Boone County Purchasing
613 E. Ash Street, Room 110
Columbia, MO 65201

REQUEST FOR BID (RFB)

Melinda Bobbitt, CPPO, CPPB
Director of Purchasing
(573) 886-4391 – Fax: (573) 886-4390
Email: mbobbitt@boonecountymo.org

Bid Data

Bid Number: **55-03SEP15**

Commodity Title: Radio Tower Design, Engineering and Fabrication Services for Battle School Project

DIRECT ANY BID FORMAT OR SUBMISSION QUESTIONS TO PURCHASING DEPT.

Bid Submission Address and Deadline

Day/Date: Thursday, September 3, 2015
Time: 1:00 PM (Bids received after this time will be returned unopened)
Location/Mail Address: Boone County Purchasing Department
Boone County Annex Building
613 E. Ash, Room 110
Columbia, MO 65201
Directions: Annex Building is located at corner of 7th & Ash Street

Bid Opening

Day/Date: Thursday, September 3, 2015
Time: 1:30 PM, Central Time
Location/Address: Boone County Government Center
Commission Chambers
801 E. Walnut, Columbia, MO 65201

Bid Contents

1.0: Introduction and General Conditions of Bidding
2.0: Primary Specifications
3.0: Response Presentation and Review
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Attachments: Statement of Bidder's Qualifications
"No Bid" Response Form
Standard Terms and Conditions
Instructions for House Bill 1549
Work Authorization Certification
Individual Bidder Affidavits
Debarment Form
Geotechnical Engineering Report

1. *Introduction and General Conditions of Bidding*

1.1. **INVITATION** – The County of Boone, through its Purchasing Department, invites responses, which offer to provide the goods and/or services identified on the title page, and described in greater detail in Section 2.

1.2. **DEFINITIIONS**

County – This term refers to the County of Boone, a duly organized public entity. It may also be used as a pronoun for various subsets of the County organization, including, as the context will indicate: *Purchasing* – The Purchasing Department, including its Purchasing Director and staff. *Department/s or Office/s* – The County Department/s or Office/s for which this Bid is prepared, and which will be the end user/s of the goods and/or services sought.
Designee – The County employee/s assigned as your primary contact/s for interaction regarding Contract performance.
Bidder / Contractor / Supplier – These terms refer generally to businesses having some sort of relations to or with us. The tem may apply differently to different classes of entities, as the context will indicate.
Bidder – Any business entity submitting a response to this Bid. Suppliers, which may be invited to respond, or which express interest in this bid, but which do not submit a response, have no obligations with respect to the bid requirements.
Contractor – The Bidder whose response to this bid is found by Purchasing to meet the best interests of the County. The Contractor will be selected for award, and will enter into a Contract for provision of the goods and/or services described in the Bid.
Supplier – All business/entities which may provide the subject goods and/or services.
Bid – This entire document, including attachments. A Bid may be used to solicit various kinds of information. The kind of information this Bid seeks is indicated by the title appearing at the top of the first page. An "Invitation for Bid" is used when the need is well defined. An "Invitation for Proposal" is used when the County will consider solutions, which may vary significantly from each other or from the County's initial expectations.
Response – The written, sealed document submitted according to the Bid instructions.

1.3. **BID CLARIFICATION** – Questions regarding this Bid should be directed in writing, preferably by fax, to the Purchasing Department. Answers, citing the question asked but not identifying the questioner, will be distributed simultaneously to all known prospective Bidders. Note: written requirements in the Bid or its Addenda are binding, but any oral communications between County and Bidder are not.

1.4. **Contact- Deadline for bid questions is 5:00 pm, August 28, 2015. Questions must be in writing.** Send to Melinda Bobbitt, Boone County Purchasing Department, 613 E. Ash, Room 110, Columbia, MO 65201. Telephone: (573) 886-4391; Facsimile: (573) 886-4390; E-mail: mbobbitt@boonecountymo.org

1.5. **Delivery Terms:** FOB- Destination with shipping and handling costs included, delivered to site of tower erection, **2600 Battle Avenue, Columbia, MO 65202.**

1.6. **Bidder Responsibility** – The Bidder is expected to be thoroughly familiar with all specifications and requirements of this Bid. Bidder's failure or omission to examine any relevant form, article, site or document will not relieve them from any obligation regarding this Bid. By submitting a Response, Bidder is presumed to concur with all terms, conditions and specifications of this Bid.

1.7. **Bid Addendum** – If it becomes evident that this Bid must be amended, the Purchasing Department will issue a formal written Addendum to all known prospective Bidders. If necessary, a new due date will be established.

1.8. **AWARD** – Award will be made to the Bidder/s whose offer/s provide the greatest value to the County from the standpoint of suitability to purpose, quality, service, previous experience, price, lifecycle cost, ability to deliver, or for any other reason deemed by Purchasing to be in the best interest of the County. Thus, the result will not be determined by price alone. The County will be seeking the least costly outcome that meets the County needs as interpreted by the County.

1.9. **CONTRACT EXECUTION** – This Bid and the Contractor's Response will be made part of any resultant Contract and will be incorporated in the Contract as set forth, verbatim.

Precedence – In the event of contradictions or conflicts between the provisions of the documents comprising this Contract, they will be resolved by giving precedence in the following order:

1) the provisions of the Contract (as it may be amended);
2) the provisions of the Bid;
3) the provisions of the Bidder's Response.

1.10. **COMPLIANCE WITH STANDARD TERMS AND CONDITIONS** – Bidder agrees to be bound by the County's standard "boilerplate" terms and conditions for Contracts, a sample of which is attached to this Bid.

2. Primary Specifications

SPECIFICATIONS FOR RADIO TOWER:

1.0 GENERAL:

1.01 Vendor shall provide all resources and services to completely design, engineer, fabricate and deliver a radio tower in accordance with these specifications and all applicable EIA and manufacturer-recommended specifications.

1.02 Vendor shall deliver anchor bolts and anchor bolt templates in advance of tower steel to the designated erection site at rear of 2600 Battle Avenue, Columbia, MO 65202.

1.03 Vendor shall deliver complete tower, less anchor bolts and template, pre-packaged, on flatbed truck(s) to the designated erection site at rear of 2600 Battle Avenue, Columbia, MO 65202 following notification by Owner of completion of foundation construction.

1.04 Individual tower sections and pre-packaged tower components to be unloaded from flatbed truck(s) by others.

1.05 Owner will secure all necessary construction and zoning permits.

1.06 Owner will furnish access route up to the actual tower unloading site.

1.07 All parts, materials and practices will meet at least the minimum generally published and publicly advertised standards of the Vendor.

1.08 Vendor shall warranty tower and include sample printed warranty with bid.

2.00 DESIGN:

2.01 Tower shall be fabricated from steel material and shall be multi-flatted, tapered, slip-fit monopole design. Smooth round, round taper, stepped taper, and towers with bolted flanges are not acceptable.

2.02 Tower shall be designed, engineered and fabricated according to ANSI/EIA RS-222-G, however if any requirement of this specification is more stringent then it shall apply.

2.03 Tower shall be designed assuming basic wind speed of 90 mph with 0" radial ice and 40 mph with 1" of radial ice.

2.04 Tower shall be designed as a Class III Structure.

2.05 Tower shall be designed for Exposure Category C.

2.06 Tower shall be designed for Topographic Category I.

2.7 All tower components shall be hot dip galvanized after fabrication in accordance with ASTM A-123.

2.8 All bolts shall conform to ASTM A-325 and shall be galvanized in accordance with ASTM A-153

2.9 Welds made during fabrication shall be X-ray quality and conform to AISC and AWS standards.

2.10 At its own discretion, Owner may require the contractor to furnish copies of certification of welders employed in fabrication, mill tests of materials used in the structure or report of X-ray examination of welds by an independent testing laboratory.

2.11 Tower shall be designed and fabricated so that erection may be accomplished using tensioning hoists and bolt-on brackets with no field welding, cutting, or drilling required or allowed. Any bolt-on section tensioning brackets necessary for Vendor-recommended assembly shall be furnished with tower.

2.12 Vendor to guarantee structural analysis of proposed tower. Vendor agrees to reimburse Owner for professional fees in the event an independent tower engineering firm calculates engineering/fabrication/material deficiency(ies) in Vendor's proposed products which causes rejection.

2.13 Tower shall be 170' height from bottom of bottom plate to top of structural supporting steel.

3.00 LOADING AND ATTACHMENTS

3.01 Tower shall be designed for the following loads:

Item #	Elevation	Quantity	Brand/Make	Model
1	170'	1	Tower Mfg	Platform at top of tower
2	170'	1	Alive Telecom	ATC-GD1V40 – on separate mounting pipe
3	170'	2	Andrew	7/8" Heliax – two per Item #2 antenna
4	170'	3	Andrew	DB-222 – one centered on each platform face
5	170'	3	Andrew	7/8" Heliax – one per Item #4 antenna
6	170'	6	Various	Nominal 20" x 20" Wi-Fi panel antennas, two per platform face
7	170'	6	Andrew	1/2" Heliax – one per item #6 antenna
8	170'	1	Radiowaves	SP3-5.2 nominal 3' microwave dish
9	170'	1	Andrew	5/8" Heliax for Item #8 dish
10	155'	1	Tower Mfg	Low Profile Heavy Duty 12' Cellular Platform
11	155'	12	Amphenol	5690110 Cellular Panel Antennas
12	155'	12	Andrew	1-5/8" Heliax
13	155'	3	Trade/Various	Cellular Tower Top Amps
14	155'	3	Andrew	1-5/8" Heliax
15	140'	1	Tower Mfg	Low Profile Heavy Duty 12' Cellular Platform

16	140'	12	Amphenol	5690110 Cellular Panel Antennas
17	140'	12	Andrew	1-5/8" Heliax
18	140'	3	Trade/Various	Cellular Tower Top Amps
19	140'	3	Andrew	1-5/8" Heliax
20	125'	1	Tower Mfg.	Low Profile Heavy Duty 12' Cellular Platform
21	125'	12	Amphenol	5960110 Cellular Panel Antennas
22	125'	12	Andrew	1-5/8" Heliax
23	125'	3	Trade/Various	Cellular Tower Top Amps
24	125'	3	Andrew	1-5/8" Heliax
25	100'	1	Alive Telecom	ATC-GD1V40, on standoff bracket
26	100'	2	Andrew	7/8" Heliax – one per item #22 antenna
27	75'	1	Alive Telecom	ATC-GD1V40, on standoff bracket
28	75'	2	Andrew	7/8" Heliax – two per Item #
29	20'	3	Andrew	DB-224, nominal 120 degree spacing
30	20'	6	Andrew	1/2" Heliax

Item #1. Furnish a suitably engineered nominal 12' face, top-mounted, three-sided low profile platform attached above top of tower supporting steel. This platform will consist of a suitable mounting system, supporting radial brackets, expanded sheet metal grid walk/work surfaces and three connected face brackets/supports. Furnish platform with four (4) nominal 3' long x 2-3/8" OD vertical support pipes on each face for attachment of Item #4 and Item #6 antennas. Item #8 antenna will attach centrally on one face.

Item #2. Furnish nominal 2-7/8" OD x 36" long heavy duty vertical antenna mounting pipe secured concentrically centered at apex of tower for attachment of Item #2 heavy duty whip antenna. Item #2 antenna is fed with two Item #3 feedlines.

Item #10 through Item #24. Tower shall be designed for 12 heavy duty panel antennas plus brackets and stiff arms in support of high performance commercial carrier at each of three elevation levels. See antenna specs.

Item #25. Furnish one heavy duty nominal 3' standoff bracket for attachment of Item #25 antenna.

Item #27. Furnish one heavy duty nominal 3' standoff bracket for attachment of Item #27 antenna.

Item #29. Furnish three whip antenna mounting brackets for attachment of Item #29 antennas to tower legs. Provide flat plate weldment points on tower for attachment of nominal 24" long bottom- and top-mounted support pipes for these antennas.

3.02 Furnish tower climbing bolts/pegs.

3.03 Furnish safety cable kit for climbing area, no harness.

3.04 Furnish feedline entry ports as follows:
To service top platform and top antenna furnish 3 each 6" x 12"

To service 155' platform furnish three each 8" x 16"
To service 140' platform furnish three each 8" x 16"
To service 125' platform furnish three each 8" x 16"
To service 100' antenna furnish one each 6" x 12"
To service 75' antenna furnish one each 6" x 12"
To service 20' antennas furnish three each 6" x 12"
At base of tower furnish four large ports spaced 90 degrees each 12" x 26"

4.00 SPECIFICATION ATTACHMENTS

4.01 Geotechnical analysis is attached for use by Vendor for foundation design. Test boring was taken at center point of tower foundation. Based on soils report, Vendor is requested to offer Owner (any) viable alternate foundation designs.

5.00 SUBMITTALS

The following items shall be submitted with the Bid Response:

5.01 The following items shall be submitted with the bid:

5.02 Plan view and elevation of proposed tower.

5.03 Tower section drawings showing all members, slip joint configuration, base flange details, reinforced entry ports and any additional information required to identify and evaluate each component.

5.04 Drawings to include dimensions and weights of sections and weight of complete tower assembly.

5.05 Drawings of miscellaneous details including antenna mounts, top-mounted platform, and standoff brackets.

5.06 Vendor is requested to submit plans, drawings and separate, additional unit cost of proposed Low Profile platforms as described in Item #8, #13, and #18 under Section 3.01.

5.07 Plan view and elevation of foundation. To include reinforcing bar size, quantity and position, concrete quantities and finishing techniques, and all other pertinent information. Vendor is encouraged to offer alternative foundation designs based on local conditions.

5.08 Structural analysis of tower. Such analyses to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of analyses showing calculations and stresses.

5.09 Foundation design(s). Such design(s) to be certified by a registered professional engineer, state of registry: Missouri. Furnish complete details of design(s) showing calculations and stresses.

5.10 Upon award of tower bid, Vendor shall furnish key erection drawings, fabrication and design drawings all certified by a registered professional engineer, state of registry: Missouri.

5.11 Sample printed warranty.

3. *Response Presentation and Review*

3.1. **RESPONSE CONTENT** – In order to enable direct comparison of competing Responses, Bidder must submit Response in strict conformity to the requirements stated herein. Failure to adhere to all requirements may result in Bidder's Response being disqualified as non-responsive. All Responses must be submitted using the provided Response Sheet. Every question must be answered and if not applicable, the section must contain "N/A". Manufacturer's published specifications for the items requested shall be included with the response.

3.2. **SUBMITTAL OF RESPONSES** – Responses MUST be received by the date and time notes on the title page under "Bid Submission Information and Deadline". NO EXCEPTIONS. The County is not responsible for late or incorrect deliveries from the US Postal Service or any other mail carrier.

3.3. **Advice of Award** – If you wish to be advised of the outcome of this Bid, the results may be viewed on the County's web page at www.showmeboone.com.

3.4. **BID OPENING** – On the date and time and at the location specified on the title page, all Responses will be opened in public. Brief summary information from each will be read aloud, and any person present will be allowed, under supervision, to scan any Response. In the event only one bid is received by the date and time of the bid opening, County reserves the right to not open the bid and extend the Closing Date for the purpose of inviting bid responses from more vendors in the interest of establishing competition.

3.5. **Removal from Vendor Database** – If any prospective Bidder currently in our Vendor Database to whom the Bid was sent elects not to submit a Response and fails to reply in writing stating reason for not bidding, that Bidder's name may be removed from our database. Other reasons for removal include unwillingness or inability to show financial responsibility, reported poor performance, unsatisfactory service, or repeated inability to meet delivery requirements.

3.6. **RESPONSE CLARIFICATION** – The County reserves the right to request additional written or oral information from Bidders in order to obtain clarification of their Responses.

3.7. **Rejection or Correction of Responses** – The County reserves the right to reject any or all Responses. Minor irregularities or informalities in any Response which are immaterial or inconsequential in nature, and are neither affected by law nor at substantial variance with Bid conditions, may be waived at our discretion whenever it is determined to be in the County's best interest.

3.8. **EVALUATION PROCESS** – The County's sole purpose in the evaluation process is to determine from among the Responses received which one is best suited to meet the County's needs at the lowest possible cost. Any final analysis or weighted point score does not imply that one Bidder is superior to another, but simply that in our judgment the Contract selected appears to offer the best overall solution for our current and anticipated needs at the lowest possible cost.

3.9. **Method of Evaluation** – The County will evaluate submitted Responses in relation to all aspects of this Bid.

3.10. **Acceptability** – The County reserves the sole right to determine whether goods and/or services offered are acceptable for County use.

3.11. **Endurance of Pricing** – Bidder's pricing must be held until contract execution or 60 days, whichever comes first.

4. Response Form

Company Name: _____
Address: _____
City/Zip: _____
Phone Number: _____
E-Mail: _____
Fax Number: _____

Federal Tax I.D. _____
( ) Corporation
( ) Partnership – Name_____
( ) Individual/Proprietorship – Individual Name _____
( ) Other (Specify) _____

4.00 PRICING

To furnish all resources, materials, and labor to completely design, engineer, fabricate and deliver FOB Destination to Columbia, MO a radio tower in accordance with these bid specifications and all applicable EIA and manufacturer-recommended specifications. **Refer to Primary Specifications.** Quoted cost below shall include key erection drawings, fabrication and design drawings, all certified by a registered professional engineer, state of registry: Missouri. State pricing as listed below:

4.01. Radio tower, designed, engineered, and fabricated (lump sum) $ _____

4.02. Proposed cost for additional low profile platform as described in section 5.06. For informational purpose only - will not be awarded. $ _____

4.03. Delivery of all items specified in this bid: _____ARO (after receipt of order)

4.04. **Subcontracting:** If Vendor proposes to use subcontractors for this work, list the names of the firms and the work to be assigned in spaces below.

Subcontractor Name/Address	Work Assigned
_____	_____
_____	_____
_____	_____

4.05. **Debarment and Suspension**: By submission of its Bid Response, Vendor agrees to comply with the provisions of Executive Order 12549, regarding Debarment and Suspension. Specifically, the Vendor certifies that neither he/she nor their principals are 1.) presently debarred, suspended, proposed for debarment, declared ineligible or voluntary excluded from covered transactions by a Federal department or agency, 2) have not with a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain or performing a public transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property; 3.) are not presently indicted for or otherwise criminal or civilly charged by a government entity with commission of any of the offenses stated above and 4.) have not within a three year period preceding this bid had one or more public transactions terminated for cause or default.

4.06. **Certification of Non-Resident/Foreign Contractors**: If the Contractor is a foreign corporation or nonresident Contractor, it is agreed that the Contractor shall procure and maintain during the life of this contract:

A. A certificate of authority to transact business in the State of Missouri from the Secretary of State, unless exempt pursuant to the provisions of Section 351.572 RSMo.

B. A certificate from the Missouri Director of Revenue evidencing compliance with transient employer financial assurance law, unless exempt pursuant to the provisions of Section 285.230 RSMo.

4.07. The undersigned offers to furnish and deliver the articles or services as specified at the prices and terms stated and in strict accordance with all requirements contained in the Request for Bid which have been read and understood, and all of which are made part of this order. By submission of this bid, the vendor certifies that they are in compliance with Section 34.353 and, if applicable, Section 34.359 (Missouri Domestic Products Procurement Act) of the Revised Statutes of Missouri.

Authorized Representative (Sign By Hand):

_____Date: _____

Print Name and Time of Authorized Representative:

_____

STATEMENT OF BIDDER'S QUALIFICATIONS

Each bidder for the work included in the specifications and plans and the Contract Documents shall submit with their bid the data requested in the following schedule of information. This data must be included in and made a part of each bid document and be contained in the sealed envelope. Failure to comply with this instruction may be regarded as justification for rejecting the Contractor's proposal.

1. Name of Bidder:_____

2. Business Address: _____

3. When Organized: _____

4. When Incorporated: _____
   If not incorporated, state type of business (sole proprietor, partnership, or other)_____

5. List federal tax identification number: _____

6. Number of years engaged in business under present firm name: _____

7. If you have done business under a different name, please give name and business location under that name: _____

8. Percent of work done by own staff: _____

9. Have you ever failed to complete any work awarded to your company? If so, where and why?_____

10. Have you ever defaulted on a contract? _____If so, give _____

11. List of contracts completed within the last three years for work similar in scope to that described in this bid, including value of each._____

12. List of projects currently in progress: _____

*** Attach additional sheets as necessary ***

Boone County Purchasing

613 E. Ash, Room 110
Columbia, MO 65201

Melinda Bobbitt, Director of Purchasing
(573) 886-4391 – Fax: (573) 886-4390

"No Bid" Response Form

"NO BID RESPONSE FORM"

NOTE: COMPLETE AND RETURN THIS FORM ONLY IF YOU DO NOT WANT TO SUBMIT A BID

If you do not wish to respond to this bid request, but would like to remain on the Boone County vendor list **for this service/commodity**, please remove form and return to the Purchasing Department by mail or fax.

If you would like to FAX this "No Bid" Response Form to our office, the FAX number is (573) 886-4390.

Bid: 55-03SEP15 – RADIO TOWER DESIGN, ENGINEERING, FABRICATION SERVICES

Business Name: _____

Address: _____

_____

_____

Telephone: _____

Contact: _____

Date: _____

Reason(s) for not bidding:

_____

_____

_____

Boone County Purchasing
613 E. Ash, Room 110
Columbia, MO 65201

Standard Terms and Conditions

Melinda Bobbitt, CPPO
Director of Purchasing
Phone: (573) 886-4391 – Fax: (573) 886-4390

1. Contractor shall comply with all applicable federal, state, and local laws and failure to do so, in County's sole discretion, shall give County the right to terminate this Contract.

2. Responses shall include all charges for packing, delivery, installation, etc., (unless otherwise specified) to the Boone County Department identified in the Request for Bid and/or Proposal.

3. The Boone County Commission has the right to accept or reject any part or parts of all bids, to waive technicalities, and to accept the offer the County Commission considers the most advantageous to the County. Boone County reserves the right to award this bid on an item-by-item basis, or an "all or none" basis, whichever is in the best interest of the County.

4. Bidders must use the bid forms provided for the purpose of submitting bids, must return the bid and bid sheets comprised in this bid, give the unit price, extended totals, and sign the bid. The Purchasing Director reserves the right, when only one bid has been received by the bid closing date, to delay the opening of bids to another date and time in order to revise specifications and/or establish further competition for the commodity or service required. The one (1) bid received will be retained unopened until the new Closing date, or at request of bidder, returned unopened for re-submittal at the new date and time of bid closing.

5. When products or materials of any particular producer or manufacturer are mentioned in our specifications, such products or materials are intended to be descriptive of type or quality and not restricted to those mentioned.

6. Do not include Federal Excise Tax or Sales and Use Taxes in bid process, as law exempts the County from them.

7. The delivery date shall be stated in definite terms, as it will be taken into consideration in awarding the bid.

8. The County Commission reserves the right to cancel all or any part of orders if delivery is not made or work is not started as guaranteed. In case of delay, the Contractor must notify the Purchasing Department.

9. In case of default by the Contractor, the County of Boone will procure the articles or services from other sources and hold the Bidder responsible for any excess cost occasioned thereby.

10. Failure to deliver as guaranteed may disqualify Bidder from future bidding.

11. Prices must be as stated in units of quantity specified, and must be firm. Bids qualified by escalator clauses may not be considered unless specified in the bid specifications.

12. No bid transmitted by fax machine or e-mail will be accepted.

13. The County of Boone, Missouri expressly denies responsibility for, or ownership of any item purchased until same is delivered to the County and is accepted by the County.

14. The County reserves the right to award to one or multiple respondents. The County also reserves the right to not award any item or group of items if the services can be obtained from a state or other governmental entities contract under more favorable terms.

15. The County, from time to time, uses federal grant funds for the procurement of goods and services. Accordingly, the provider of goods and/or services shall comply with federal laws, rules and regulations applicable to the funds used by the County for said procurement, and contract clauses required by the federal government in such circumstances are incorporated herein by reference. These clauses can generally be found in the Federal Transit Administration's Best Practices Procurement Manual – Appendix A. Any questions regarding the applicability of federal clauses to a particular bid should be directed to the Purchasing Department prior to bid opening.

16. In the event of a discrepancy between a unit price and an extended line item price, the unit price shall govern.

17. Should an audit of Contractor's invoices during the term of the Agreement, and any renewals thereof, indicate that the County has remitted payment on invoices that constitute an over-charging to the County above the pricing terms agreed to herein, the Contractor shall issue a refund check to the County for any over-charges within 30-days of being notified of the same.

18. **For all titled vehicles and equipment the dealer must use the actual delivery date to the County on all transfer documents** including the Certificate of Origin (COO,) Manufacturer's Statement of Origin (MSO,) Bill of Sale (BOS,) and Application for Title.

19. **Equipment and serial and model numbers -** The contractor is strongly encouraged to include equipment serial and model numbers for all amounts invoiced to the County. If equipment serial and model numbers are not provided on the face of the invoice, such information may be required by the County before issuing payment.

INSTRUCTIONS FOR COMPLIANCE WITH HOUSE BILL 1549

House Bill 1549 addresses the Department of Homeland Security's and the Social Security Administration's E-Verify Program (Employment Eligibility Verification Program) that requires the County to verify "lawful presence" of individuals when we contract for work/service; verify that contractor has programs to verify lawful presence of their employees when contracts exceed $5,000; and a requirement for OSHA safety training for public works projects.

The County is required to obtain certification that the bidder awarded the attached contract participates in a federal work authorization program. To obtain additional information on the Department of Homeland Security's E-Verify program, go to:

http://www.uscis.gov/portal/site/uscis/menuitem.eb1d4c2a3e5b9ac89243c6a7543f6d1a/?vgnextoid=75bce2e261405110VgnVCM1000004718190aRCRD&vgnextchannel=75bce2e261405110VgnVCM1000004718190aRCRD

Please complete and return form *Work Authorization Certification Pursuant to 285.530 RSMo* if your contract amount is in excess of $5,000. **Attach to this form the first and last page of the *E-Verify Memorandum of Understanding* that you completed when enrolling.**

WORK AUTHORIZATION CERTIFICATION
PURSUANT TO 285.530 RSMo
(FOR ALL AGREEMENTS IN EXCESS OF $5,000.00)

County of_____)
)ss
State of_____)

My name is _____. I am an authorized agent of _____ _____(Bidder). This business is enrolled and participates in a federal work authorization program for all employees working in connection with services provided to the County. This business does not knowingly employ any person that is an unauthorized alien in connection with the services being provided. Documentation of participation in a federal work authorization program is attached hereto.

Furthermore, all subcontractors working on this contract shall affirmatively state in writing in their contracts that they are not in violation of Section 285.530.1, shall not thereafter be in violation and submit a sworn affidavit under penalty of perjury that all employees are lawfully present in the United States.

_____
Affiant Date

_____
Printed Name

Subscribed and sworn to before me this ___ day of _____, 20___.

_____
Notary Public

CERTIFICATION OF INDIVIDUAL BIDDER

Pursuant to Section 208.009 RSMo, any person applying for or receiving any grant, contract, loan, retirement, welfare, health benefit, post secondary education, scholarship, disability benefit, housing benefit or food assistance who is over 18 must verify their lawful presence in the United States. Please indicate compliance below. Note: A parent or guardian applying for a public benefit on behalf of a child who is citizen or permanent resident need not comply.

_____1. I have provided a copy of documents showing citizenship or lawful presence in the United States. (Such proof may be a Missouri driver's license, U.S. passport, birth certificate, or immigration documents). Note: If the applicant is an alien, verification of lawful presence must occur prior to receiving a public benefit.

_____2. I do not have the above documents, but provide an affidavit (copy attached) which may allow for temporary 90 day qualification.

_____3. I have provided a completed application for a birth certificate pending in the State of _____. Qualification shall terminate upon receipt of the birth certificate or determination that a birth certificate does not exist because I am not a United States citizen.

_____ _____

Applicant Date Printed Name

AFFIDAVIT
(Only Required for Individual Bidder Certification Option #2)

State of Missouri)
)SS.
County of _____)

I, the undersigned, being at least eighteen years of age, swear upon my oath that I am either a United States citizen or am classified by the United States government as being lawfully admitted for permanent residence.

_____ _____
Date Signature

_____ _____
Social Security Number Printed Name
or Other Federal I.D. Number

On the date above written _____ appeared before me and swore that the facts contained in the foregoing affidavit are true according to his/her best knowledge, information and belief.

_____
Notary Public

My Commission Expires:

(Please complete and return with Bid)

Certification Regarding
Debarment, Suspension, Ineligibility and Voluntary Exclusion
Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 29 CFR Part 98 Section 98.510, Participants' responsibilities. The regulations were published as Part VII of the May 26, 1988, Federal Register (pages 19160-19211).

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS FOR CERTIFICATION)

(1) The prospective recipient of Federal assistance funds certifies, by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective recipient of Federal assistance funds is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Name and Title of Authorized Representative

Signature

Date

CROCKETT
GEOTECHNICAL - TESTING LAB

GEOTECHNICAL ENGINEERING REPORT
FOR
COLUMBIA/BOONE COUNTY
JOINT COMMUNICATIONS

911 MONOPLE RADIO TOWER
COLUMBIA, MISSOURI

JULY 20, 2015

Crockett GTL Project Number: G15046

500 Big Bear Blvd. • Columbia, MO 65202
Phone: 573-447-3981
www.CrockettGTL.com

CROCKETT
GEOTECHNICAL - TESTING LAB
500 Big Bear Boulevard
Columbia, Missouri 65202
(573) 447-3981

July 20, 2015

Joint Communications Radio Network
609 E Walnut Street
Columbia, MO 65201

Attn: Mr. Dave Dunford

Re: Geotechnical Engineering Report
911 Monopole Radio Tower
Columbia, Missouri
Crockett GTL Project Number: G15046

Dear Mr. Dunford:

Crockett Geotechnical – Testing Lab (Crockett GTL) has completed the geotechnical engineering services for the referenced project. This report should be read in its entirety. This report presents the results of our field explorations, laboratory testing, and recommendations for design and construction of the referenced project.

We appreciate the opportunity to be of service and look forward to working with you during the construction phase of this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Shane Steinman, E.I.
Project Manager

Eric H. Lidholm, P.E.
Principal Engineer
Missouri: E-23265

Enclosures
cc: 1 – Client (.PDF)
1 – File

TABLE OF CONTENTS

Geotechnical Engineering Report
911 Monopole Radio Tower
Columbia, Missouri
Crockett GTL Project Number: G15046
July 20, 2015

1 INTRODUCTION

Crockett Geotechnical - Testing Lab (CGTL) has conducted a geotechnical exploration for the proposed development. The purpose of our exploration was to:

- characterize and evaluate the subsurface conditions,
- provide design and construction recommendations for:
  - earthwork
  - foundations
  - seismic considerations

2 SITE AND PROJECT INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

Item	Description
Location	This site is located near the southeastern corner of the Elliot Battle Elementary School property located at 2600 Battle Avenue in the city of Columbia, Missouri.
Approximate GPS Coordinates	Latitude: 38.974681° Longitude: -92.221980°
Existing improvements	This tower site is undeveloped.
Current ground cover	Recently graded. Mostly bare soil and some weeds.
Existing topography	Relatively level.

2.2 PROJECT DESCRIPTION

Item	Description
Proposed structures	Monopole Tower, 180 feet tall Possible equipment building

Item	Description
Estimated loads (assumed)	Vertical: 40 kips Shear: 30 kips Moment: 3,600 k-ft Uplift: N/A
Grading (approximate)	For this proposal we have assumed site grading to consist of less than approximately 5 feet of cut and fill.
Cut and fill slopes	Final slopes are assumed to be no steeper than 3H:1V (Horizontal to Vertical)
Free-standing retaining walls	None.
Below grade areas	None.

3 SUBSURFACE CONDITIONS

3.1 FIELD EXPLORATION AND LABORATORY TESTING

One (1) boring was drilled for this project at the approximate location indicated on the Boring Location Plan included in the Appendix of this report. The boring location was designated and staked by Boone County. The ground surface elevation indicated on the boring log is approximate and was obtained from Boone County Parcel Viewer using the terrain feature. The boring elevation was rounded to the nearest foot. The location and elevation of the boring should be considered accurate only to the degree implied by the means and methods used to define them.

The boring was drilled with a track mounted CME-45 drill rig. Representative samples were obtained using thin-walled tube sampling procedures. The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring log attached to this report includes soil descriptions, consistency evaluations, boring depth, sampling intervals, and groundwater conditions. The boring was backfilled with auger cuttings prior to the drill crew leaving the site.

The field log was prepared by the drill crew. The final boring log included with this report represents the engineer's interpretation of the field log and includes modifications based upon laboratory tests and observation made of the samples. The descriptions of the soil on the final boring log is in general accordance with the Unified Soil Classification System which is included in the Appendix of this report.

Detailed information regarding the material encountered and the results of field sampling and laboratory testing are shown on the Boring Log included in the Appendix of this report.

3.2 Encountered Subsurface Conditions

Lean to fat clay was encountered from the ground surface to a depth of approximately 7 feet at the boring location. The lean to fat clay was stiff to very stiff in consistency. Underlying the lean to fat clay was fat clay which extended to a depth of approximately 10 feet.

Underlying the lean to fat clay and fat clay was lean to fat clay that was visually identified as glacial drift. The glacial drift was very stiff to hard in consistency and extended to boring termination depth of 50 feet.

Detailed descriptions of the encountered materials are listed on the boring log included in the Appendix of this report. Strata lines indicate the approximate location of changes in material types. The transition between material types may be gradual.

3.3 Groundwater

Groundwater was encountered at a depth of 28 feet while drilling, 32 feet at the completion of drilling, and at 30 feet ½ hour after the completion of drilling. Once groundwater was encountered, the water level remained fairly constant and rapidly filled between each sampling interval.

Pockets, lenses, and stringers of sand were encountered in the glacial soils found in the vicinity of the referenced project. These sand pockets are normally discontinuous and often contain water of variable quality and quantity. These sand pockets may be encountered during foundation excavation.

Groundwater levels depend on seasonal and climatic variations, and other factors not evident at the time the boring was performed, and may be present at different levels in the future. Therefore, groundwater levels during construction or at other times in the life of the structure may be at different levels than those indicated on the boring logs. In addition, without extended periods of observation in piezometers or observation wells, accurate groundwater level measurements may not be possible, particularly in low permeability soils.

The borehole was backfilled prior to departing the project site. Groundwater records are indicated on the boring log included in the Appendix of this report.

4 GEOTECHNICAL RECOMMEDATIONS

4.1 EARTHWORK

At the completion of stripping and grubbing, we recommend the exposed subgrade be thoroughly evaluated before the start of any fill operations. We recommend the geotechnical engineer be retained to evaluate the bearing material for the foundations and subgrade soils. Subsurface conditions, as identified by the field and laboratory testing programs have been reviewed and evaluated with respect to the proposed project plans known to us at this time.

4.1.1 Site Preparation

All existing utility backfill, and any otherwise unsuitable material should be removed from the construction areas prior to placing structural fill. After stripping and grubbing, the site should be proofrolled to aid in locating loose or soft areas. Proofrolling can be performed with a loaded tandem axle dump truck. Soft, wet, dry and low-density soil should be removed or be moisture conditioned and recompacted in place as structural fill prior to placing new structural fill.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a vertical face height of 1 to 3 feet and should be cut wide enough to accommodate the compaction equipment. We recommend structural fill slopes be overfilled and then cut back to develop an adequately compacted slope face.

4.1.2 Structural Fill Requirements

Compacted structural fill should consist of approved materials free of organic matter and debris. Frozen material should not be used and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted for evaluation prior to use.

Structural Fill Requirements		
Material Type	USCS Classification	Acceptable Uses
Lean Clay and Clayey Sand	CL & SC (LL<40)	All locations
Lean to Fat Clay	CL-CH (40<LL<50)	>24 inches below slabs on grade unless PI<23
Fat Clay	CH (LL≥50+)	>24 inches below slabs on grade
Well Graded Granular 1. MoDOT Type V or similar	GM	All locations

Structural Fill Requirements		
Low Volume Change Material [1,2]	CL CL-CH (40<LL<50 & PI<23)	All locations
	1. Similar to MoDOT Type 1 crushed limestone aggregate, limestone screenings, or granular material such as sand, gravel or crushed stone containing at least 18% low plasticity fines. 2. Low plasticity cohesive soil or granular soil having at least 18% low plasticity fines.	
Soil Fill Lift Thickness	9 inches or less when using heavy self-propelled compaction equipment 6-inches or less when using hand guided or light self-propelled equipment	
Soil Compaction Requirements [1]	95% of standard Proctor dry density (ASTM D-698)	
	1. We recommend the engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.	
Compaction Moisture Content Requirements • Cohesive	From standard Proctor optimum moisture content (OMC) to 4% above the standard Proctor OMC.	
• Granular	Workable moisture content. Shall not pump when proofrolled	

4.1.3 Grading and Drainage

Final surrounding grades should be sloped away from the structure on all sides to prevent ponding of water. Collected water should discharge at least 10 feet beyond the footprint of the tower support structure.

4.1.4 Earthwork Construction

In periods of dry weather, the surficial soils may be of sufficient strength to allow fill construction on the stripped and grubbed ground surface. However, unstable subgrade conditions could develop if the soils are wet or subjected to repetitive construction traffic. Should unstable subgrade conditions be encountered, stabilization measures will need to be employed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the

subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork/fill placement and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of building floor slabs.

4.1.5 Temporary Excavations

The Occupational Safety and Health Administration (OSHA) has developed regulations to provide for the safety of workers entering excavations. Temporary excavations will probably be required during grading operations. All operations should be performed under the supervision of qualified site personnel in accordance with OSHA Excavation and Trench Safety Standards.

4.2 Foundation Recommendations

The subsurface data obtained from the boring was analyzed to evaluate potential foundation design alternatives. It is our professional opinion the self-support tower can be supported by either a shallow, spread footing foundation system or by a drilled pier foundation system bearing within the native clay. The equipment building can be supported by a shallow foundation system bearing on stiff native clay or compacted structural fill. Design recommendations and construction considerations for shallow foundations follow:

4.2.1 Shallow Foundation Design Recommendations

Shallow Foundation Design Recommendations	
Net allowable bearing pressure [1] • From 0 to 3 Feet • From 3 to 13 Feet • Deeper than 13 Feet 1. Net allowable bearing pressure is based on a factor of safety of 3.0.	 Ignore 3,000 psf 5,500 psf
Allowable overstress for transient loads (i.e. snow, wind, seismic)	33%

Shallow Foundation Design Recommendations	
Ultimate passive pressure (equivalent fluid pressure) [1,2,3] 1. The sides of the spread footing foundation excavations must be nearly vertical and the concrete should be placed neat against the vertical faces for the passive earth pressure values to be valid. 2. Passive resistance in the frost zone should be neglected. 3. Some movement of the footing will be required to mobilize resistance from passive pressure and sliding friction.	270 pcf
Coefficient of sliding friction	0.32
Minimum embedment below finished grade for frost protection	30 inches
Approximate Settlement [1] • Total • Differential 1. Foundation settlement will depend upon the variations within the subsurface soil profile, the tower's structural loading conditions, the embedment depth of the footings, the thickness of compacted fill (if any), and the quality of the earthwork operations.	< 1 inch < ¾ inch

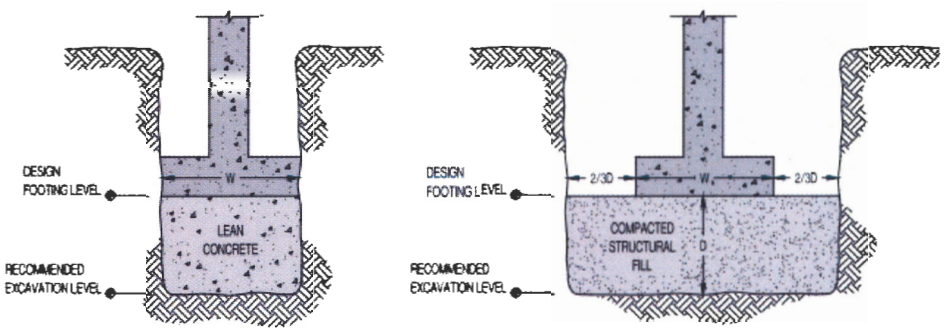
Uplift resistance for spread footing foundations may be computed as the sum of the effective weight of the foundation element and the effective weight of the soil overlying the foundation. We recommend using a soil unit weight of 120 pounds per cubic foot (pcf) for structural fill overlying the footing placed as described in this section of this report. A unit weight of 150 pcf could be used for reinforced footing concrete. We recommend a minimum factor of safety of 1.5 be utilized for uplift calculations.

4.2.2 Shallow Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soil at the foundation bearing level become excessively dry, disturbed, saturated, or frozen the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

Although groundwater was not encountered at or above the anticipated shallow foundation bearing elevation, it may be encountered during foundation excavation. In addition, some surface and/or perched groundwater may enter foundation excavations during construction. It is anticipated any water entering foundation excavations from these sources can be removed using sump pumps or gravity drainage.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings should bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well graded granular material placed in lifts of 9 inches or less in loose thickness and compacted to at least 98 percent of the material's maximum standard effort maximum dry density (ASTM D 698). The lean concrete backfill and overexcavation-and-backfill procedures are described in the diagram below.



LEAN CONCRETE BACKFILL — OVEREXCAVATION / BACKFILL

NOTE:
EXCAVATIONS IN SKETCHES SHOWN VERTICAL FOR CONVENIENCE. EXCAVATIONS SHOULD BE SLOPED AS NECESSARY FOR SAFETY.

4.2.3 Drilled Pier Foundation Design Recommendations

The proposed structure can be founded on straight shaft drilled piers bearing in suitable glacial drift. The design parameters provided in the following table are based on the results of field and laboratory testing, published values, and our past experience with similar soil conditions.

Drilled Pier Design Parameters						
Approximate Depth (feet) [1]	Allowable Skin Friction (psf) [2]	Allowable End Bearing Pressure (psf) [3]	Allowable Passive Pressure (psf) [2]	Cohesion (psf)	Strain ε_{50} (in./in) [4]	Lateral Subgrade Modulus (pci) [4]
0 - 3	Ignore	Ignore	Ignore	Ignore	Ignore	Ignore

Drilled Pier Design Parameters						
Approximate Depth (feet) [1]	Allowable Skin Friction (psf) [2]	Allowable End Bearing Pressure (psf) [3]	Allowable Passive Pressure (psf) [2]	Cohesion (psf)	Strain ε_{50} (in./in) [4]	Lateral Subgrade Modulus (pci) [4]
3 – 13	250	NR [5]	1,250	1,250	0.009	370
13 - 30	600	7,500 [3]	3,000	3,000	0.005	1,000
› 30	500	7,500 [3]	2,500	2,500	0.006	830

1. A moist unit weight of 125 pcf can be used for soil above groundwater
   An effective unit weight of 63 pcf can be used for soil below groundwater
   CGTL should observe pier excavations to evaluate whether conditions are consistent with those encountered in our boring.
2. The skin friction and passive pressure values are based on a constant (rectangular) pressure distribution for cohesive soils and bedrock.
   Skin friction and passive pressure should be neglected within 3 feet of the final grade.
   Allowable skin friction based on a FOS=3.0.
3. Minimum pier length of 4 diameters required. CGTL should be contacted if the pier length is less than four times the pier diameter as modifications to our design parameters may be warranted.
   Allowable end bearing based on a FOS=3.0.
4. Lateral subgrade modulus and strain values are to be utilized with LPILE software.
5. NR = Not Recommended

Drilled piers should have a minimum shaft diameter of 30 inches. The above-indicated cohesion values are ultimate values without factors of safety. The end bearing, skin friction, and passive resistance are allowable parameters with factors of safety. The values given in the above table are based on our boring and past experience with similar material types.

4.2.4 Drilled Pier Foundation Construction Considerations

Pier drilling through the upper native soils is not expected to be difficult based upon the material encountered in the boring. However, special drilling techniques may be required to penetrate potential gravel and cobble zones that could be encountered in the glacial drift materials. The contractor should be aware boulders, although not encountered in our boring, are sometimes present within glacial drift in this area.

Groundwater was encountered in the boring while drilling with the solid stem augers and the groundwater rapidly filled the borehole between each sampling interval. Groundwater should be anticipated during future pier drilling and the contractor should be prepared to handle wet drilling conditions.

Temporary casing may be needed to advance drilled pier excavations. Temporary casing should also be installed when personnel enter the shafts to clean and/or test the bearing surface.

For proper performance of the drilled pier foundation system, it is critical for the bottom of pier excavations to be cleaned of any water and loose material prior to placing reinforcing steel and concrete. A minimum shaft diameter of at least 30 inches is required for entry of construction and testing personnel, and to facilitate clean-out and possible dewatering of the pier excavation.

Concrete should be placed soon after excavating to minimize bearing surface disturbance. Any water accumulating in the pier excavation should be pumped from the excavation or the water level should be allowed to stabilize and then concrete should be placed using the tremie method.

If concrete will be placed as the temporary casing is being removed, we recommend the concrete mixture be designed with a slump of about 5 to 7 inches to reduce the potential for arching when removing the casing. While removing the casing from a pier excavation during concrete placement, the concrete inside the casing should be maintained at a sufficient level to resist any earth and hydrostatic pressures outside the casing during the entire casing removal procedure.

We recommend a CGTL engineer or their representative be present on a full-time basis during drilling activities to evaluate the materials removed from the drilled pier excavations to determine when adequate capacity has been developed, to observe the base of the drilled pier to determine that the cuttings have been adequately removed, and also to observe the concreting techniques.

Although obvious signs of harmful gases such as methane, carbon monoxide, etc., were not noted in the boring during the geotechnical drilling operations, gas could be encountered in the drilled shaft excavations during construction. The contractor should check for gas and/or oxygen deficiency prior to any workers entering the excavation for observation and manual cleanup.

4.3 Seismic Considerations

The 2012 International Building Code requires the average properties in the upper 100 feet of the subsurface profile a site profile determination extending a depth of 100 feet for seismic site classification. The drilling scope performed for this project had one boring that extended to a maximum depth of approximately 50.0 feet.

Seismic Site Classification	
Code Used	2012 International Building Code (IBC)
Site Classification	D

Additional exploration to greater depths could be considered to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a more favorable seismic site class.

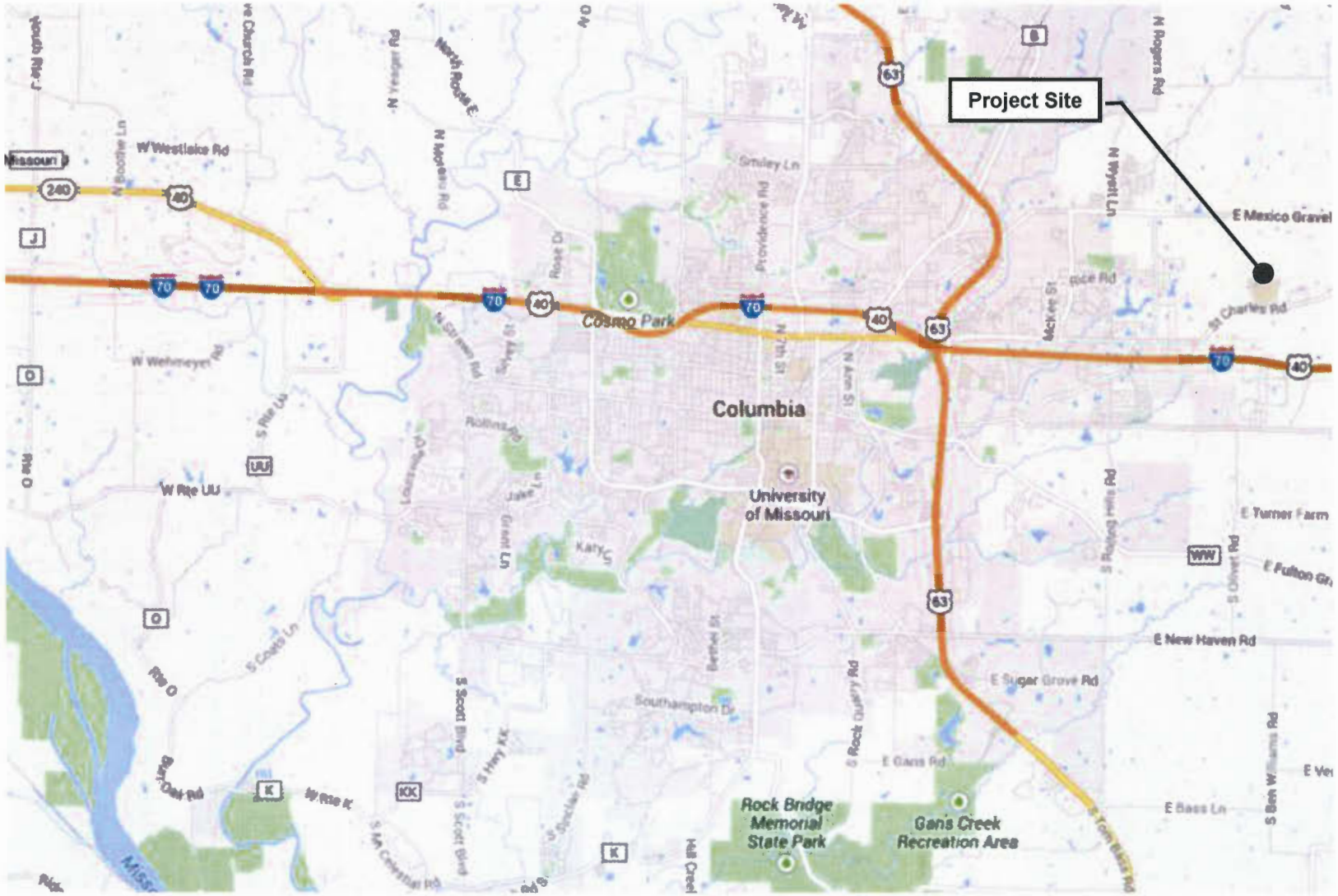
5 GENERAL COMMENTS

The recommendations provided herein are for the exclusive use of our client. Our recommendations are specific only to the project described herein and are not meant to supersede more stringent requirements of local ordinances or codes. The recommendations are based on subsurface information obtained at our boring locations, sample locations, our understanding of the project as described in this report, and geotechnical engineering practice consistent with the current standard of care. No warranty is expressed or implied. CGTL should be contacted if conditions encountered are not consistent with those described.

CGTL should be provided with a set of final plans and specifications, once they are available, to review whether our recommendations have been understood and applied correctly and to assess the need for additional exploration or analysis. Failure to provide these documents to CGTL may nullify some or all of the recommendations provide herein. In addition, any changes in the planned project or changes in site conditions may require revised or additional recommendations on our part.

The final part of our geotechnical service should consist of direct observation during construction to observe that conditions actually encountered are consistent with those described in this report and to assess the appropriateness of the analyses and recommendations contained herein. CGTL cannot assume liability or responsibility for the adequacy of recommendations without being retained to observe construction.

APPENDIX



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SITE LOCATION MAP

911 MONOPLE RADIO TOWER
COLUMBIA, MISSOURI

PROJECT NO.: G15046

Prepared By:
CROCKETT
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PROJECT NO: G15046

BORING LOCATION PLAN

911 MONOPOLE RADIO TOWER
COLUMBIA, MISSOURI

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CROCKETT GEOTECHNICAL - TESTING LAB

BORING NUMBER B-1

CLIENT Columbia/Boone County Joint Communications
PROJECT NAME 911 Monopole Radio Tower
PROJECT NUMBER G15046
PROJECT LOCATION Columbia, Missouri
DATE STARTED 7/14/15 **COMPLETED** 7/14/15
GROUND ELEVATION 860 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR IPES
GROUND WATER LEVELS:
DRILLING METHOD 4" SSA
AT TIME OF DRILLING 28.00 ft / Elev 832.00 ft
LOGGED BY Friedman **CHECKED BY** Lidholm
AT END OF DRILLING 32.00 ft / Elev 828.00 ft
NOTES Borehole backfilled upon completion
0.5hrs AFTER DRILLING 30.00 ft / Elev 830.00 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY LENGTH	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	UNC. COMP. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0		LEAN TO FAT CLAY: Brown and gray, trace rust stains, trace lignite, trace gravel, stiff to very stiff	ST 1	12		4500		104	22			
			ST 2	15		8000	4250	107	21			
		7.0 / 853.0										
		FAT CLAY: Dark brown to brown, trace gravel, stiff	ST 3	14		2500	2500	92	30			
10		10.0 / 850.0	ST 4	10		2500		100	22			
		LEAN TO FAT CLAY Brown and gray, trace lignite, trace gravel, trace sandy, occasional sandy zones, very stiff to hard (Glacial Drift)	ST 5	20		6500		104	23			
20			ST 6	20		7500	5920	112	18			
			ST 7	23		7000		115	18			
30		▽ ▼	ST 8	24		7000	6550	111	19			
			ST 9	19		5000		103	23			
40		--: becomes dark gray to gray	ST 10	24		6000	3840	107	23			
		--: becomes brown to light brown, trace gray, sandy clay to clayey sand	ST 11	24		5500		110	20			
50		50.0 / 810.0	ST 12	22		8000			27			

No Refusal
Bottom of borehole at 50.0 feet.

BORING LOG LEGEND AND NOMENCLATURE

Sample Type	Description
AU	Auger sample, disturbed, obtained from auger cuttings
NR	No recovery or lost sample
RC	Rock core, diamond core bit, nominal 2-inch diameter rock sample (ASTM D 2113)
ST	Thin walled (Shelby) tube sample, relatively undisturbed (ASTM D 1587)
SPT	Split spoon sample, disturbed (ASTM D 1586)
VA	Shear vane (ASYM D 2753)

Grain Size Terminology	
Boulders	Larger than 12-inches
Cobbles	3-inches to 12-inches
Gravel	Retained on #4 sieve to 3-inches
Sand	Retained on #200 sieve but passes #4 sieve
Silt or Clay	Passes #200 sieve

Descriptor	Relative Proportion of Sand and Gravel	Relative Proportion of Fines
Trace	Less than 15% by dry weight	Less than 5% by dry weight
With	15% to 30% by dry weight	5% to 12% by dry weight
Modifier	More than 30% by dry weight	More than 12% by dry weight

Relative Density of Coarse grained Soils	
Descriptive Term	SPT N-Value, Blows/Foot
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50+

Consistency of Fine Grained Soils		
Descriptive Term	SPT N-Value, Blows/Foot	Unconfined Compressive Strength, psf
Very Soft	0 - 2	0 - 500
Soft	2 - 3	500 - 1,000
Medium	4 - 9	1,000 - 2,000
Stiff	10 - 29	2,000 - 4,000
Very Stiff	30 - 49	4,000 - 8,000
Hard	50+	8,000+

USCS Soil Classification System				
Major Divisions			Group Symbol	Group Name
coarse grained soils more than 50% retained on #200 sieve	gravel >50% of coarse fraction retained on #4 (4.75 mm) sieve	clean gravel <5% small than #200 sieve	GW	well-graded gravel, fine to coarse gravel
			GP	poorly graded gravel
		gravel with >12% fines	GM	silty gravel
			GC	clayey gravel
	sand >50% of coarse fraction passes #4 (4.75 mm) sieve	clean sand	SW	well-graded sand, fine to coarse sand
			SP	poorly graded sand
		sand with >12% fines	SM	silty sand
			SC	clayey sand
fine grained soils more than 50% passes #200 sieve	silt and clay liquid limit < 50	inorganic	ML	silt
			CL	clay
		organic	OL	organic silt, organic clay
	silt and clay liquid limit ≥ 50	inorganic	MH	silt of high plasticity, elastic silt
			CH	clay of high plasticity, fat clay
		organic	OH	organic clay, organic silt
highly organic soils			PT	peat

Weathering	Description of Rock Properties
Fresh	No discoloration. Not oxidized.
Slightly weathered	Discoloration or oxidation of most surfaces but or short distance from fractures
Moderately weathered	Discoloration or oxidation extends from fractures, usually throughout. All fractured surfaces are oxidized or discolored.
Severely weathered	Discoloration or oxidation throughout. All fractured surfaces are oxidized or discolored. Surfaces are friable.
Decomposed	Resembles a soil. Partial or complete remnant rock structure may be present.

Rock Quality Designator (RQD)	
RQD, %	Rock Quality
90 - 100	Excellent
75 - 90	Good
50 - 75	Fair
25 - 50	Poor
0 - 25	Very poor

Joint, Bedding, and Foliation Spacing in Rock		
Spacing	Joints	Bedding/Foliation
< 2-inches	Very close	Very thin
2-inches - 1-foot	Close	Thin
1-foot - 3-feet	Moderately Close	Medium
3-feet - 10-feet	Wide	Thick
>10-feet	Very Wide	Very thick