

**Grand Forks Broadband Connectivity  
Business Development Roadmap:  
Expanded Scope of Work  
Final Report**

*Presented to:*

**The County of Grand Forks**

**And**

**The Base Realignment Impact Committee**

C/o Grand Forks Region Economic Development Corporation  
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## **Introduction**

In March 2007 the County of Grand Forks, through the Base Realignment Impact Committee, retained Access Consulting, P.C. of Missoula, Montana to prepare a Broadband Connectivity Business Development Roadmap (hereinafter “the Roadmap”). That Roadmap examined existing telecommunications services and infrastructure in the area surrounding Grand Forks Air Force Base and identified some significant strengths and weaknesses. The three significant weaknesses identified included spotty cellular telephone coverage, lack of public safety mobile data services, and lack of broadband internet services to rural areas. The Roadmap identified potential remedies for these deficiencies and laid out two implementation strategies for future action.

Upon completion of the Roadmap, the County and the Base Realignment Impact Committee tasked Access with a follow-on study to identify the existing gaps in cellular and broadband service and develop a plan for building the infrastructure necessary to fill those gaps. The follow-on study included the following tasks:

- Identification of geographic gaps in service;
- Identification of existing infrastructure that could be used for telecommunications improvements;
- Defining what new infrastructure is needed;
- Development of a prioritized plan for building the required infrastructure;
- Estimation of construction and operating costs of services;
- Drafting an RFP for implementation of the plan.

This document is the Final Report of the follow-on study and presents the results of our investigations and analysis.

## ***Background and Goals***

The Grand Forks Base Realignment Impact Committee (BRIC) is a partnership of Grand Forks County, the City of Grand Forks, the Grand Forks Region Economic Development Corporation and Job Services North Dakota. BRIC was formed in response to the realignment of Grand Forks Air Force Base announced in 2005. BRIC was formed to assess the economic impact of the Base realignment and to develop plans for addressing those impacts. During the BRIC assessment, the lack of telecommunications services in the rural communities surrounding the Base was identified as one of the most significant impediments to economic development in those communities. The services most needed in those communities included reliable cellular telephone service, rural broadband internet coverage, and public safety mobile data coverage.

In addition to the economic impacts of the Base realignment, the Grand Forks region is also grappling with the long term impacts of the flooding that occurred in 1997. The flooding of that year destroyed about 30% of the housing stock in the City of Grand Forks. Businesses in Grand Forks are growing and creating jobs only to find that the lack of available housing has limited the population available to fill those jobs. Improving telecommunications services in the rural communities surrounding the Base will better position those communities to provide housing for the work force needed by the region. Improving those services will also make it possible for businesses to locate satellite or expansion offices in the Base-area communities and enable individual workers to tele-commute to the City of Grand Forks or other home office locations.

The goal of this study is to provide a plan for building the infrastructure that is needed to improve telecommunications service coverage throughout Grand Forks

County. The plan will identify the telecommunications technologies that can most economically fill the service gaps within the Grand Forks County and will recommend construction priorities that will allow the County to build the most needed facilities first. Cost estimates for the infrastructure will be provided to support future funding activities.

## ***Critical Systems***

The follow-on study was focused on two critical telecommunications systems, cellular telephone service and rural/mobile broadband service. These two services were chosen for many reasons. Cellular telephone service proved to be a vital part of the recovery from the tornado that struck Northwood in August, 2007. Families whose children must now attend school outside of Northwood rely on cellular service for emergency communications. Further, cellular telephones have become the primary means of communications for mobile workers in the public and private sector. Cellular service and broadband internet access have become mandatory services for companies seeking relocation opportunities in rural locations. Broadband public safety data service has become a vital component for improving the effectiveness of officers in the field. Finally, rural/mobile internet access can significantly increase the effectiveness of the public and private sector workforce.

There is a great deal of common infrastructure (i.e. towers, equipment shelters, and access to power and telecommunication networks) that supports cellular voice service and rural/mobile broadband service. By focusing on that common infrastructure, the cost of construction and operation can be held to a minimum while meeting all the needs of the County.

## **Study Approach**

Access Consulting used an eleven step approach to conduct this study. Those eleven steps included:

- Reviewing infrastructure data gathered in previous study relating to existing fiber networks, wireless broadband networks, and cellular networks;
- Searching the FCC Universal Licensing System data base for the locations of additional wireless infrastructure used by public safety, educational institutions, private enterprise, and the public sector;
- Querying providers for additional information. For example, Polar Communications now has fiber to within 15,000 feet of every customer in their territory;
- Plotting all location data using Google Maps;
- Identifying areas where no known cellular and/or broadband service exists (gaps in service);
- Identifying existing infrastructure in those gaps that could be used to support critical services;
- Defining the new infrastructure required to provide service in the gaps;
- Developing a plan for building the required infrastructure;
- Suggesting potential funding sources to pay for the construction; and
- Recommending a plan of action for acquiring funding and moving forward.

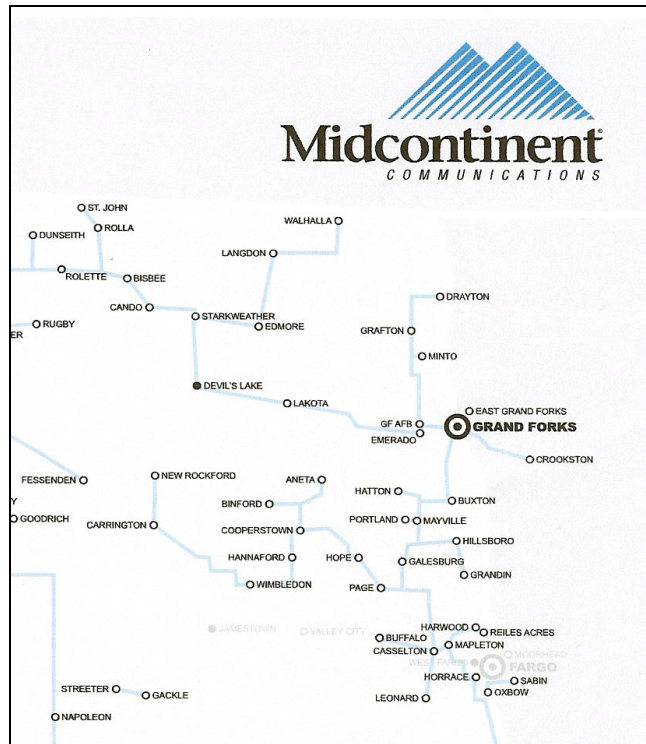
## **Identifying the Gaps**

The first task of the follow-on study was to identify the gaps in current cellular voice and broadband service in Grand Forks County. In order to identify those gaps, this

study began by reviewing the existing infrastructure data gathered by the Roadmap. The data included information about the existing fiber optic networks of Qwest, Polar Communications, and Mid-Continent. For example, a diagram of the Mid-Continent fiber optic network is presented in Figure 1 below. This diagram indicates that Midco fiber runs west from Grand Forks along U.S. Highway 2 and north from Grand Forks AFB to Grafton, ND. The study also included data about the existing wireless broadband internet service from Invisimax. A map of existing Invisimax towers is shown in Figure 2.

The next step in identifying existing infrastructure was a search of the Federal Communications Commission Universal Licensing System data base to identify all known wireless infrastructure, including cellular telephone towers, public safety radio towers, other wireless broadband internet provider towers, and any educational broadband systems that might be present. The data base was queried by County, by frequencies used for the above mentioned services, and by service type. Figures 3 through 6 show the results of those queries. Figure 3 shows the existing cellular towers in and around Grand Forks County that are owned and/or operated by Verizon Wireless (labeled Verizon or RSA3-X) or by Alltel (labeled WWC-X). These towers are located predominantly along the US 2 and I-29 corridors with only a few exceptions.

Figure 4 shows existing towers supporting public safety radio uses. These towers include those belonging to Grand Forks County, the City of Northwood, and local fire departments. This infrastructure is also located on the US 2 and I-29 corridors. There may be some agencies with sites that were not included on this map, but to our knowledge the data shown in the Figure is representative of the available infrastructure in the County.



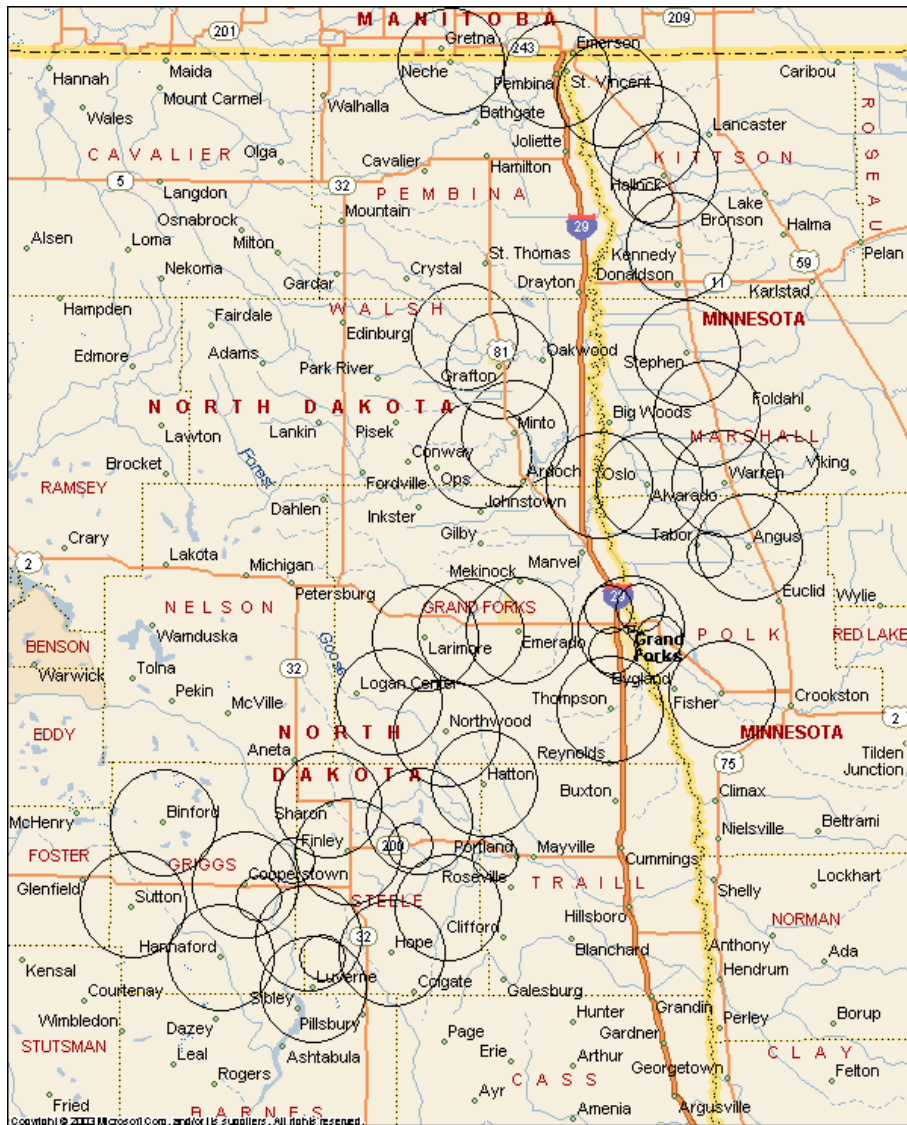
**Figure 1. Diagram of existing Mid-Continent fiber network.**

Next, the FCC was searched for locations of licensed wireless broadband services. Polar Communications offers wireless broadband to users in the City of Grand Forks and some portions of Grand Forks County using the 700MHz and 2.5GHz frequencies. Licensed frequencies such as these operate at higher power outputs than

unlicensed services (such as that offered by Invisimax) and therefore provide greater coverage and service reliability. Figure 5 shows the Polar Communications radio locations labeled as WLW888 and B166-X after their license call signs. The Polar towers are located in the City of Grand Forks and in Northwood.

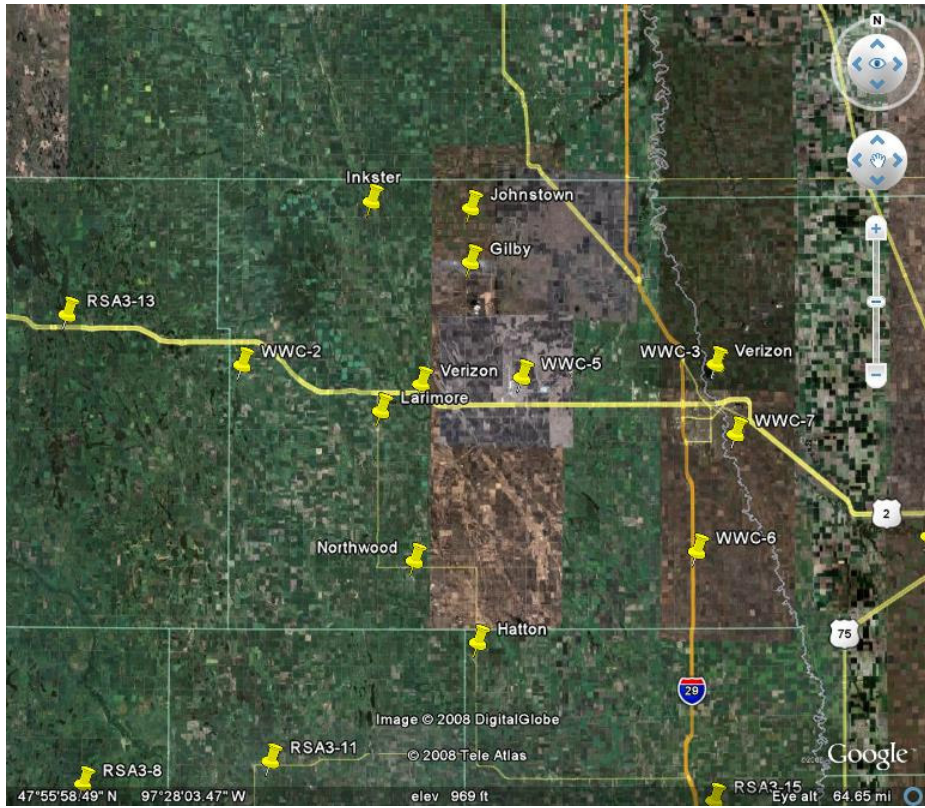
At one time, public school districts, colleges and universities were offered free licenses for the Educational Broadband Service. These licenses operate in the 2.5 GHz and 2.6GHz ranges. Two school districts in the County, Larimore Public Schools and Northwood Public Schools, own such licenses and the location of their transmitters is shown in Figure 6. We have not verified whether these Districts have actually deployed equipment. They share the same transmitter location north of Inkster near the County line.

To identify gaps in broadband internet and cellular voice service, all of the locations above were plotted on a single map (See Figure 7). While the map becomes somewhat cluttered with all the existing sites shown, three regions with little or no infrastructure can be identified. These gaps include the southwestern corner of the County around Logan Center Township, the northern third of the County between US Highway 2 and the Inkster/Johnstown area, and the south central portion of the County centered on the intersections of Highways 3 and 15 in Washington and Union Townships. The gaps in cellular service were verified during a drive through the County on May 28, 2008.

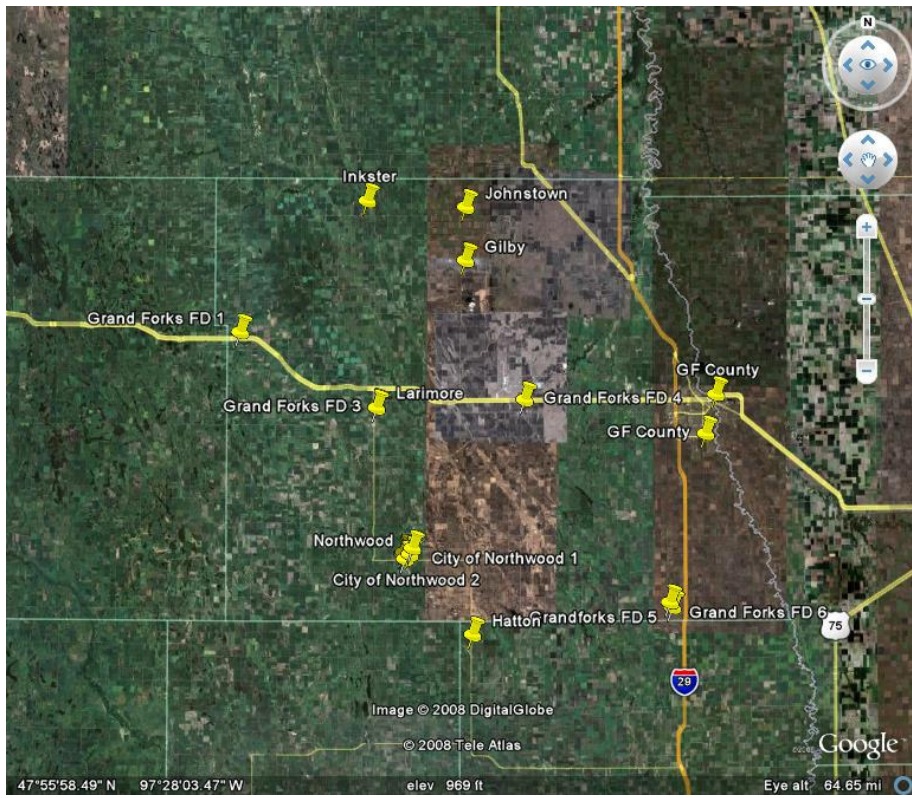


**Figure 2. Existing tower locations for Invisimax wireless internet service.**



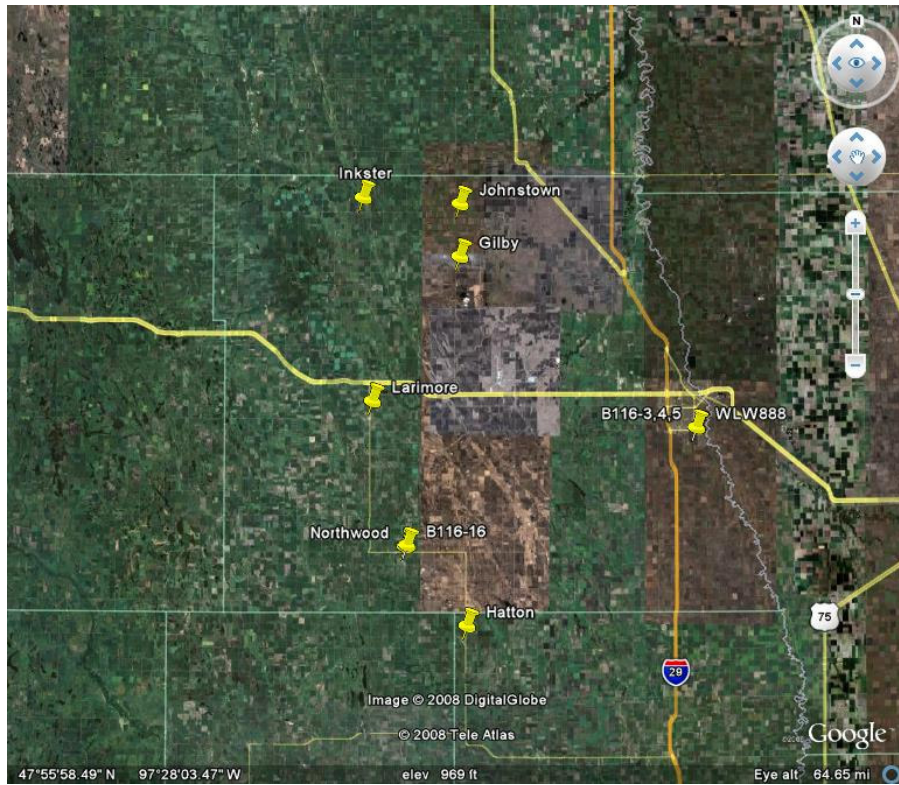


**Figure 3. Existing cellular towers in and around Grand Forks County**

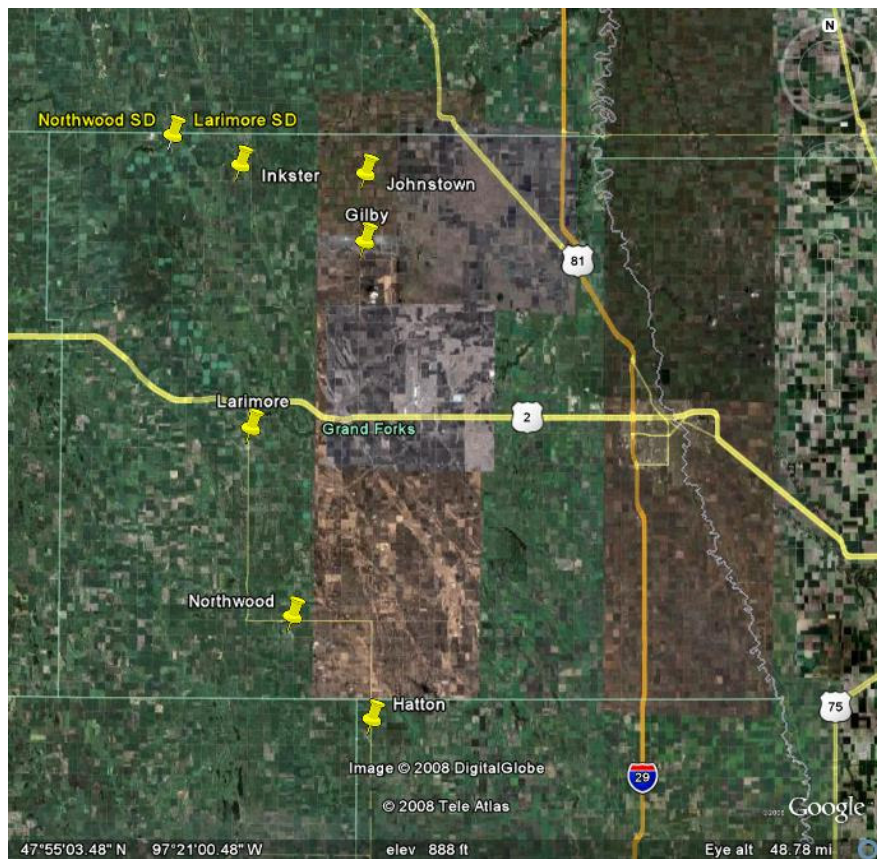


**Figure 4. Existing public safety radio tower locations.**



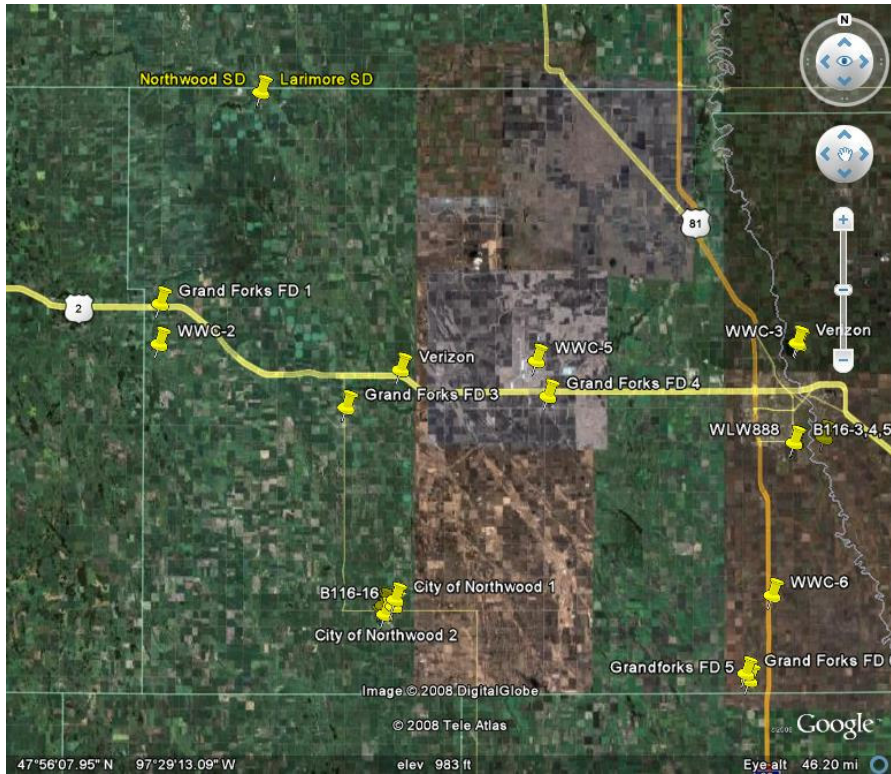


**Figure 5. Existing Polar Communications wireless broadband internet service towers.**



**Figure 6. Existing Educational Broadband License Sites**





**Figure 7. All wireless locations identified from FCC data base.**

## Leveraging Existing Infrastructure

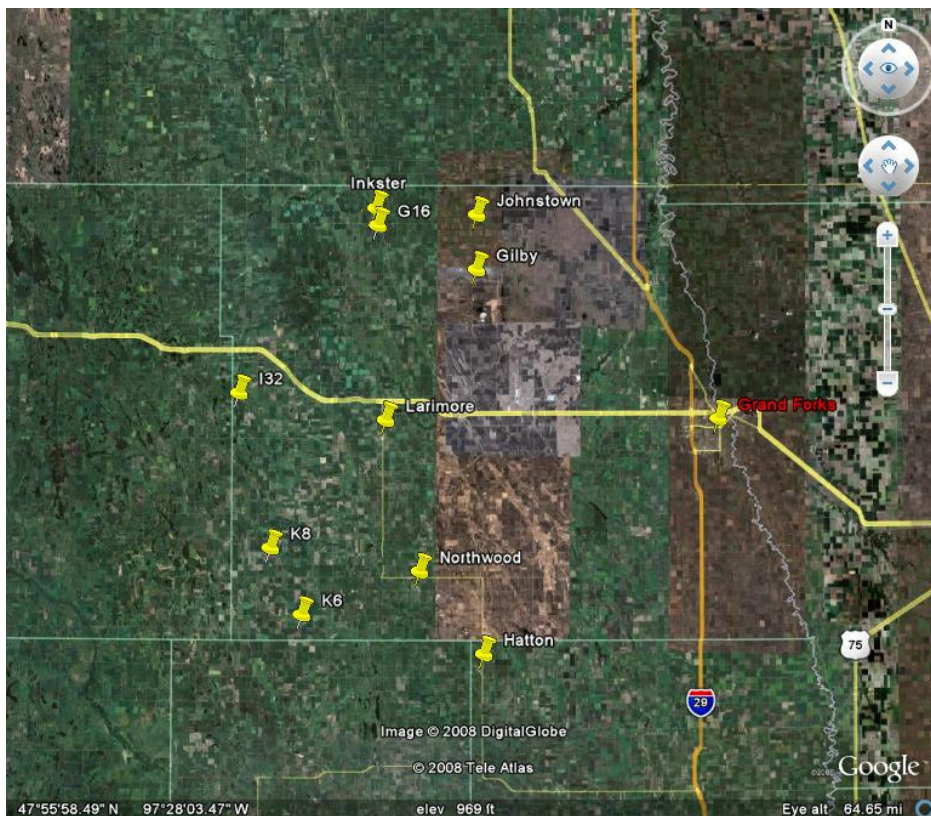
The simplest means to reduce the cost of building new infrastructure to fill the service gaps identified by this study is to leverage the existing infrastructure in the region. Available land, access to electrical power and telecommunications services (phone lines), a shelter for electronic equipment, and an elevated platform on which to mount antennas are the four largest factors that make up the cost of a cellular or wireless broadband site. This portion of the study focused on identifying the existing assets that could be used to reduce the cost of filling in the service gaps identified in the previous task.

Providing access to electrical power and telecommunications services at a tower site can be very expensive if that access is located more than a thousand feet away. The study examined several abandoned missile sites to evaluate their use as tower sites. These sites have been decommissioned and are up for auction or had been released back to the adjacent land owner. These sites have existing access roads, electrical service and telecommunications service that could be used for a new tower site. However, the lease terms prohibit the construction of any structure if the foundation of that structure would penetrate more than two feet below the surface of the ground. This restriction eliminates these sites for all practical purposes. Locating tower sites as near as possible to these missile sites should, however, ensure easy access to existing telecommunications and electrical power.

Based on geographic location alone, two abandoned missile sites (See Figure 8 below) were identified as being well located to help fill in the service gaps. Site K8 in Logan Center Township and Site G16 two miles south of Inkster are both ideally located to serve as tower sites. Site G16 should also be located in close proximity to the fiber optic network of Polar Communications which should allow for affordable upgrades to

the connection from the tower to the existing telecommunications as demand for services grows. Procuring sites in close proximity to K8 and G16 should minimize the cost accessing existing electrical power and telecommunications services.

Wireless telecommunications require an elevated “platform” upon which to mount the antennas. The higher an antenna is mounted, the greater the effective range of the services provided by that antenna. The use of an existing structure like the water tower in Northwood can reduce the cost of building a tower site by well over \$100,000. Tours of the unserved regions of the County identified a grain elevator in Johnstown that might be used in place of a traditional tower. The study was not able to identify any other existing structures in the unserved areas that might be used.



**Figure 8. Abandoned missile sites evaluated for use as tower sites.**

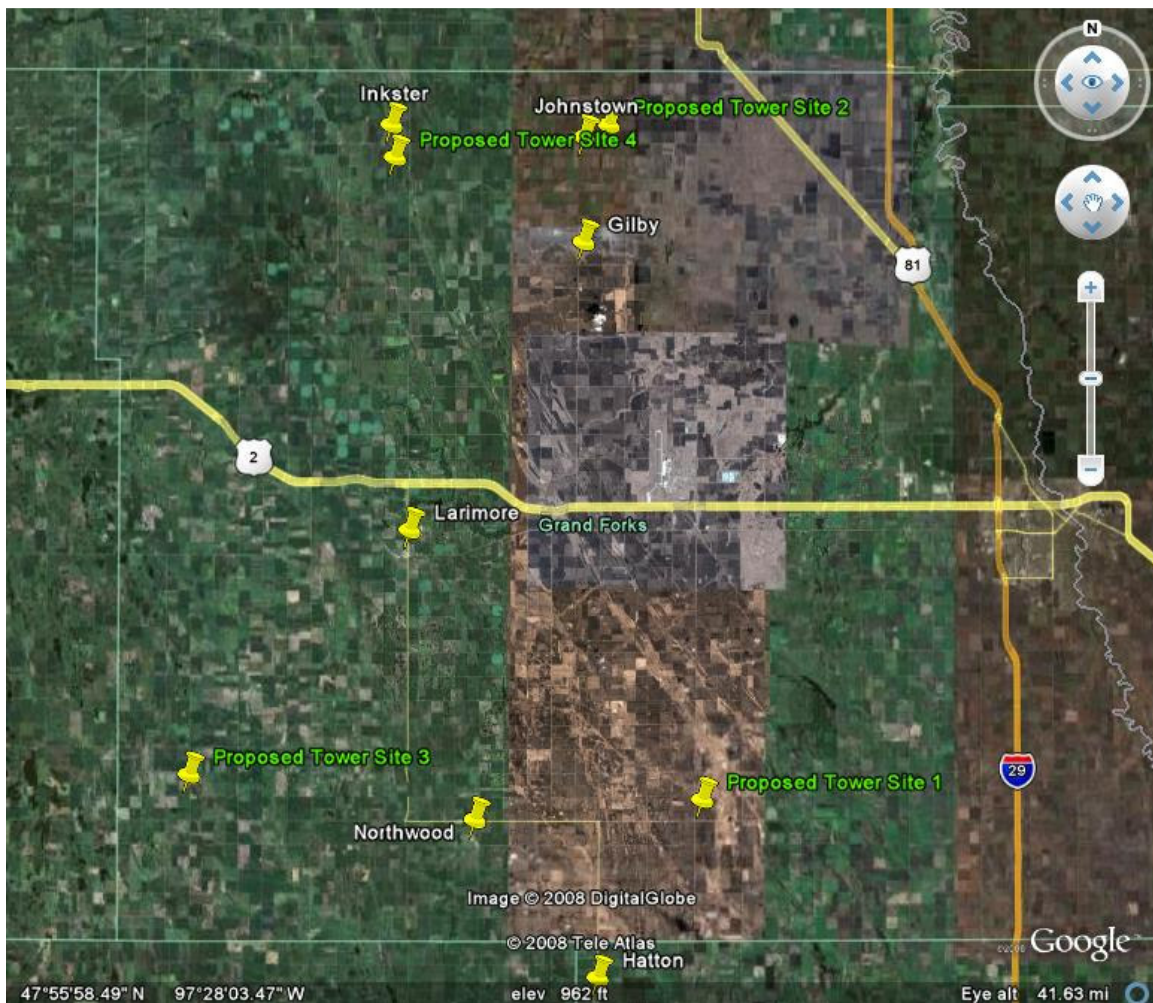
## Filling the Gaps

Filling the gaps in cellular voice and rural/mobile broadband service identified in this study will require a minimum of four tower sites. This assessment is based on the assumption that a ten to fifteen mile spacing between towers is the best compromise between continuous, reliable service coverage and reasonable construction costs. The relatively flat terrain in Grand Forks County enables us to space these towers equally between areas with existing coverage without great concern for coverage gaps. Using the ten to twelve mile spacing, and assuming the completion of the Verizon Wireless tower in Northwood, then four towers are the minimum needed to cover the gaps.

The four sites chosen are shown on Figure 9 below. These sites were chosen primarily to provide equal spacing between existing towers, but also based on existing



infrastructure that could be used to minimize the cost of construction. For example, Proposed Tower Site 1 was selected because it is approximately equidistant between the existing Alltel tower in Thompson and the planned Verizon tower in Northwood. Proposed Tower Site 2 in the Johnstown area was selected because it was located within fifteen miles of both the eastern edge of the County and existing cellular towers along US Highway 2. Proposed Tower Site 3 (in Logan Center Township) is located approximately twelve miles from the tower planned for Northwood and approximately 15 miles south of the existing Alltel tower in Niagara. Finally, Proposed Tower Site 4 (two miles south of Inkster) is located twelve miles from the western edge of the County, five miles south of the northern edge of the County and 14 miles north-northwest of the existing Verizon tower between Arvilla and Larimore.



**Figure 9. Proposed Tower Sites**

Depending on funding availability and service provider participation, the four tower sites can be constructed separately or at the same time. If the towers must be constructed at separate times, we recommend prioritizing the construction in the order by which the sites are numbered in Figure 9. We recommend these priorities because we believe this order of construction most closely matches the needs of the County as outlined in the introduction to this report. Sites 1 and 2 will provide service to residents in the communities impacted by the GFAFB realignment. By improving telecommunications

services in these communities, they will be better equipped to support economic diversification and to absorb the growing workforce requirements of businesses and agencies located in the City of Grand Forks. Proposed Sites 3 and 4 would follow as soon as possible to provide service to businesses and residents in those areas and to support the continued westward migration of population as the County grows into the future.

## **Building Needed Infrastructure**

The infrastructure required at each site will be interrelated with the service provider agreements the County will negotiate. For the purposes of estimating construction and operating cost estimates, this study assumes that the County will be required to build the common infrastructure including an access road, a perimeter fence, a 100' tower, a small equipment shelter and access to electrical power and the local telecommunications network. Service providers will be responsible for their own equipment shelter, active electronics, antennas and back-up generator.

Our research into the probable cost of construction of the common infrastructure listed above shows a range of cost from \$150,000 to \$250,000. The variables that contribute to this wide range include cost of land, cost of zoning and permitting, cost of access to power and telecommunications lines, and relative difficulty of construction on any particular site. Each of the four sites selected are relatively flat and easily accessed. Two of the four sites can be located near abandoned missile sites, implying relatively easy access to power and telecommunications. Assuming that cost of land, zoning and permitting are an average of the data from other regions of the country, we estimate that the sites can each be built for \$200,000.

Operational costs also will be a function of the operating agreements negotiated by the County with service providers. If the County chooses to negotiate a turnkey operating agreement with a provider, the operating costs of the site could be as low as zero. If the County must provide site maintenance and backhaul connectivity for the providers (assumed to be two T-1 lines at \$800 per month each), those costs could be as high as \$2,500 per month. These operating cost estimates do not include cost of land should the County decide to lease versus purchase the land required for the sites.

## **Potential Funding Resources**

Several funding sources may have resources available to fund this project. The plan proposed by this study has the potential to impact education, public safety, rural healthcare, and economic development. By viewing this plan from all of those perspectives, the County should be able to build a pool of funding large enough to pay for the common infrastructure at all sites. For example, by focusing on the use of the proposed tower sites to support a public safety mobile data system may qualify the project for grant funding from the Department of Homeland Security. By focusing on the ability of the system to provide broadband internet service to unserved areas, the County may be able to qualify for grant or loan funding from the US Department of Agriculture Rural Development Telecommunications Programs. By focusing on the resources being developed by this plan as utilities required by the local communities, the County may be able to solicit funding from the US Department of Commerce Economic Development Administration. Finally, because the genesis of this plan is the base realignment at GFAFB, the County may qualify for funding from the Department of Defense to offset the impact of the realignment.



## **Plan of Action**

What are the next steps to continue the development of the needed telecommunications resources for Grand Forks County? Three parallel efforts should be undertaken to move this plan forward. The first of these tasks is to pursue funding resources as described in the previous paragraph. While funding is sought, the County should also enter into negotiations with property owners of the four sites recommended by this study. The third parallel task is to engage service providers through a request for proposal process. A Request for Proposal should be issued to all telecommunications providers who might be interested in expanding their offerings within the region. This RFP should allow for a variety of business approaches, but should always protect the County's right to engage more than one provider on any single site.

## **Conclusions**

This study presents a plan to improve cellular voice and broadband data services throughout unserved and underserved regions of Grand Forks County. These services will enable public safety mobile data applications and continuous cellular and rural/mobile broadband data coverage. Cellular and broadband data coverage will, in turn, encourage commuters (both actual and tele-commuters) to consider moving into the rural communities. They will also encourage the development of more mobile workforce applications that can positively impact the productivity of private and public sector mobile workers. In sum, the effect of this plan will be to make all of Grand Forks County a "connected community" able to grow its economy and workforce with a telecommunications infrastructure designed to grow and adapt along with the Region. And finally, building the infrastructure identified in this plan will also position Grand Forks County to provide the telecommunications support that will be required by any new mission assigned to Grand Forks Air Force Base.

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# GRAND FORKS BROADBAND CONNECTIVITY BUSINESS DEVELOPMENT ROADMAP

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## TYPICAL WIRELESS SITE SPECIFICATIONS

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PROJECT ENGINEER:  
ACCESS CONSULTING, P.C.  
265 WEST FRONT ST.  
MISSOULA, MT 59802  
406-327-0629

## **Geotechnical Engineering and Analysis Minimum Specifications**

Geotechnical engineering and analysis are required prior to placing a tower and its foundation, to ensure that the soil, foundation design, and site preparation are appropriate to support the needs of the structure during its operational life. The successful contractor will provide an appropriate geotechnical report for all sites requiring new shelters and physical additions of towers at the cost quoted to this response. These investigations and reports will be signed by Geotechnical Engineers who are registered in the State of North Dakota. Geotechnical investigations and reporting will be in accordance with the American Society for Testing and Materials, ASTM D 420, "Standard Guide to Site Characterization for Engineering Design and Construction Purposes" for new work.

**Note:** In the event the site is inaccessible to normal drilling machinery, other accepted tower-manufacturer methods will be considered to generate the soil sample report.

The contractor shall:

- Gather surface and subsurface soil sample at the designated site.
  - Perform one boring at the center of the proposed tower location. At a minimum, bore to a minimum depth of 20 ft if possible, and record the resistivity at 5-foot intervals, if possible.
  - Maintain a log during the drilling and collect samples of subsurface materials at intervals.
  - Collect and record penetration resistance measurements. In cases where the site is solid rock, perform analysis as required to recommend a tower foundation based on site and rock conditions.
  
- Perform geotechnical engineering and analysis to include subsurface soil and groundwater conditions appropriate to support the needs of the tower structure during its operational life.
  - Classify the samples collected.
  - Perform tests necessary to conduct a competent geotechnical engineering analysis to support development of foundation recommendations.
  - At a minimum, test selected samples for moisture content, soluble sulfate, and resistivity.
  
- Complete engineering and geotechnical analysis and report in a timely fashion, but no longer than 10 working days.
  - Include all data collection and information resulting from the exploration and testing activities with the analysis.
  
- Report findings to Project Manager.
  
- Provide separate pricing for the core sample and Geo-Technical report.

### ***Underground Location (Call Before You Dig):***

The contractor shall either call the Utilities Underground Location Center at 1-800-424-5555 least two business days ahead of time for free underground locating services or the contractor shall use the online service available at: <http://www.callbeforeyoudig.org/>.

### ***Documentation:***

Five (5) complete hard copies of the report, and one soft (electronic) copy.

## **Project Fencing Specifications**

### ***Fencing:***

#### **DESCRIPTION OF WORK:**

Work includes but is not limited to:

Provide and install chain link fences and gates as complete units controlled by a single source including all necessary erection accessories, fittings, fastening, etc., required for a sound, secure and complete installation.

Completely coordinate with work of other trades.

#### **GENERAL:**

**Dimensions:** Dimensions indicated for pipe are outside dimensions, exclusive of coatings.

#### **SUBMITTALS:**

Submit manufacturer's specifications for **products, sizes, weight per lin. ft., locations, dimensions, etc.** to be used on this project.

#### **MANUFACTURERS:**

Subject to compliance with requirements, provide products of one of the following:

a. **Type II Galvanized Steel Fence Piping:**

"SS-40" by Allied Tub and Conduit Corp.  
"TUF 40" by American Fence Corp.

Or As Approved.

b. **Galvanized Fabric:**

Master-Halco, Inc.  
Merchants Metals, Inc.



Or As Approved.

**MATERIALS:**

**Steel Fencing:**

Fabric: No. 9 Ga. (0.148") finished size steel wires, 2" mesh, both top and bottom selvages twisted and Barbeded. As per galvanized I/A/W, chain Link Fencing Manufacturer's Institute (CLFMI), Fed. Spec. RR-F-191 and ANSTM A 392.

- a. Furnish one-piece fabric widths.
  - b. **Fabric Finish:** Galvanized, ASTM A 392, Class II, with not less than 2.0 oz. zinc per sq. ft. of surface.
  - c. Fabric shall be hung on the outside face of fence framework.
2. **Framework:** Hot dipped galvanized on interior and exterior surfaces; zinc coated Class 1, Steel pipe, Grade B, Type II, ASTM A 569, with 1.0 oz zinc per sq. ft. of surface +/- 0.1 oz. per sq. ft.; Chromate Conversion Coating shall be 30 micrograms per sq. in. +/- 1.5 micrograms per sq. in.; thickness of Clear Coating shall be nominal 0.5 mils +/- 0.2 mils; ASTM F 669 for strength.
3. **Fittings and Accessories:** Galvanized, ASTM A 153; RR-F-191/4C.

**Framing and Accessories:**

**Line Posts:** Space 10'-0" o.c. maximum, unless otherwise indicated, or following sizes and weights:

3.275" OD steel pipe, 3.12 lbs. per lin. ft.

**End, Corner and Pull Posts:** minimum sizes and weights as follows:

2.875" OD steel pipe, 4.64 lbs. per lin. ft.

**Top Rail:** 1.625" O.D. Steel pipe. 1.82 lbs. per lin. ft., continuous with no joints within 10'-0" of corner or gate posts.

**Gate Posts:** furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

<u>Leaf Width</u>	<u>Gate Post</u>	<u>lbs/lin.ft.</u>
Over 6' to 13'	4.000" OD pipe	5.56

**Tension Wire:** 7-gauge, coated coil spring wire, ASTM A 824, Type II, Class 2.

- a) Locate two inches (2") maximum above the bottom of fence fabric and at inside face of fence fabric. At fence posts, the tension wire shall be between the fence fabric and fence posts.
5. **Post Brace Assembly:** Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as posts for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener. Horizontal brace shall extend from corner and gate posts to the first adjacent line post.
6. **Stretcher Bars:** One-piece lengths of galvanized steel equal to full height of fabric, with minimum cross-section of 3/16" X 3.4". Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into line post.
7. **Stretcher Bar Bands:** Space not over 15" o.c. to secure stretcher bars to end, corner, pull, and gate posts.
8. **Barbed Wire Supporting Arms:** Manufacturer's standard galvanized Barbed wire supporting arms, 14 ga. (minimum) pressed steel and galvanized to match frame work, with provision for anchorage to posts and attaching 3 rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap and must be capable of withstanding 250 lbs. downward pull at outermost end. Provide the following type:
  - a. Single 45 degree arm for 3 strands barbed wire, one for each post. Coordinate with vertical gate extensions.
  - b. "V-arm", double 45 degree arms for 3 strands barbed wire per each arm, one for each post.
9. **Galvanized Barbed Wire:** 2 strand, 12-1/2 ga. Wire with 14 ga. 4-point round barbed spaced not more than 5" o.c.; ASTM A 121, Class 3. Three stands of barbed wire required for installation.
10. **Wire Ties:** As per ASTM A 121 and ASTM F 626.
  - a. For tying fence fabric to top rail, use 12. ga. galvanized steel ties or ties of the same gauge and material as the fencing, spaced 24" o.c. No aluminum ties permitted.
  - b. For tying fence fabric to line posts, use 12. ga. galvanized steel ties or ties of the same gauge and material as the fencing, spaced 12" o.c. No aluminum ties permitted.
  - c. For tying fence fabric to rails and braces, use 12 ga. galvanized steel ties or ties of the same gauge and material as the fencing, spaced 24" o.c. No aluminum ties permitted.

- d. For tying fence fabric to tension wire, use 12 ga. galvanized steel ties, ties of the same gauge and material as the fencing, or clips spaced 24" o.c. No aluminum ties permitted.
11. **Concrete:** Provide concrete consisting of Portland cement (ASTM C 150), aggregate (ASTM C33), and potable water **as supplied from a pre-mix concrete company only**. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.
- a. Size: As per ASTM F 567 and as specified herein.
    - Hole diameter shall be at least four (4) times the largest cross section of the post and no smaller than 12 inches (12"0 in diameter).
    - Hole depth shall be a minimum of thirty-six inches (36") at all line posts; Forty-two inches (42") at all terminal, corner, pull, and gate posts.

**c. Gates and Accessories:**

**1. General:**

- b. Fabricate perimeter frames of gates from **1.90" O.D. Class I steel pipe**, finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8'-0" apart, unless otherwise indicated.
- c. Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attached stretcher bars to gate frame at not more than 15" o.c.
- d. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
- e. Where barbed wire is above gates, extends end members of gate frame 1'-0" above top member. Provide necessary clips to receive and secure 3 strands of wire.

**2. Gate Hardware:** Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:

- a. **Hinges:** Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 8'-0" nominal height.

- b. **Latch:** Provide horizontal sliding rod (at middle cross bar) to permit operation from exterior side of gate, with padlock eye as integral part of latch.
- c. **Keepers:** Provide keepers for vehicle gates, which automatically engage gate leaf and holds it in open position until manually released. Each gate leaf shall have one (1) keeper. **Keeper shall be placed in concrete 12" in dia. X 24 deep.**
  - i. Location of keepers shall be on exterior side of each drive-thru gate leaf and shall allow each gate to swing towards the exterior of the compound 170 degrees from the closed position, as shown on the Drawings bound herein.

## 6. INSTALLATION

- a. Install in accordance with ASTM F 567, written installation instructions of fencing manufacturer, and as specified herein to provide a secure, aligned installation.
- b. All sub-grade items shall be anchored in concrete as detailed herein. This includes, but is not limited to, line, terminal, corner, pull, gate posts and gate keepers.
- c. Tie existing chain link fencing to new chain link fencing at a new post, as required.
- d. Bottom of gates shall be adjusted to have two inches (2") maximum clearance to finish grade in the closed position.
- e. Barbed wire shall be secured to supporting arms in such a manner to prevent easy removal.

### ***Permits:***

The contractor will be responsible for securing all necessary permits from necessary entities. All required permits such as local building permits, electrical permit, building inspections, and any other required documentation are the responsibility of the contractor.

### ***Shipping and Delivery:***

Final delivery locations are anticipated to be at remote sites. Initial delivery of fencing materials will be to an easily accessible location at a city near the remote site, such as a city equipment yard. Transportation to the remote site and installation costs will be requested when task orders are issued. Delivery locations may be subject to change and pricing may be adjusted accordingly. Delivery sequence must be coordinated with local contact.

Weekends and holidays deliveries are not accepted, deliveries shall be F.O.B. DESTINATION, to the location specified. The term "F.O.B. destination, within the premises," as used in this clause, means free of expense and delivered to the location specified. The Contractor shall:



- Pack and mark the shipment to comply with specifications; or if the specifications do not contain specific packing or marking instructions, pack and mark the shipment in accordance with prevailing commercial practices and in such a manner as to ensure delivery in good condition and as required by this RFP.
- Prepare and distribute commercial bills of lading and Material Safety Data Sheets (MSDS) as appropriate.
- Deliver the shipment in good order and condition to the point of delivery specified.
- Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the Owner at the delivery point specified.
- Furnish a delivery schedule and designate the mode of delivering carrier; and
- Pay and bear all charges to the specified points of delivery.

**Site Clean-up:**

- Unused construction materials must be removed from the site location and disposed of.

**Warranty:**

A five (5) year warranty is expected. The contractor shall have 30 days to resolve warranty issues from the date of written receipt of warranty problems. If not resolved within the 30 days, the Customer reserves the right to hire a subcontractor to make the necessary repairs at the Contractor's expense.

## **Project Shelter Specifications**

**Shelter: (Thermo Bond preferred)**

The purpose of this document is to list the minimum requirements for shelters to be placed at the radio communications sites. The shelter floor plans are an integral part of this specification to be used as a guide for placement of cable ladders, electrical outlets, lighting, transfer switch and doors. The general specifications are:

- Pre-assembled shelter with brown aggregate exterior finish.
- No concrete buildings.
- Height 9 feet I.D.
- Sizes to bid:
  - 10 feet O.D., Length 12 feet O.D. (generator outside)
  - 12 feet O.D., Length 24 feet O.D., with a generator room (generator inside)
- 3'x7' exterior steel door with passage, triple-point (3-point) locks, and Best deadbolt hardware (equipment room).
- R-values of 19 in the walls and floor and 25 in the roof.
- Galvanized "I" beam skid assembly.
- Two-ply rubber roofing material with galvanized roof edging.
- Vinyl tile floor covering.
- Finished interior walls.
- 3/4" Oriented Strand Board /Fiber Reinforced Plywood (OSB/FRP) interior finish.
- Twelve hole (12) – 4" wave guide ports Microfect.
- Roof Load 150 psf. Roof sloped from the center to prevent water pooling.

- Seismic Design Category C or better.
- Twelve inch wide (12") overhead cable trays to be placed in "fishbone" pattern as shown in the sample shelter drawing below.
- Shelter average wind rating 90 mph.
- Rodent proof.
- Grounding per current R56 specifications.
- North Dakota Professional Engineer (PE) stamped shelter drawing package.
- 4" thick, 3' x 3' entry pad in front of all doors.

***Generator Room Requirements (for shelters with generator rooms):***

- 4'x7' exterior steel doors, triple-point (3-point) locks, with Best lock hardware (generator room).
- Ventilation package including intake and exhaust, outside hoods and thermostat for the generator room.
- Generator exhaust thimble.
- Factory installed transfer switch for indoor generators.
- Snorkel intake and exhaust at roof height utilized for inside generator designs. (Option).

***Electrical:***

Some shelters may have an inside mounted generator, some may have an outside generator and factory installed transfer switch. Provide all labor, materials, equipment and incidentals necessary to perform the electrical work on the equipment per each size of the shelter layout diagram below, as follows:

- 40 space, Square D Electrical 200 AMP Circuit Panel with main disconnect switch. (shelters will have a 20 space Square D Electrical Circuit Panel with a 200 AMP main disconnect switch)
- 4-foot, 2-bulb fluorescent light fixtures and switches.
- Vandal-proof exterior light with switch.
- 120v 20-amp twist-lock receptacles.
- 120v duplex receptacles.
- GFI exterior receptacles, 1 near cable entry port, 1 near equipment room entry door.
- Alarm Package to include, but not limited to:
  - Door alarm (all entry points)
  - Smoke detector
  - Over-temperature
  - AC on/AC off (power)
  - HVAC Enhanced alarm board
  - HVAC Fault (heater/air conditioning fail)
  - HVAC Fault (heater/air conditioning fail).
- R-56 Interior and exterior grounding.
- 10# ABC fire extinguisher.
- One Carbon Dioxide (CO<sub>2</sub>) fire extinguisher mounted on the interior wall near the main distribution panel.
- Breakers to accommodate the above.
- All electrical wires, boxes, conduit, etc. to make a complete assembly.

- Space and preparation for Generator Transfer Switch.

**Electrical Notes:**

1. All wiring shall be in accordance with the National Electric Code (NEC) and National Fire Protection Association (NFPA).
2. All electrical materials shall be UL listed and classified as suitable for the purpose specified.
3. All wiring shall be surface mounted in a raceway or EMT conduit using approved connectors, couplings, and clamps. All conduit shall be anchored in place at approximately every 4 ft.
4. All wiring shall be a solid conductor, THHN or THWN Copper, no smaller than #12.
5. All wire runs shall be continuous.
6. Low-voltage wire may be stranded.
7. All wiring shall be tested and inspected prior to shipment.
8. Green ground conductors shall be run to all of the buildings' A/C powered devices. Conduit shall not be used as the sole source of ground.
9. All wiring for alarm devices shall run in its own conduit to the alarm cabinet.

**R-56 Grounding:**

Provide all necessary services, tools, conduit, piping, and other materials as may be required to install R56 grounding system based on TIA/EIA grounding specifications to meet Motorola R56 grounding requirements. All grounding connections must be cad-welded. This shall include all excavation and underground work as may be required. It is the responsibility of the contractor to meet all NEC, R56 grounding, and TIA/EIA-568-B cabling specifications and provide necessary electrical permits. A common tie point must be provided for the complete site grounding (tower, shelter, fence, propane tank, and generator).

**HVAC Requirements:**

- ♦ Dual 4-ton cool/5kW heat **Bard or equivalent** air conditioner with economizer option and master control thermostat.
- ♦ Exterior mounted units must be rodent proof.

**Concrete Pad for Shelter:**

The contractor shall:

- Provide all services, tools, material and equipment required for the design/installation of the shelter foundation.
- Contractor shall provide all services to install and set the prefabricated shelter onto the concrete pad. Concrete pad must be constructed in accordance with manufacturer's specifications. Installation must be plumb and anchored per manufacturer's specifications. This includes any use of heavy support equipment needed to safely perform the functions.
- Strength inspection including break tests, to be conducted at 7/14/28 days, by a third-party testing and inspection company.

**Permits:**

The contractor will be responsible for securing all necessary permits from essential entities. All required permits such as local building permits, electrical permit, building

inspections, and any other required documentation, are the responsibility of the contractor.

**Site Clean-up:**

- Unused material must be removed from the site location and legally disposed of.

**Documentation:**

- Five (5) hard copies of complete shelter drawing package and one electronic copy (PDF file).

**Warranty:**

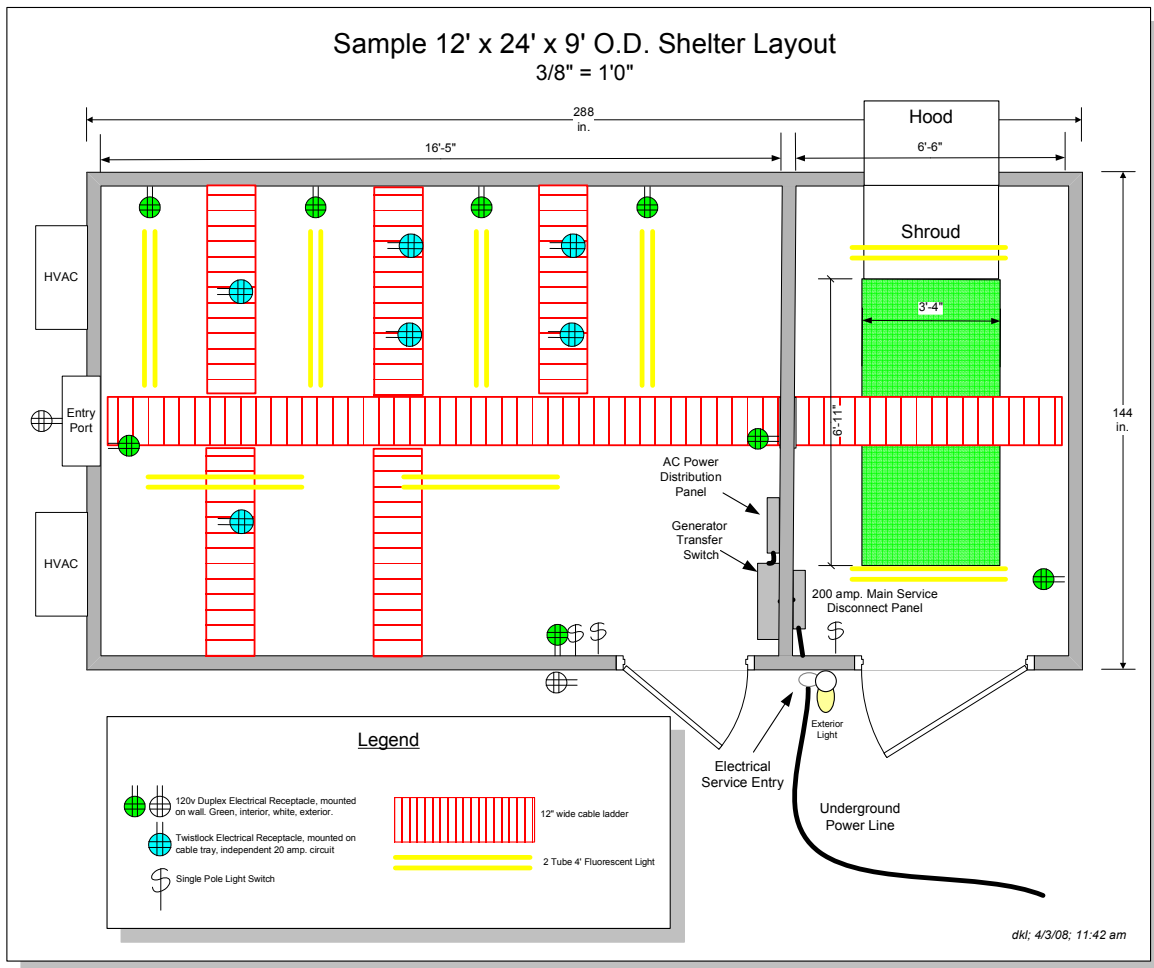
A five (5) year warranty is expected. The contractor shall have 30 days to resolve warranty issues from the date of written receipt of warranty problems. If not resolved within the 30 days, the North Dakota jurisdiction reserves the right to hire a subcontractor to make the necessary repairs at the Contractor's expense.

**Shipping and Delivery:**

Final delivery locations are anticipated to be at remote sites. Initial delivery of shelters may be to an easily accessible location at a city near the remote site, such as a city equipment yard. Delivery sequence must be coordinated with local contact.

Weekends and holidays are not accepted, deliveries shall be F.O.B. DESTINATION, to the location specified. The term "F.O.B. destination, within the Owner's premises," as used in this clause, means free of expense to the IMPD and delivered to the location specified. The Contractor shall:

- Pack and mark the shipment to comply with specifications; or if the specifications do not contain specific packing or marking instructions, pack and mark the shipment in accordance with prevailing commercial practices and in such a manner as to ensure delivery in good condition and as required by this RFP.
- Prepare and distribute commercial bills of lading and Material Safety Data Sheets (MSDS) as appropriate.
- Deliver the shipment in good order and condition to the point of delivery specified.
- Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the Owner at the delivery point specified.
- Furnish a delivery schedule and designate the mode of delivering carrier; and
- Pay and bear all charges to the specified points of delivery.



**Sample 12x24 Shelter Layout, Including Generator**

**Project 60KW Generator  
Minimum Specifications**

Minimum specifications for a 60KW Industrial Rated generator are to include the following:

**Generator**

- 60 HZ, 120/240 VAC, 1 Phase
- Direct excitation
- 75AH, GRP26, 525 CCA battery, w/rack installed
- 2 Amp Battery charger
- 1000 W block heater with ambient temperature thermostat with 40 degree F shutoff
- 200A UL mainline circuit breaker
- Critical Muffler
- Flex fuel line

- Standard Electronic Governor
- Hour Meter
- Std set of 3 manuals
- Factory authorized start-up on site
- LP liquid fuel
- 75AH, GRP26, 525 CCA battery, with rack installed, at a minimum

***Automatic Transfer Switch:***

Provide an automatic transfer switch and all labor and materials to connect generator to auto transfer switch and the transfer switch to the electrical supply, per manufacturer instructions. Note: at time of order, contractor will be notified if transfer switch has been pre-installed in the equipment shelter at the shelter factory.

- Installation in shelter
- 600 Volt contactor
- Rated at 200 amps
- 2 Pole construction
- Operating at 60 HZ
- 240 Volts, 1 phase
- In-phase adjustable control
- 7-Day programmable exerciser
- 2-wire start circuit
- 2-year limited warranty
- Set of 3 manuals
- NEMA 1 Enclosure

***Alarm System:***

Alarm capabilities are intended to provide the customer the ability to plug the generator system into the monitoring system at the radio site so that remote monitoring can be conducted from a remotely located dispatch or maintenance center. For example:

- **Onan<sup>®</sup>/Cummins<sup>®</sup> Generators** - Provide the transfer switch with the alarm option. (OTPC not OTEC - The Cummins OTPC transfer switch is more advanced and provides Date/time stamped event recording of up to 50 events.)
- **Generac<sup>®</sup> Generators** – Provide the H100 controller on the generator and the HTS transfer switch, not the R series controller and RTS transfer switch. (The H series controllers and transfer switched provide monitoring capabilities.)

Minimum alarm requirements are:

- Commercial Power status (AC on/off)
  - (Standard: Program to stay on for 15 minutes after power is restored.)
- Remote re-set/start
- Generator on/off
- Low oil pressure
- Low fuel pressure (propane)
- Over crank
- High coolant temperature
- Low coolant level
- Low battery voltage

- Over speed

Note: Generators manufactured for Industrial or Commercial use must be quoted. Generators manufactured for residential or light-duty use are not acceptable.

If the manufacturer can provide additional monitoring capabilities, the contractor is asked to quote the minimum requirements listed above and also describe and quote optional capabilities that could be integrated at a later date.

***Electrical Services:***

All electrical services including:

- Installation of the meter base with a 200-amp main disconnect switch
- All wiring from the meter base as required to provide a complete installation of the generator as per NEC and state electrical codes.
- All required state, local, and federal pre- and completion permits and/or inspections required by law.
- Any coordination with the local power company that may be required.

***Generator Installation:***

Contractor shall provide all services required to provide a complete installation, by qualified personnel, of a generator system. Installation configuration is to include gas line for liquid propane to the shelter and connection utilizing code-compliant NEMA boxes or other parts, systems, or components required to connect to the generator. Contractor is responsible to include all plumbing that may be required to connect the generator to the LP supply including all excavation and underground work as may be required. Contractor is responsible for all required inspections per county, state or public lands requirements. Complete system checkout and start up by factory-certified personnel is required. Personnel shall conduct a load test and provide a report to the project manager.

Details will include the following:

**Inside Generator (Contractor Option):**

- Delivery of the generator to the site, including off loading and installation.
- Connection of all electrical and propane fuel including all excavation and underground work as may be required.
- NEMA 3R box (enclosure) and vaporizer valve.

**Outside Generator (Contractor Option):**

- Delivery of the generator to the site, including off loading and installation.
- All services, tools, materials and equipment required for the installation of the generator concrete pad (foundation) per manufacturer's specifications.
- Installation of the generator onto the concrete pad. Installation must be plumb and anchored per manufacturer's specifications. This includes any use of heavy support equipment needed to safely perform the functions.
- Connection of all electrical and propane (liquid to generator-not vapor) fuel including all excavation and underground work as may be required'
- Elevate the generator three (3) feet above ground level, using metal supports or framing. (Contractor shall submit a drawing or design.)
- Outdoor generator housings must be rodent proof.



***Shipping and Delivery:***

Final delivery locations are anticipated to be at remote sites. Initial delivery of generators may be to an easily accessible location at a city near the remote site, such as a city equipment yard. Delivery sequence must be coordinated with local contact person.

Weekends and holidays deliveries are not accepted, deliveries shall be F.O.B. DESTINATION, to the location specified. The term "F.O.B. destination, within the IMPD 's premises," as used in this clause, means free of expense to the IMPD and delivered to the location specified. The Contractor shall:

- Pack and mark the shipment to comply with specifications; or if the specifications do not contain specific packing or marking instructions, pack and mark the shipment in accordance with prevailing commercial practices and in such a manner as to ensure delivery in good condition and as required.
- Prepare and distribute commercial bills of lading and Material Safety Data Sheets (MSDS) as appropriate.
- Deliver the shipment in good order and condition to the point of delivery specified.
- Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the Owner at the delivery point specified.
- Furnish a delivery schedule and designate the mode of delivering carrier; and
- Pay and bear all charges to the specified points of delivery.

***Site Clean-up:***

- Unused concrete material must be removed from the site location and legally disposed of.
- The site to be graded so that surface water is directed away from the generator and propane tank.

***Documentation:***

Five (5) complete sets of manuals and one (1) electronic set.

***Warranty:***

A three (3) year warranty is required. The contractor shall have 30 days to resolve warranty issues from the date of written receipt of warranty problems. If not resolved within the 30 days, the Customer reserves the right to hire a subcontractor to make the necessary repairs at the Contractor's expense.

**Project Self-Supporting Communications Towers  
Minimum Specifications**

***Tower Foundation Design Specifications:***

The contractor shall:

- Install the concrete foundation, based on engineering soil analysis of site and specification listed previously provided in this document.

**Pier and Pad Foundations for a Self-Supporting Tower**

1. Allowable bearing capacity
2. Angle of internal friction
3. Unit weight

4. Depth to water table (if encountered)

#### **Mat Foundation for a Self-Supporting Tower**

1. Allowable bearing capacity
2. Unit weight
3. Depth to water table (if encountered)

#### **Caisson Foundations for a Self-Supporting Tower**

1. Allowable skin friction
2. Allowable end bearing
3. Angle of internal friction
4. Depth to water table (if encountered)
  - a) Strength inspection including break tests, to be conducted at 7/14/28 days, a third-party testing and inspection company.
  - b) Digital images of the foundation rebar placement before the concrete is poured. (Building Permit requirement)
  - c) Site preparation in the area of the proposed tower foundation, will involve the excavation and backfill for engineered foundation.
  - d) All tower foundations to be designed and constructed for a 100-foot tower, actual installed tower height may be shorter, allowing for future expansion of towers.

#### ***Description of Work:***

The tower structures shall be self-supporting and 100 ft in height. Additional requirements may be specified when task orders are issued.

The tower (with dishes and antenna) must withstand 100 mph winds and ice loading of 1" on all surfaces. The tower structure design must conform to ANSI/EIA/TIA-222-F-1996 code. Some sites will be deemed extremely hostile with the possibility of more than 1" of ice on all surfaces with a 100 mph wind speed or higher. Additional ice loading specifications may be provided on a site-by-site basis. It is the responsibility of the contractor to assess proper wind and ice loading per location along with any applicable state or local building codes.

Contractor will furnish all services, labor, materials, and equipment to install Self-Supporting Galvanized Steel Communications Tower(s) and other services to provide a tower, tower installation, tower pad, R-56 grounding, transportation of tower to the site and other services to provide a fully operational communications tower which is ready for installation of radio and microwave equipment.

Provide 100' self-supporting Galvanized Steel tower with tubular legs depending on site requirements. Tower design to support the following equipment:

Tower materials to be supplied:

- i. Complete tower steel and hardware.
- ii. Anchor bolts and templates.
- iii. Climbing step bolts: Provide climbing step bolts for all legs from ground level to the top. A climbing ladder can be substituted for the leg with step bolts to the top of the tower.
- iv. One (1) wave guide support ladder with one (1) stacker to support twelve (12) cables

- v. Fall protection safety cable kit with two (2) removable brakes and mounting brackets. The climbing kit hardware and associated cables must include hardware to secure the cables when not in use so that the wind does not whip the cables and cause damage the tower or antennas. Damage caused by improperly mounted wire ropes will be responsibility of the tower company (Tower climbers are required to provide their own harness.).
- vi. Ice Bridge: provide and install an ice bridge between the equipment shelter and the tower of required size to support 12 cables. Minimum distance between the tower and shelter will be 15-20 feet.
- vii. P.E.-certified tower profile and foundation drawings:

***Installation:***

Contractor shall be responsible for:

- a) Assembling and erecting tower in accordance with OSHA and TIA/EIA standards.
- b) Installing climbing ladder, anti-climbing safety device and fall protection device.
- c) Providing any necessary tools and material required to paint communication tower and any reflective attachments that are installed on the tower.
- d) Procurement of all necessary tools and materials required for the installation of the tower including placing and securing of the tower onto its new foundation.
- e) Providing all necessary tools, labor and equipment to install cable ladder and ice bridge system from the top of tower to the RF cable entry port at the communication shelter.
- f) Ensuring that all soil around the tower is returned to the pre-construction state. Remove excess soil if necessary.
- g) Providing all services to unload the tower from any and all delivery equipment (trucks, trailers, etc.). This includes, but is not necessarily limited to (as necessary) crane, forklift, hand trucks.
- h) Providing equipment to place tower in its temporary location in any storage facility, as required and transport shelter from temporary storage location if necessary (within 100 miles of site).
- i) Providing all services to install and set the tower onto its foundation provided by Contractor. This includes any use of heavy support equipment needed to safely perform these functions.

***Optional Tower Painting and Lighting:***

The Contractor shall file all necessary Federal Communications Commission (FCC) and/or Federal Aviation Administration (FAA) forms and/or applications required for and as a result of the erection of the tower. FAA, FCC or local regulations may require the following:

- Provide and install tower lighting.
- Provide all necessary services, tools and materials required to paint communications tower and provide any reflective attachments on the tower.

***R-56 Grounding:***

Provide all necessary services, tools, conduit, piping, and other materials as may be required to install R56 grounding system based on TIA/EIA grounding specifications to meet Motorola R56 grounding requirements. All grounding connections must be cad-

welded. This shall include all excavation and underground work as may be required. It is the responsibility of the contractor to meet all NEC, R56 grounding, and TIA/EIA-568-B cabling specifications and provide necessary electrical permits. Towers are required to have a copper bus bar (large enough to accommodate grounding for all coax cables) installed at the bottom of the cable ladder that is tied into the common point of the ground. A common tie point must be provided for the complete site grounding (tower, shelter, fence, propane tank, and generator).

**Site Clean-up:**

- Unused material must be removed from the site location and disposed of in a legal, appropriate manner.
- The site to be graded so that surface water is directed away from the communications tower.

**Permits:**

The contractor will be responsible for securing all necessary permits from necessary entities. All required permits such as local building permits, electrical permit, building inspections, and any other required documentation are the responsibility of the contractor.

**Shipping and Delivery (Quote Separately):**

Final delivery locations are anticipated to be at remote sites. Initial delivery of towers may be to an easily accessible location at a city near the remote site, such as a city equipment yard. Delivery sequence must be coordinated with local contact.

Weekends and holidays deliveries are not accepted, deliveries shall be prepaid, F.O.B. DESTINATION, to the location specified. The term "F.O.B. destination, within the Owner's premises," as used in this paragraph means free of expense to the IMPD and delivered to the location specified. The Contractor shall:

- Pack and mark the shipment to comply with specifications; or if the specifications do not contain specific packing or marking instructions, pack and mark the shipment in accordance with prevailing commercial practices and in such a manner as to ensure delivery in good condition and as required.
- Prepare and distribute commercial bills of lading and Material Safety Data Sheets (MSDS) as appropriate.
- Deliver the shipment in good order and condition to the point of delivery specified.
- Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the Owner at the delivery point specified.
- Furnish a delivery schedule and designate the mode of delivering carrier; and
- Pre-pay and bear all charges to the specified points of delivery.
- Itemize shipping charges as a separate item on invoicing.
- Ship items via the least expensive common carrier unless otherwise stipulated.

**Documentation:**

- Five (5) copies of PE-certified tower profile drawings and one (1) electronic PDF file.
- Five (5) copies of PE-certified foundation drawings and one (1) electronic PDF file.
- Building-permit-required digital photos of all phases of construction, at minimum:

- Excavated hole for tower foundation.
- Excavated hole with rebar placement (before concrete placement).
- Foundation before back-fill to include grounding images.
- Five (5) copies of the final as-built tower drawings and one (1) electronic PDF file.
- Digital images of the completed tower.

***Warranty:***

Standard warranty is expected. The contractor shall have 30 days to resolve warranty issues from the date of written receipt of warranty problems. If not resolved within the 30 days, the North Dakota jurisdiction reserves the right to hire a subcontractor to make the necessary repairs at the Contractor's expense.

**Project Propane Fuel Tank Specifications**

***Propane Fuel Tank:***

Contractor shall provide transportation and all services, tools, conduit, piping, and other materials as may be required to provide and install one 1000-gallon propane tank (HEAVY) onto a concrete pad and anchored per manufacturer's specifications. This includes the following:

- One 1000-gallon propane tank filled with propane
- Gas line for liquid propane to the generator
- Connection to the generator
- All required inspections per county, state or public lands requirements.
- All excavation and underground work as may be required;
- Coordination and payment for filling the tank with propane.
- Average wind rating 90 mph
- Rodent proof
- Seismic zone A or better
- Vandal-proof
- Contractor will ensure that the color of the tank is compliant with local or federal rules.
- The propane tank must be set back a minimum of 10 feet from any building. Note: If the tank is over 1000 gallons, then it must be a minimum of 25 feet from the shelter. If local building codes require more distance than this, local codes shall prevail.
- Overfill Prevention Device (OPD) valve
  - ◆ Propane Gas Detector (For interior applications)
  - ◆ Detects Propane, LP Gas and Natural Gas.
  - ◆ Designed for rugged environments.
  - ◆ Mute does not override detection circuit, giving you full time protection.
  - ◆ IntelCheck™ Circuit - No false alarms from temporary exposures to LP Gas/Propane, aerosol cleaners, hair spray and other flammable gases.
  - ◆ Micro Current Technology that saves precious battery power. Operates on 12v DC
  - ◆ Long Life, Self Cleaning, Maintenance-free Sensor.
  - ◆ Loud 85 dB Alarm alerts you to hazardous propane vapors.
  - ◆ Test/Reset Button temporarily silences alarm during ventilation. Tests all the detectors functions with one touch.

***Concrete Pad for Propane Fuel Tank:***

- 11 foot x 4 foot x 6 inches thick.
- Fiberglass reinforced.
- Must meet 4000 psi.
- Broom finish.

***Optional:***

- Contractor shall provide a quote for painting the tank, if needed.

***Alarms:***

- Alarm package to include, but not limited to, a low fuel level alarm.

***Installation Instructions:***

The contractor shall:

- Be responsible for the procurement of all necessary tools and materials required for the installation of the shelter, shelter pad, ice bridge, propane tank, propane tank pad, generator, generator pad including placing and securing of shelter, generator and propane tank on their new concrete pads.
- Be responsible for returning all soil around the propane tank to its pre-construction state.
- Provide all services to transport the shelter, generator and propane tank from any and all delivery equipment (trucks, trailers, etc.). This includes, but is not necessarily limited to (as necessary) crane, forklift, hand trucks.
- Provide all services to install and set the propane tank, shelter and generator onto their concrete pads provided by Contractor. This includes any use of heavy support equipment needed to safely perform this function.