Total Length	2664

CONCRETE - Fc= 4000 psi

ANCHOR BOLTS are STRAIGHT w\ UPLIFT NUT

BASE PLATE

[Bend Model: 1/4 Circ]

YIELD STRENGTH	=	50.0 ksi
BEND LINE WIDTH	=	40.8 in.
PLATE MOMENT	=	3179.5 in-k
THICKNESS REQD	=	2.632 in.
BENDING STRESS	=	41.2 ksi
ALLOWABLE STRESS	=	45.0 ksi
[Fy x .90 x 1.00]		

BASE PLATE USED			
2.75	in.	THICK	SHIP
60.25	in.	SQUARE	(lbs)
39.00	in.	CENTER HOLE	1500
14.00	in.	CORNER CLIP	

LOAD CASE SUMMARY

	FORCES-(kips)			MOMENTS-(ft-k)			ABolt-Str	Plate-Str		
							Allow	Actual	Allow	Design
LC	Axial	ShearX	ShearY	X-axis	Y-axis	TorQ	CSR	ksi	ksi	ksi	Code
1	61.6	27.2	27.2	3552	3552	0	.833	75.00	41.21	45.00	TIA-G
2	46.6	27.2	27.2	3456	3456	0	.809	75.00	39.97	45.00	TIA-G
3	94.6	4.6	4.6	614	614	0	.160	75.00	7.99	45.00	TIA-G
4	50.1	5.5	5.5	709	709	0	.174	75.00	8.62	45.00	TIA-G

MAT FOUNDATION DESIGN BY SABRE TOWERS & POLES
170' Monopole SBA NETWORK SERVICES INC Bridgewater 4, CT (55137) 3-8-12 REB

Overall Loads:			
Factored Moment (ft-kips)	5776.83		
Factored Axial (kips)	70.87		
Factored Shear (kips)	44.22		
Bearing Design Strength (ksf)	**22.35**	Max. Net Bearing Press. (ksf)	3.62
Water Table Below Grade (ft)	**4**		
Width of Mat (ft)	26.5	Ultimate Bearing Pressure (ksf)	**29.80**
Thickness of Mat (ft)	2	*Bearing* Φs	**0.75**
Depth to Bottom of Slab (ft)	6		
Quantity of Bolts in Bolt Circle	20		
Bolt Circle Diameter (in)	58		
Top of Concrete to Top of Bottom Threads (in)	60		
Equivalent Diameter of Pier (ft)	7.9	Minimum Pier Diameter (ft)	6.33
Ht. of Pier Above Ground (ft)	0.5	Equivalent Square b (ft)	7.00
Ht. of Pier Below Ground (ft)	4		
Quantity of Bars in Mat	40		
Bar Diameter in Mat (in)	1		
Area of Bars in Mat (in^2)	31.42		
Spacing of Bars in Mat (in)	7.97	Recommended Spacing (in)	6 to 12
Quantity of Bars Pier	36		
Bar Diameter in Pier (in)	1.128		
Tie Bar Diameter in Pier (in)	0.625		
Spacing of Ties (in)	12		
Area of Bars in Pier (in^2)	35.98	Minimum Pier A_s (in^2)	35.29
Spacing of Bars in Pier (in)	7.54	Recommended Spacing (in)	6 to 12
f'c (ksi)	4		
fy (ksi)	60		
Unit Wt. of Soil (kcf)	**0.117**		
Unit Wt. of Concrete (kcf)	0.15		
Volume of Concrete (yd^3)	60.19		
Two-Way Shear Action:			
Average d (in)	20		
ϕV_c (kips)	1368.6	V_u (kips)	110.6
$\phi V_c = \phi(2 + 4/\beta_c)f'_c{}^{1/2}b_o d$	2052.9		
$\phi V_c = \phi(\alpha_s d/b_o + 2)f'_c{}^{1/2}b_o d$	1443.2		
$\phi V_c = \phi 4 f'_c{}^{1/2}b_o d$	1368.6		
Shear perimeter, b_o (in)	360.65		
β_c	1		
One-Way Shear:			
ϕV_c (kips)	683.8	V_u (kips)	381.5
Stability:			
Overturning Design Strength (ft-k)	6211.6	Total Applied M (ft-k)	6064.3

MAT FOUNDATION DESIGN BY SABRE TOWERS & POLES (CONTINUED)
170' Monopole SBA NETWORK SERVICES INC Bridgewater 4, CT (55137) 3-8-12 REB

Pier Design:

ϕV_n (kips)	776.9	V_u (kips)	44.2
$\phi V_c=\phi 2(1+N_u/(2000A_g))f'_c{}^{1/2}b_w d$	776.9		
V_s (kips)	0.0	*** V_s max = $4 f'_c{}^{1/2}b_w d$ (kips)	1818.8
Maximum Spacing (in)	7.77	(Only if Shear Ties are Required)	
Actual Hook Development (in)	19.00	Req'd Hook Development l_{dh} (in)	14.98
		*** Ref. To Spacing Requirements ACI 11.5.4.3	

Flexure in Slab:

ϕM_n (ft-kips)	2704.2	M_u (ft-kips)	2492.9
a (in)	1.74		
Steel Ratio	0.00494		
β_1	0.85		
Maximum Steel Ratio ($.75p_b$)	0.0214		
Minimum Steel Ratio	0.0018		
Rebar Development in Pad (in)	156.00	Required Development in Pad (in)	43.57

Condition	1 is OK, 0 Fails
Maximum Soil Bearing Pressure	1
Pier Area of Steel	1
Pier Shear	1
Interaction Diagram Visual Check	1
Two-Way Shear Action	1
One-Way Shear Action	1
Overturning	1
Flexure	1
Steel Ratio	1
Length of Development in Pad	1
Hook Development	1

Attachment 3

P65-17-XLH-RR | Dual Broadband Antennas

POLARIZATION: Dual linear ±45°
FREQUENCY (MHz): 698-894, 1710-2170
HORIZONTAL BEAM WIDTH (°): 65, 65
GAIN (dBi/dBd): 17.2/15.1 17.5/15.4
TILT: 0-6, 0-10
LENGTH: 96"

ELECTRICAL SPECIFICATIONS*

Frequency range (MHz)	698-894		1710-2170		
Frequency band (MHz)	698-806	806-894	1710-1880	1850-1990	1900-2170
Gain (dBi/dBd)	16.4/14.3	17.2/15.1	16.9/14.8	17.2/15.1	17.5/15.4
Polarization	Dual Linear +/- 45			Dual Linear +/- 45	
Nominal Impedance (Ω)	50			50	
VSWR	< 1.5:1			< 1.5:1	
Horizontal beam width, -3 dB (°)	70	63	60	63	60
Vertical beam width, -3 dB (°)	8.4			6.5	
Electrical down tilt (°)	0 to 6			0 to 10	
Side lobe suppression, vertical 1st upper (dB)	> 16			> 16	
Isolation between inputs (dB)	> 30			> 30	
Inter band Isolation (dB)	> 40				
Tracking, horizontal plane ±60° (dB)	< 2			< 2	
Vertical beam squint (°)	< 0.5			< 0.5	
Front to back ratio (dB) 180°±30° copolar	> 25			> 30	
Front to back ratio (dB) 180°±30° total power	> 22			> 25	
Cross polar discrimination (XPD) 0° (dB)	> 15			> 15	
Cross polar discrimination (XPD) ±60° (dB)	10			10	
IM3, 2xTx@43dBm (dBc)	<-153			<-153	
Power handling, average per input (W)	500			300	
Power handling, average total (W)	1000			600	

MECHANICAL SPECIFICATIONS*

Connector	4 X 7/16 DIN Female
Connector position	Bottom
Dimensions, HxWxD, in (mm)	96" x 12" x 6" (2438 x 305 x 152)
Mounting	Pre-mounted Tilt Brackets
Weight, with brackets, lbs (kg)	70 (32)
Weight, without brackets, lbs (kg)	59 (27)
Wind load, frontal/lateral/rear side 42 m/s Cd=1.0 (N)	1840
Maximum operational wind speed, mph (m/s)	100 (45)
Survival wind speed, mph (m/s)	150 (67)
Lightning protection	DC Ground
Operating Temperature	
Radome material	PVC
Packet size, HxWxD, in (mm)	107" x 16" x 10" (2725 x 400 x 255)
Radome colour	Light Grey
Shipping weight, lbs (kg)	81 (37)
RET	IRET AISGv1.1, MET and AISGv2.0 Available
Brackets	7256.00, 7454.00

*All specifications subject to change without notice. Please contact your Powerwave representative for complete performance data.

ANTENNA PATTERNS*

For detailed patterns visit http://www.powerwave.com/rpa/.

Attachment 4

SD050

CUSTOM MODEL

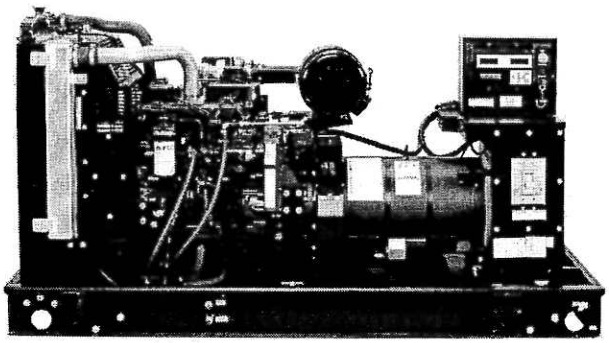
GENERAC® | INDUSTRIAL POWER

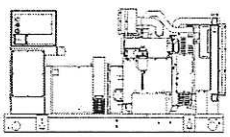
Industrial Diesel Generator Set

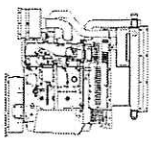
EPA Emissions Certification: Tier III

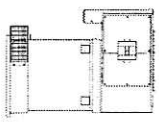
50 kW Diesel

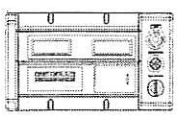
Standby Power Rating
50KW 60 Hz











features	benefits
Generator Set	
• PROTOTYPE & TORSIONALLY TESTED	▸ PROVIDES A PROVEN UNIT
• UL2200 TESTED	▸ ENSURES A QUALITY PRODUCT
• RHINOCOAT PAINT SYSTEM	▸ IMPROVES RESISTANCE TO ELEMENTS
• SOUND LEVEL 2 ENCLOSURE	▸ 71dbA @ 7 METERS (23FT)
Engine	
• EPA TIER CERTIFIED	▸ ENVIRONMENTALLY FRIENDLY
• INDUSTRIAL TESTED, GENERAC APPROVED	▸ ENSURES INDUSTRIAL STANDARDS
• POWER-MATCHED OUTPUT	▸ ENGINEERED FOR PERFORMANCE
• INDUSTRIAL GRADE	▸ IMPROVES LONGEVITY AND RELIABILITY
Alternator	
• TWO-THIRDS PITCH	▸ ELIMINATES HARMFUL 3RD HARMONIC
• LAYER WOUND ROTOR & STATOR	▸ IMPROVES COOLING
• CLASS H MATERIALS	▸ HEAT TOLERANT DESIGN
• DIGITAL 3-PHASE VOLTAGE CONTROL	▸ FAST AND ACCURATE RESPONSE
Controls	
• ENCAPSULATED BOARD W/ SEALED HARNESS	▸ EASY, AFFORDABLE REPLACEMENT
• 4-20mA VOLTAGE-TO-CURRENT SENSORS	▸ NOISE RESISTANT 24/7 MONITORING
• SURFACE-MOUNT TECHNOLOGY	▸ PROVIDES VIBRATION RESISTANCE
• ADVANCED DIAGNOSTICS & COMMUNICATIONS	▸ HARDENED RELIABILITY

primary codes and standards

SD050

application and engineering data

ENGINE SPECIFICATIONS

General

Make	Iveco / FPT
EPA Emissions Compliance	Tier III
EPA Emissions Reference	See Emissions Data Sheet
Cylinder #	4
Type	Diesel
Displacement - L (cu. in.)	4.5 (274)
Bore - mm (in.)	105 (4.1)
Stroke - mm (in.)	132 (5.2)
Compression Ratio	17.5:1
Intake Air Method	Turbocharged
Cylinder Head Type	2 Valve
Piston Type	Aluminum
Crankshaft Type	Forged Steel
Engine Block Type	Cast Iron / Wet Sleeve

Engine Governing

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	+/- 0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full Flow
Crankcase Capacity - L (gal)(qts)	13.6 (3.6) (14.4)

Cooling System

Cooling System Type	Closed
Water Pump	Belt Driven Centrifugal
Fan Type	Pusher
Fan Blade Number	2538 (10)
Fan Diameter (in.)	26
Coolant Heater Wattage	1500
Coolant Heater Standard Voltage	120

Fuel System

Fuel Type	Ultra Low Sulfur Diesel Fuel
Fuel Specifications	ASTM
Fuel Filtering (microns)	5
Fuel Inject Pump Make	Standyne
Fuel Pump Type	Engine Driven Gear
Injector Type	Mechanical
Engine Type	Direct Injection
Fuel Supply Line - mm (in.)	1/4 inch Npt
Fuel Return Line - mm (in.)	1/4 inch Npt

Engine Electrical System

System Voltage	12VDC
Battery Charging Alternator	90 Amp
Battery Size (at 0 oC)	Optima Redtop
Battery Group	34
Battery Voltage	12VC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	390
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	< 3.5%
Telephone Interference Factor (TIF)	< 50
Standard Excitation	PMG
Bearings	Single Sealed Cartridge
Coupling	Direct, Flexible Disc
Load Capacity - Standby	100%
Load Capacity - Prime	100%
Prototype Short Circuit Test	Y

Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	+/- 0.25%

CODES AND STANDARDS COMPLIANCE (WHERE APPLICABLE)

NFPA 99
NFPA 110
ISO 8528-5
ISO 1708A.5
ISO 3046
BS5514
SAE J1349
DIN6271
IEEE C62.41 TESTING
NEMA ICS 1

Rating Definitions:
Standby – Applicable for a varying emergency load for the duration of a utility power outage with no overload capability. (Max. load factor = 70%)
Prime – Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. (Max. load factor = 80%) A 10% overload capacity is available for 1 out of every 12 hours.

SD050

operating data (60Hz)

POWER RATINGS (kW)

	STANDBY		
Single-Phase 120/240VAC @1.0pf	50	Amps:	208
Three-Phase 120/208VAC @0.8pf	-	Amps:	-
Three-Phase 120/240VAC @0.8pf	-	Amps:	-
Three-Phase 277/480VAC @0.8pf	-	Amps:	-
Three-Phase 346/600VAC @0.8pf	-	Amps:	-

NOTE: Generator output limited to 200A.

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480VAC						208/240VAC					
Alternator*	kW	10%	15%	20%	25%	30%	35%	10%	15%	20%	25%	30%	35%
Standard	50	-	-	-	-	-	-	26	39	52	65	77	90
Upsize 1		-	-	-	-	-	-	-	-	-	-	-	-
Upsize 2		-	-	-	-	-	-	-	-	-	-	-	-

*All Generac industrial alternators utilize Class H insulation materials. Standard alternator provides less than or equal to Class B temperature rise. Upsize 1 provides less than or equal to Class B temperature rise. Upsize 2 provides less than or equal

FUEL

Fuel Consumption Rates

Fuel Pump Lift - in (m)
36(.9)

STANDBY		
Percent Load	gph	lph
25%	1.52	5.75
50%	2.33	8.82
75%	3.08	11.65
100%	4.15	15.71

COOLING

Coolant System Capacity - Gal (L)
4.5 (17.44)

Maximum Radiator Backpressure
1.5" H_2O Column

		STANDBY
Coolant Flow per Minute	gpm (lpm)	32.7(123.8)
Heat rejection to Coolant	BTU/min	123,000
Inlet Air	cfm (m3/min)	6,360 (180.0)
Max. Operating Radiator Air Temp	F° (C°)	122(50)
Max. Operating Ambient Temperature	F° (C°)	122(50)

COMBUSTION AIR REQUIREMENTS

		STANDBY	
Intake Flow at Rated Power	cfm (m3/min)	247	(7.00)

EXHAUST

Exhaust Outlet Size (Open Set)
3.0"

Maximum Backpressure (Post-Silencer)
1.5" Hg

		STANDBY
Exhaust Flow (Rated Output)	cfm (m3/hr)	534(906.7)
Maximum Backpressure	inHg (Kpa)	1.5 (5.1)
Exhaust Temp (Rated Output)	°F (°C)	930(498.8)

ENGINE

		STANDBY
Rated Engine Speed	rpm	1800
Horsepower at Rated kW	hp	93
Temperature Deration		Consult Factory
Altitude Deration		Consult Factory

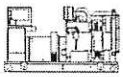
* CA units include aftertreatment

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

SD050

standard features and options

GENERATOR SET



● Genset Vibration Isolation	Std
● Factory Testing	Std
● Extended warranty	Std
● Padlockable Doors	Std
● Steel Enclosure (Enclosed Models)	Std
○ Remote Emergency Shutdown	Opt

ENGINE SYSTEM

General

● Oil Drain Extension	Std
● Air Cleaner	Std
● Industrial Exhaust Silencer (Open Sets, ship loose)	Std
● Critical Exhaust Silencer (Enclosed Sets)	Std
● Stainless steel flexible exhaust connection	Std

● Fuel System

● Primary Fuel Filter with Water Separator	Std
● Flexible Fuel Lines	Std
● UL142 Fuel Tank, 48 Hr Runtime	Std
● 2 Gal Overflow Containment with Alarm	Std

Cooling System

● 120VAC Coolant Heater (3-wire connection cord)	Std
● 50%/50% Coolant	Std
● Level 1 Guarding (Open Sets)	Std
● Closed Coolant Recovery System	Std
● UV/Ozone resistant hoses	Std
● Factory-Installed Radiator	Std
● Radiator Drain Extension	Std
● Fan guard	Std
● Radiator duct adapter (Open Sets)	Std
●	

Engine Electrical System

● Battery charging alternator	Std
● Battery cables	Std
● Battery tray	Std
● 75W 120VAC Battery heater	Std
● Solenoid activated starter motor	Std
● 10A UL float/equalize battery charger	Std
● Weather Resistant electrical connections	Std
● Duplex GFCI Convenience Outlet	Std

ALTERNATOR SYSTEM

● UL2200 GENprotect™	Std
● 100% Rated 200A Main Line Circuit Breaker	Std

CONTROL SYSTEM

Control Panel

● Digital H Control Panel - Dual 4x20 Display	Std
● Programmable Crank Limiter	Std
● 7-Day Programmable Exerciser (requires H-Transfer Switch)	Std
● Special Applications Programmable PLC	Std
● RS-232	Std
● RS-485	Std
● All-Phase Sensing DVR	Std
● Full System Status	Std
● Utility Monitoring (Req. H-Transfer Switch)	Std
● 2-Wire Start Compatible	Std
● Power Output (kW)	Std
● Power Factor	Std
● Reactive Power	Std
● All phase AC Voltage	Std
● All phase Currents	Std
● Oil Pressure	Std
● Coolant Temperature	Std
● Coolant Level	Std
● Low Fuel Pressure Indication	Std
● Engine Speed	Std
● Battery Voltage	Std
● Frequency	Std
● Date/Time Fault History (Event Log)	Std
● UL2200 GENprotect™	Std
○ Low-Speed Exercise	Opt
● Isochronous Governor Control	Std
● -40deg C - 70deg C Operation	Std
● Weather Resistant Electrical Connections	Std
● Audible Alarms and Shutdowns	Std
● Not in Auto (Flashing Light)	Std
● On/Off/Manual Switch	Std
● E-Stop (Red Mushroom-Type)	Std
○ Remote E-Stop (Break Glass-Type, Surface Mount)	-
○ Remote E-Stop (Red Mushroom-Type, Surface Mount)	-
○ Remote E-Stop (Red Mushroom-Type, Flush Mount)	-
● NFPA 110 Level I and II (Programmable)	Std
● Remote Communication - RS232	Std

Alarms (Programmable Tolerances, Pre-Alarms and Shutdowns)

● Low Fuel	Std
● Oil Pressure (Pre-programmed Low Pressure Shutdown)	Std
● Coolant Temperature (Pre-programmed High Temp Shutdo	Std
● Coolant Level (Pre-programmed Low Level Shutdown)	Std
● Engine Speed (Pre-programmed Overspeed Shutdown)	Std
● Voltage (Pre-programmed Overvoltage Shutdown)	Std
● Battery Voltage	Std

Other Options

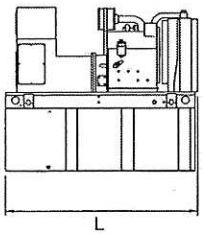
● Single Side Service

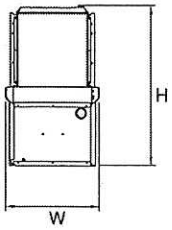
●

○

SD050

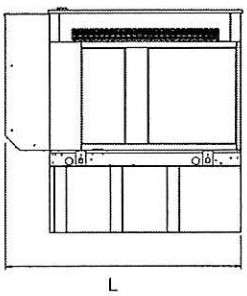
dimensions, weights and sound levels

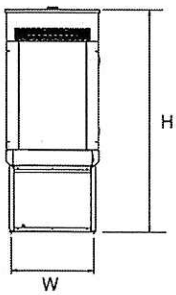




OPEN SET

	TANK SIZE							
	RUNTIME HOURS	CAPACITY (GAL)	TANK VOLUME	L	W	H	WT	dBA*
○	-	-	-	-	-	-	-	84
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
●	48	210	210	76	38	87	3400	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	





LEVEL 2 SOUND ENCLOSURE

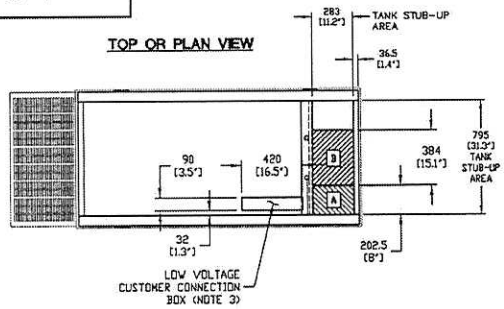
	TANK SIZE							
	RUNTIME HOURS	CAPACITY (GAL)	TANK VOLUME	L	W	H	WT	dBA*
○	-	-	-	-	-	-	-	71
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	
●	48	210	210	94.8	38	99	3935	
○	-	-	-	-	-	-	-	
○	-	-	-	-	-	-	-	

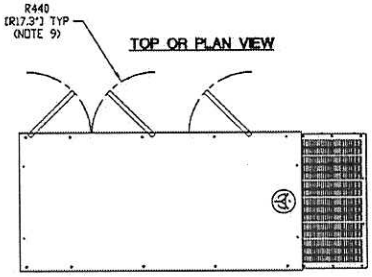
*Required gallons based on 100% of standby rating. Weights consider steel enclosure and are without fuel in tank. Sound levels measured at 23ft (7m) and does not account for ambient site conditions.

YOUR FACTORY RECOGNIZED GENERAC INDUSTRIAL DEALER

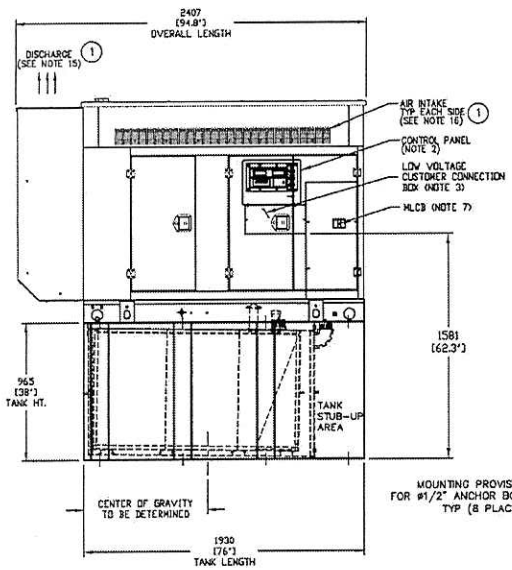
Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please consult a Generac Power Systems Industrial Dealer for detailed installation drawings.

0J2534

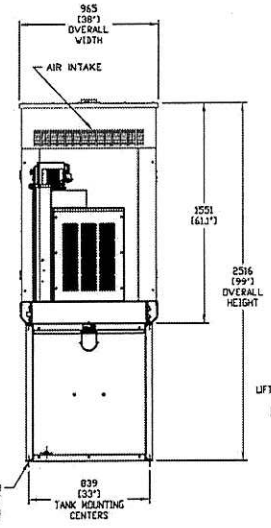




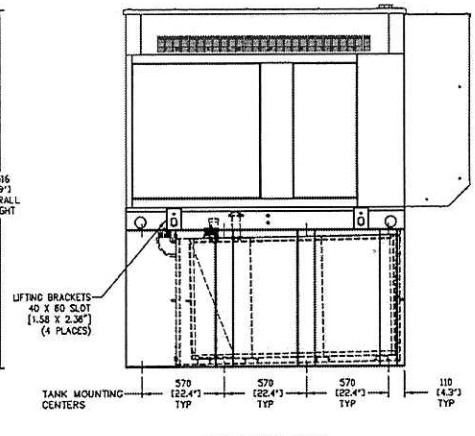
RECOMMENDED ELECTRICAL STUB-UPS (SEE TOP VIEW)	
DESCRIPTION	INSIDE BASE
AC LOAD LEAD CONDUIT GLAND AREA	A
1) LOW VOLTAGE CUSTOMER CONNECTION BOX FOR 120VAC GFCI OUTLET, (STANDARD BLOCK HEATER, BATTERY CHARGER AND OTHER 120 VAC OPTIONS). 2) TRANSFER SWITCH/ COMMUNICATION CONDUITS. COMMUNICATIONS AND 2-WIRE START MUST NOT BE RUN IN CONDUIT WITH AC WIRING.	B SEE NOTE 3



LEFT SIDE VIEW



REAR VIEW



RIGHT SIDE VIEW

NOTES:

1. THE LEFT SIDE OF THE GENERATOR IS SERVICE ACCESSIBLE.
2. 10 AMP BATTERY CHARGER ENCLOSED WITHIN CONTROL PANEL.
3. CONNECTION POINTS FOR CONTROL WIRES. BOTTOM OF LOW VOLTAGE CUSTOMER CONNECTION BOX HAS KNOCKOUTS FOR 1/2" AND 3/4" CONDUIT FITTINGS.
4. GENERATOR MUST BE GROUNDED.
5. 12 VOLT NEGATIVE GROUND SYSTEM.
6. OPTIONAL REMOTE EMERGENCY STOP SHIPPED LOOSE WITH GENERATOR.
7. MAIN LINE CIRCUIT BREAKER (MLCB). AC LOAD LEAD CONNECTION AND AUXILIARY 120/240V CONNECTION.
8. LEVEL 2A SOUND ATTENUATED ENCLOSURE STANDARD WITH GENERATOR.
9. DOORS MUST BE ABLE TO OPEN 90 DEG. TO BE REMOVED. DOORS ARE LOCATED ON THE LEFT SIDE OF THE GENERATOR ONLY.
10. STUB-UPS: BASE TANK REQUIRES ALL STUB-UPS TO BE IN THE REAR TANK STUB-UP AREA.
11. 'A' IS THE STUB UP AREA FOR THE MLCB AND NEUTRAL CONNECTION.
12. SEE DRAWING 0C3850 FOR DUCT REMOVAL. REMOVAL OF FRONT DUCT WILL PROVIDE ACCESS TO MUFFLER.
13. 120VAC ENGINE BLOCK HEATER.
14. 210 GALLON USEABLE CAPACITY BASETANK STANDARD WITH GENERATOR.
15. (1) MUST ALLOW FREE FLOW OF DISCHARGE AIR AND EXHAUST. SEE SPEC SHEET FOR MINIMUM AIR FLOW AND MAXIMUM RESTRICTION REQUIREMENTS.
16. (1) MUST ALLOW FREE FLOW OF INTAKE AIR. SEE SPEC SHEET FOR MINIMUM AIR FLOW AND MAXIMUM RESTRICTION REQUIREMENTS.
17. (1) IT IS THE RESPONSIBILITY OF THE INSTALLATION TECHNICIAN TO ENSURE THAT THE GENERATOR INSTALLATION COMPLIES WITH ALL APPLICABLE CODES, STANDARDS, AND REGULATIONS.

WEIGHT DATA (INCLUDES WOODEN SHIPPING SKID)
ENCLOSED GENERATOR WITH EMPTY FUEL TANK – TO BE DETERMINED

UNITS: mm [INCHES]

PRELIMINARY

INSTALLATION DRAWING

INSTALLATION D4.5L G17 50KW

ENCLOSED LEVEL 2A

GENERAC POWER SYSTEMS
Waukesha
P.O. BOX 8
WAUKESHA, WIS. 53187

FILE NAME	0J2534.DWG	SIZE B
SCALE	NTS	FIRST USE AT&T
DWG NO.	0J2534	REV 1

Attachment 5

CT 11934
Access Road Drainage Report

SBA Bridgewater
Wewaka Brook Road
Bridgewater, CT 06752

CHA Project Number: 15363.1054.30000

Prepared for:
SBA Towers III, LLC
5900 Broken Sound Parkway
Boca Raton, FL 33487

Prepared by:

2139 Silas Deane Highway
Rocky Hill, Connecticut 06067
(860) 257-4557

February 28, 2012

TABLE OF CONTENTS

APPENDICES

FIGURES

1.0 INTRODUCTION

The project site is located off Wewaka Brook Road in the town of Bridgewater, CT. The site spans two properties. The first parcel is owned by Edward R. and Cynthia S. Bennet. The second parcel is owned by Mary Allen. The subject parcels are bounded by Wewaka Brook Road to the East, and residential parcels to the North, South and West. Site access comes from an existing residential asphalt driveway off Wewaka Brook Road.

The proposed work includes the installation of a fenced gravel compound for a telecommunications tower, construction of a gravel access drive to the tower site (2,215 linear feet), and installation of a stormwater collection system consisting of rock lined drainage swales, and storm drain culverts. Replacement of the existing residential driveway and accompanying existing bridge is also associated with this project but has not been analyzed as part of this report.

This report addresses the design of drainage swales and storm drain culverts to protect the access road from washout, safely convey stormwater flows, and protect outfall locations from erosion. This report does not address the design of groundwater controls or slope stabilization, as site geotechnical information was not available at the time of this report.

Refer to the proposed Certificate Drawings submission, dated 10-27-10, under a separate cover, for specific site details.

2.0 HYDROLOGIC EVALUATION

Existing Watershed Characteristics

The Connecticut United States Geological Survey (USGS) Roxbury Quandrangle Map indicates that the project improvements are located between an existing topographic ridge to the west, and Wewaka Brook Road to the east. Topography is varied between these features and includes small topographic ridges, natural swales, flatlands, and wetlands in the surrounding area. Existing topography contributing to site drainage consists of elevations ranging from 670' above mean sea level (AMSL) along Stuart Road to the north to 482' AMSL at an existing culvert to be replaced. Existing slopes vary from flat to very steep ranging (+/- 25%) (See Figure 1 – USGS Map).

Aerial photography and a site field visit indicate that the existing land use at the site consists primarily of forested area, with the exception of the existing residential asphalt driveway off Wewaka Brook Road and adjacent lawn area (See Figure 2 – Aerial Map).

Project site soil characteristics were determined using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey. The site is primarily comprised of soils belonging to Hydrologic Soil Groups (HSG) B and C, with small pockets of HSG D (See Appendix A). A summary of the soil composition is shown in Table 1 on the following page.

Below is a brief description of the hydrologic soil groups present within site drainage areas:

Group B – Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C – Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D – Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Table 1 - Soil Analysis Summary

Unit Symbol – Unit Name	Hydrologic Soil Group	Percent of Drainage Areas
2 – Ridgebury fine sandy loam	D	2.2
3 – Ridgebury, Leicester, and Whitman soils, extremely stony	D	4.9
34A – Merrimac sandy loam, 0 to 3 percent slopes	B	0.1
50B – Sutton fine sandy loam, 3 to 8 percent slopes	B	1.2
60C – Canton and Charlton soils, 8 to 15 percent slopes	B	0.4
73C – Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	B	48.7
75C – Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	3.5
75E – Hollis-Chatfield-Rock Outcrop complex, 15 to 45 percent slopes	D	4.6
84B – Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	20.9
84C – Paxton and Montauk fine sandy loams, 8 to 15 percent slopes	C	6.4
85B – Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, extremely stony	C	3.1
86D – Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	C	3.9

Design Methodology

In order to design the proposed swales and culverts, peak flows (Q) for the 10-, 25-, and 50-year design storms were calculated using the Rational Method (Q=CIA). Composite runoff coefficients (C) were developed from an analysis of existing land use and typical C-values provided in Tables 6-3 and 6-5 of the Connecticut Department of Transportation (ConnDOT) Drainage Manual, dated October 2000 (See Appendix C). Times of concentration (T_c) were computed using standard NRCS TR-55 Methodology (See Appendix D). Rainfall intensities (I) were determined from Table B-2.1 of the ConnDOT Drainage Manual and the computed T_c values. A frequency factor (C_f) was used to refine the calculated peak flow for the 25- and 50-year design storms as prescribed in Table 6-2 in Section 6.9.5 of the ConnDOT Drainage Manual.

Proposed Condition Hydrology

For the purposes of the proposed condition analysis, eleven (11) drainage areas (DA) were developed to quantify the peak stormwater runoff rates to the proposed swales. Additionally, two separate design points (DP) were generated to quantify the peak stormwater runoff rates to the proposed culvert locations.

Drainage areas were determined through review of the existing topographic survey of the site (See Certificate Drawing submission) and the Connecticut USGS Roxbury Quadrangle Map.

A summary of the results for the proposed condition hydrologic analysis is shown in Table 2 and Table 3 below (See Figures 3A through 3D for site drainage areas).

Table 2 – Hydrologic Analysis Summary (Drainage Areas)

Drainage Area/ Design Point	Area (acres)	Runoff Coefficient (C)	Tc (min)[2]	Rainfall Intensity (I) (in/hr)			Peak Discharge (Q) (cfs)		
				10 year	25 year	50 year	10 year	25 year[1]	50 year[1]
DA 1	67.56	0.27	48	2.20	2.60	2.90	39.9	51.8	63.1
DA 1.1	0.36	0.30	10	4.80	5.50	6.00	0.5	0.6	0.8
DA 1.2	0.17	0.29	13	4.30	5.00	5.40	0.2	0.3	0.3
DA 2	0.22	0.27	17	3.80	4.40	4.90	0.2	0.3	0.4
DA 3	0.38	0.33	11	4.70	5.30	5.80	0.6	0.7	0.9
DA 4	0.40	0.33	10	4.80	5.50	6.00	0.6	0.8	1.0
DA 5	6.09	0.24	24	3.30	3.80	4.20	4.8	6.1	7.3
DA 5.1	0.25	0.40	10	4.80	5.50	6.00	0.5	0.6	0.7
DA 5.2	0.07	0.23	10	4.80	5.50	6.00	0.1	0.1	0.1
DA 6	0.05	0.45	10	4.80	5.50	6.00	0.1	0.1	0.1
DA 7	0.09	0.42	10	4.80	5.50	6.00	0.2	0.2	0.3

[1]Frequency Factor for 25-year recurrence interval is 1.1. Frequency factor for 50-year recurrence interval is 1.2 (Table 6-2 of ConnDOT Drainage Manual)

[2]Per section 6.9.6 of the ConnDOT Drainage Manual, the minimum T_C used for design purposes shall be 10 minutes for grass areas.

Table 3 – Hydrologic Analysis Summary (Design Points)

Drainage Area/ Design Point	Area (acres)	Runoff Coefficient (C)	Tc (min)[4]	Rainfall Intensity (I) (in/hr)			Peak Discharge (Q) (cfs)		
				10 year	25 year	50 year	10 year	25 year[3]	50 year[3]
DP 1[1]	68.09	0.27	48	2.20	2.60	2.90	40.2[5]	52.3[5]	63.6[5]
DP 5[2]	6.41	0.24	24	3.30	3.80	4.20	5.2[5]	6.5[5]	7.9[5]

[1]DP 1 consists of DA 1, DA 1.1 and DA 1.2

[2]DP5 consists of DA 5, DA 5.1 and DA 5.2

[3]Frequency Factor for 25-year recurrence interval is 1.1. Frequency factor for 50-year recurrence interval is 1.2 (Table 6-2 of ConnDOT Drainage Manual)

[4]Per section 6.9.6 of the ConnDOT Drainage Manual, the minimum T_C used for design purposes shall be 10 minutes for grass areas.

[5]Due to variable T_c, the sum of individual subarea peak flow rates may not necessarily equal the overall design point peak flow rate

3.0 HYDRAULIC EVALUATION

3.1 CULVERTS

Basis of Design

In accordance with the design criteria and procedures set forth in Section 8.3 of the ConnDOT Drainage Manual, the Connecticut Department of Environmental Protection Stream Crossing Guidelines and guidelines established by the Army Corps of Engineers, culverts shall be designed to:

- Allow for continuous flow and safe conveyance of the 50-year design storm peak flow.
- Have a HW/D ratio less than 1.5 (The hydraulic performance of a culvert is commonly expressed as a ratio of headwater depth (HW), which equals the depth of water measured from the invert of the culvert, to the culvert diameter (D) as HW/D).
- Have a minimum diameter of 18 inches.
- Have a gradient that is not steeper than the streambed gradient immediately upstream or downstream of the culvert.
- Have inverts that are set to greater than or equal to 12 inches below the elevation of the streambed.
- Be backfilled with natural substrate material matching the upstream and downstream steambed substrate.

Design Methodology

The proposed culverts were analyzed using Haestad Methods CulvertMaster Computer Software (Version 3.1). This program was utilized to compute the headwater elevation and discharge velocity of the culverts (evaluating both inlet and outlet control equations) (See Appendix E).

The pipe flow capacity was calculated using:

- Manning's Equation for velocity (V) using equation 7.6 of the ConnDOT Drainage Manual.
- The Continuity Equation for flow capacity (Q) using equation 7.5 of the ConnDOT Drainage Manual.

See Appendix F for culvert capacity calculations.

Design Summary

The access road design required two (2) culvert locations (one at DP 1, the other at DP 5) for stormwater conveyance (See Figures 4A through 4D for locations). The culvert at DP 1 will be a 3-foot high x 6-foot

wide x 42-foot long concrete box culvert set at a slope of approximately 2.4 percent, with an invert set 12 inches below the streambed elevation. The culverts at DP 5 will be 24-inch RCP culverts, 35 feet in length, set at a slope of approximately 8.5% (to match existing channel slope), with inverts set 12 inches below the streambed elevation. Three culverts have been utilized at this location in an attempt to maintain the existing drainage channel width and flow characteristics, and to minimize impact to wetlands. These culverts will be backfilled with free draining material to create a french mattress as recommended by the Wetland Impact Assessment prepared for this project by VHB, Inc., dated 11/11/2011 (See Figure 5 for drainage details).

See Table 4 below for a summary of the results of the culvert analysis

Table 4 – Culvert Analysis

Culvert	Length (ft)	Slope (%)	Size (ft)	Manning's n[1] (unitless)	50-year Peak Design Flow (cfs)	Provided Flow Capacity[2] (cfs)	Computed HW (ft)	HW/D Ratio (ft/ft)
DP 1	42	2.4	3 x 6	0.013	63.6	240.8	1.41	0.71
DP 5	35	7.9	2 (3x)	0.013	7.9	99.0	0.62	0.62

[1]Manning's n referenced from CulvertMaster.
[2]See Appendix E for culvert capacity calculations.

Based on the analysis, a 6 foot x 3 foot box culvert at DP 1will allow for continuous passage of the 50-year frequency design storm, with a calculated HW/D ratio less than 1.5. Additionally, three (3) 24" diameter RCP culverts at DP 5 will safely convey peak flows from the 50-year frequency design storm, with a calculated HW/D ratio less than 1.5.

3.2 SWALES

Basis of Design

In accordance with the design criteria and procedures set forth in Sections 7.3 and 7.6 of the ConnDOT Drainage Manual, roadway swales shall be designed:

- To safely convey the 10-year frequency design storm peak flow without causing erosive damage.
- With a lining that is sufficient to resist the shear forces created from the transportation of storm flows (The permissible or critical shear stress in a swale defines the force required to initiate movement of the channel bed or lining).

Additionally, in accordance with Chapter 5, Section 6, Permanent Lined Waterway, of the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control by The Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection (CTDEP), swales shall be designed with a minimum freeboard of 0.25 feet if no out-of-bank damage would be expected.

Design Methodology

Flow capacity of the swales was determined from the following:

- Velocity (V) – Equation 7.6 of the ConnDOT Drainage Manual (Manning's Equation)
- Flow capacity (Q) – Equation 7.5 of the ConnDOT Drainage Manual (The Continuity Equation).

See Appendix H for swale sizing calculations.

Swale lining was determined by the following:

- Average Shear Stress (τ) – Equation 7.11 of the ConnDOT Drainage Manual
- Maximum Shear Stress (τ_d) – Equation 7.12 of the ConnDOT Drainage Manual
- Lining Category (Material) and Type– Table 7-4 of the ConnDOT Drainage Manual

See Appendix I for shear stress calculations.

Design Summary

For ease of construction, one swale type (size) was designed which meets the dimensional requirements at all swale locations. (See Figures 4A through 4D for proposed swale locations and Figure 5 for drainage details). The swale selected is a 1-foot deep, 1-foot wide flat bottom swale with 2:1 side slopes.

See Table 5 on the following page for a summary of the results of the swale analysis.

Table 5 – Swale Hydraulic Analysis

Swale	Slope (ft/ft)	Manning's n[1] (unitless)	Velocity (ft/sec)	10-yr Peak Design Flow (cfs)	Provided Flow Capacity (cfs)	Provided Freeboard @ 10-yr Peak Flow (ft)
DA 1.1	0.20	0.078	2.24	0.51	9.11	0.82
DA 1. 2	0.01	0.088	0.52	0.21	1.65	0.72
DA 2	0.08	0.088	1.14	0.23	4.94	0.84
DA 3	0.17	0.079	2.15	0.59	8.27	0.80
DA 4	0.14	0.080	2.05	0.64	7.30	0.77
DA 5.1	0.16	0.083	1.94	0.49	7.66	0.81
DA 5.2	0.033	0.128	0.50	0.08	2.27	0.85
DA 6	0.10	0.104	0.85	0.10	4.83	0.90
DA 7	0.20	0.104	1.34	0.19	6.83	0.88

[1]Manning's n calculated using steep slope procedures in HEC-15, as prescribed in Section 7.6.9 of the ConnDOT Drainage Manual, as well as, the values listed in Table 7-4 of the ConnDOT Drainage Manual.

To determine the type of swale lining necessary to armor the swales and protect against erosive forces imparted by stormwater flows, shear stresses were calculated. Rock riprap lining was selected to armor the swales in order to withstand the calculated shear stresses. See Table 6 below for a summary of the results of the calculated shear stress and riprap sizing analysis.

Table 6 – Shear Stress and Riprap Sizing Analysis

Swale	Calculated Shear Stress (lb/ft^2)	Required ConnDOT Riprap[1]		
		Permissible Shear Stress[2] (lb/ft^2)	Classification	D_{50} Size (inches)
DA 1.1	2.25	2.68	Intermediate	8
DA 1. 2	0.15	1.68	Modified	5
DA 2	0.75	1.68	Modified	5
DA 3	2.11	2.68	Intermediate	8
DA 4	1.94	2.68	Intermediate	8
DA 5.1	1.90	2.68	Intermediate	8
DA 5.2	0.31	1.68	Modified	5
DA 6	0.62	1.68	Modified	5
DA 7	1.50	1.68	Modified	5

[1]Determined by selecting riprap with a higher permissible shear stress than the calculated shear stress
[2]Permissible shear stress for lining materials is taken from Table 7-4 of the ConnDOT Drainage Manual

Based on the analyses, each of these swales will be capable of safely conveying the 10-year peak storm flows calculated for their respective Drainage Area, provide the required 0.25 feet of freeboard, and withstand calculated shear stresses.

3.3 OUTLET PROTECTION

Basis of Design

In accordance with the design criteria and procedures set forth in Section 11.13.3 of the ConnDOT Drainage Manual, riprap outlet protection shall be designed to reduce the erosive potential at all discharge points.

Design Methodology

The type and dimensions of rip rap protection was determined by the guidelines established in Sections 11.13.2 and 11.13.5 of the ConnDOT Drainage Manual, and the following:

- Length (L_a) – Tables 11-12.1 and 11-13.1 of the ConnDOT Drainage Manual
- Width of apron at pipe outlet (W_1) and width of apron at terminus (W_2) – Equation 11.33 of the ConnDOT Drainage Manual, as well as, Section 11.13.5 of the ConnDOT Drainage Manual.
- Riprap Specification – Table 11.11 of the ConnDOT Drainage Manual

See Appendix J for outlet protection calculations.

Design Summary

Based on recommended design procedures in Section 11.13.2 of the ConnDOT Drainage Manual, a Type A riprap apron shall be used at all of the swale discharge points. The selected riprap apron shall have a length (L_a) of 10 feet, a width of apron at outlet (W_1) of 5 feet, and a width of apron at terminus (W_2) of 10 feet . Type A riprap aprons shall utilize modified riprap for erosion protection. A Type C riprap apron shall be used at both culvert discharge locations. The culvert at DP 1 and culverts at DP 5 shall have a L_a of 24 feet and 12 feet, respectively. The width of the Type C riprap aprons shall match the width of the downstream channel. Type C riprap aprons shall utilize intermediate riprap for erosion protection (See Figure 5 for drainage details).

Table 7 on the following page summarizes the minimum outlet protection requirements.

Table 7 – Outlet Protection Requirements

Design Point	Structure	Diameter or Span (ft)	Outlet Velocity (ft/sec)	10-year Peak Discharge (ft^3/sec)	Outlet Type	Calculated Dimensions[6]			
						L_a[1] (ft)	W_1[2] (ft)	W_2[3] (ft)	Riprap Specification[4]
DA 1.1	Swale[5]	1.00	2.24	0.5	Type A Riprap Apron	10	3	10	Modified
DA 1.2	Swale[5]	1.00	0.52	0.2		10	3	10	Modified
DA 2	Swale[5]	1.00	1.14	0.2		10	3	10	Modified
DA 3	Swale[5]	1.00	2.15	0.6		10	3	10	Modified
DA 4	Swale[5]	1.00	2.05	0.6		10	3	10	Modified
DA 5.1	Swale[5]	1.00	1.94	0.5		10	3	10	Modified
DA 5.2	Swale[5]	1.00	0.50	0.1		10	3	10	Modified
DA 6	Swale[5]	1.00	0.85	0.1		10	3	10	Modified
DA 7	Swale[5]	1.00	1.34	0.2		10	3	10	Modified
DP 1	Culvert	6.00	9.92	40.2	Type C Riprap Apron	24	Match Downstream Channel		Intermediate
DP 5	Culverts	8.00	7.44	5.2		12			Intermediate

[1]L_a values determined using Table 11-12.1 and 11-13.1 of the ConnDOT Drainage Manual.

[2]W_1 = width of apron at pipe outlet

[3]W_2 = width of apron at terminus

[4]Riprap specification selected from Table 11.11 of the ConnDOT Drainage Manual

[5]Diameter used for swales is the bottom channel width

[6]Dimensions represent minimum acceptable parameters based on calculations. Actual dimensions selected for use may differ

Based on analysis of proposed outfall locations, discharge velocities meet the ConnDOT requirements for use of riprap aprons (outlet velocities are less than 14 fps). A Type A riprap aprong with dimensions of 10' (L_a) x 5' (W_1) x 10' (W_2) is sufficient to reduce the erosive potential at swale discharge points. Type C riprap aprons with widths matching the downstream channel and an L_a value of 24 feet (DP 1) and 12 feet (DP 5) are sufficient to reduce the erosive potential at the culvert discharge points.

4.0 INSPECTION AND MAINTENANCE

Inspection and maintenance of the stormwater collection system (riprap lined swales, storm drain culverts, and riprap aprons) is critical to maintaining proper function. Normally, a visual inspection of all components should be completed annually and after major storm events. Due to steep gradients which produce high shear stresses in the proposed swales, an increased inspection and maintenance schedule is required. A visual inspection of the swale riprap lining should be completed semi-annually and after major storm events.

The following maintenance tasks should be completed during the inspection process:

- Removal of any organic matter, trash/debris, or obstructions found in swales or riprap aprons
- Removal of any accumulated sediment found in culvert, swales or riprap aprons
- Removal of any potential obstructions at culvert inlet/outlet points
- Replacement of any riprap material that may have washed away during large storm events

Careful inspection and proper maintenance on a regular basis will enable the system to safely convey stormwater flows and reduce the risk of system backup or overflow during major storm events.

5.0 CONCLUSION

All proposed drainage improvements (swales, culverts, outlet protection) have been designed in accordance with the engineering guidelines established in the ConnDOT Drainage Manual, the Connecticut Department of Environmental Protection Stream Crossing Guidelines and guidelines established by the Army Corps of Engineers. Based on the analysis, the following design parameters are recommended:

- The wetland crossing at DP 1 shall be constructed using a 3-foot high x 6-foot wide concrete box culvert, with an invert set 12 inches below the adjacent streambed elevation. The crossing shall be 42 feet in length and set at a slope to match the gradient immediately upstream and downstream of the culvert. The culvert will meet the Army Corps of Engineers requirements of safely conveying the 50-year design storm peak flows.

- The wetland crossing at DP 5 shall be constructed using three (3) 24-inch diameter RCP with inverts set 12-inches below the adjacent streambed elevation. The crossing shall be 35-feet in length and set at a slope to match the gradient immediately upstream and downstream of the culvert. The culvert will meet the Army Corps of Engineers requirements of safely conveying the 50-year design storm peak flows.

- Swales shall be at minimum 1-foot wide flat bottom, 1-foot deep, riprap lined trapezoidal swales with 2:1 side slopes. The designed swales will meet the ConnDOT requirements for conveying the 10-year design storm peak flows while withstanding the calculated shear stresses. They will also meet the DEEP requirement of providing 0.25 feet of freeboard.

- Outlet protection for swales shall be Type A riprap aprons with the following minimum parameters:
    - Length (L_a) – 10 feet
    - Width of apron at pipe outlet (W_1) – 5 feet
    - Width of apron at terminus (W_2) – 10 feet
    - Utilize modified riprap for armoring.

  This will meet the ConnDOT requirements for use of riprap aprons (discharge velocities < 14 fps) to provide erosion protection at outfall locations.

- Outlet protection for culverts shall be Type C riprap aprons with the following minimum parameters:
    - Length (L_a) – 24-feet at Culvert DP 1, 12-feet at Culvert DP 5
    - Width of apron at pipe outlet (W_1) – Match width at outlet
    - Width of apron at terminus (W_2) – Match downstream width
    - Utilize intermediate riprap for armoring.

  This will meet the ConnDOT requirements for use of riprap aprons (discharge velocities < 14fps) to provide erosion protection at outfall locations.

Attachment 6

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO
ATTENTION OF

March 28, 2012

Regulatory Division
CENAE-R-PEB
Permit Number: NAE-2012-0528

SBA Towers III LLC
Attn: Hollis M. Redding
One Research Drive, Suite 200 C
Westborough, MA 01581

Dear Ms Redding:

We have reviewed your application to construct an access road which will include the replacement of an existing 16' clear span bridge with a new 26' clear span bridge, in-kind replacement of an existing culvert and installation of one (1) new culvert at 89 Wewaka Brook Road in Bridgewater, Connecticut. The work is located over the Wewaka Brook and adjacent wetlands as described on the attached plans entitled "Project No. 15363-1054-4300" on 12 sheets, and dated "10/27/10."

Based on the information you have provided, we have determined that the proposed activity, which includes a discharge of dredged or fill material into waters or wetlands, will have only minimal individual and cumulative impacts on waters of the United States, including wetlands. Therefore, this work is authorized as a Category 1 activity under the attached Federal permit known as the Connecticut General Permit (GP). This work must be performed in accordance with the terms and conditions of the GP.

You are responsible for complying with all of the GP's requirements. Please review the attached GP carefully; in particular the GP conditions, to be sure you understand its requirements. You should ensure that whoever does the work also fully understands the requirements and that a copy of the permit document is at the project site throughout the time the work is underway.

The GP provides one year for completion of work that has commenced or is under contract to commence prior to this GP's expiration on July 15, 2016. For work within Corps jurisdiction that is not completed by July 15, 2017, you will need to review any reissued GP to see if your project is still authorized under Category 1. If it is no longer authorized, you must submit an application and receive written authorization before you can proceed.

This authorization requires you to complete and return the enclosed Work Start Notification Form/Mitigation Work Start Form to this office at least two weeks before the anticipated starting date. You must also complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work.

This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law, as listed on Page 2 of the GP. Performing work not specifically authorized by this determination or failing to comply with all the terms and conditions of the GP may subject you to the enforcement provisions of our regulations.

This authorization presumes that the work as described above and as shown on your plans noted above is in waters of the U.S. Should you desire to appeal our jurisdiction, please submit a request for an approved jurisdictional determination in writing to this office.

We continually strive to improve our customer service. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://per2.nwp.usace.army.mil/survey.html

Please contact Michael Riccio of my staff, at (978) 318-8685 if you have any questions.

Sincerely,

Robert J. DeSista
Chief, Permits & Enforcement Branch
Regulatory Division

ALL-POINTS
TECHNOLOGY
CORPORATION, P.C.

Thursday, March 08, 2012

Mr. Robert J. DeSista, Chief
Permits & Enforcement Branch
Army Corps of Engineers New England District
696 Virginia Road
Concord, Massachusetts 01742-2751

APT Project No.: CT115270

Re: U.S. Army Corps of Engineers
CPG Category 1 Eligibility
Proposed SBA/AT&T Facility
Wewaka Brook Road
Bridgewater, Connecticut

State: Connecticut
County: Litchfield
Latitude/Longitude Coordinates: N41°30'31.43" W73°21'15.80"
Size of Property: ±51.2
Watershed: Housatonic River

Mr. DeSista,

On behalf of SBA Towers III LLC, All-Points Technology Corporation, P.C. (APT) is pleased to submit this letter requesting a determination of Category 1 eligibility under the Connecticut General Permit (CGP) for a proposed telecommunications facility which will consist of a 170± tall monopole tower within a 45-foot by 80-foot fenced-enclosed compound area. AT&T antennas will be attached to the monopole tower with a 12-foot by 20-foot equipment shelter installed at its base. The proposed 12-foot wide gravel access drive will initiate from an existing paved and gravel driveway that serves the agricultural property located at 89 Wewaka Brook Road and will extend in a northwesterly direction toward the compound generally following an existing agricultural road then woods road. By its Decision and Order dated January 5, 2012, the Connecticut Siting Council granted a Certificate of Environmental Compatibility and Public Need for the construction, maintenance and management of the referenced Facility (Docket No. 412)[1].

The following documents and plans are enclosed to assist in making the requested permit determination:

- Site plans prepared by CHA, latest revision 10/27/10;
  - Drawing No. C-1: Abutters Map
  - Drawing No. C-2A: Site Access Map
  - Drawing No. C-2B: Site Access Map

[1] CSC Application and other documents can be found at http://www.ct.gov/csc/cwp/view.asp?a=962&q=468976

- Drawing No. C-2C: Site Access Map
- Compound Plan
- Tower Elevation
- USGS Topo Map
- Aerial Photo
- Site Summary
- Tree Inventory

- Preliminary Bridge Design for Wewaka Brook Crossing, prepared by CHA, dated November 4, 2010;
- Preliminary Wetlands and Vernal Pool Assessment, prepared by VHB, dated November 11, 2012;
- FEMA Flood Boundary and Floodway Map, Community Panel No. 0901840006, effective date November 1, 1979;
- CTDEP Natural Diversity Data Base letter, dated June 11, 2010; and,
- Connecticut SHPO letter, No Adverse Effect issued October 4, 2010.

Thank you for your timely consideration of this request and feel free to contact me at (860) 984-9515 or dgustafson@allpointstech.com with any questions or if you require additional documentation to make this permit determination.

Sincerely,

Dean Gustafson
Senior Wetland Scientist

Enclosures

cc: Hollis Redding, SBA Towers II, LLC