4.7 Preliminary Design – Locations

This section contains a preliminary design for the creation of a P25, trunked radio system that covers the entire ten-county ETIC area, that joins with the Northern Tier consortium, and will be capable of joining with the Big Sky 11 consortium, provided they follow the P25 standard.

The site design consists of 31 P25 sites, some trunked, some conventional, linked by microwave. Some microwave links will be low bandwidth and some high, depending on the expected traffic at each site. The Project Manager worked with Bob Brenner and Mike Huseby of TAB Electronics in Glendive, and Paul Grutkowski of East-Mont Communications in Miles City to create this preliminary design.

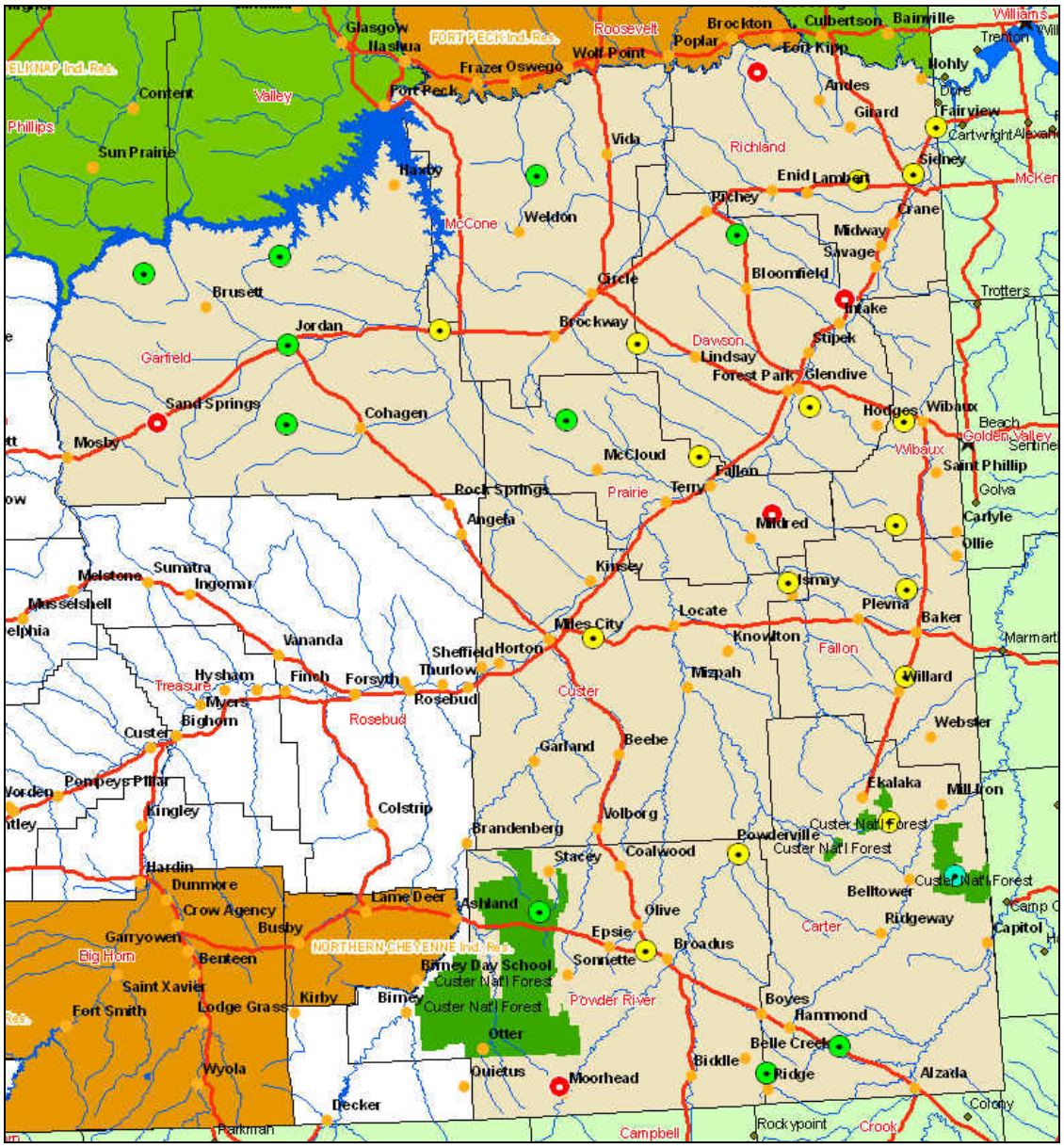

Figure 65 – Preliminary Design, P25, Trunked Sites With Microwave Links

<u>Key:</u>

Green Dots – Proposed Sites With Low Bandwidth Microwave (on existing ETIC sites)
Yellow Dots – Proposed Sites With High Bandwidth Microwave (on existing ETIC sites)
Red Dots – Proposed Sites With Low Bandwidth Microwave (on new ETIC sites)
Blue Dots – Proposed Sites With High Bandwidth Microwave (on new ETIC sites)

Although an attempt was made to create a coverage map using the Preliminary Design, one could not be secured.

Figure 66 – Preliminary Design, Potential Coverage Map

Assumptions:

1. Sixty-five foot antennas (transmit)
2. 65 watt ERP

4.8 Preliminary Design – Cost Estimate

This section contains a summary of the costs per site of the preliminary design and a total for the consortium.

The total estimate for the entire consortium for implementing a P25-compatible, trunked system is **$13,371,500**. This includes not only the costs for each site (which are detailed below), but also the labor for installation, and licensing costs for repeater frequency pairs. Licensing and labor costs for the microwaves are included in the cost for the microwaves.

Important: It cannot be emphasized enough that this estimate should be taken as nothing more than a rough order of magnitude (ROM). It is not possible at this point in the project to come up with anything more exact. There are far too many variables which are not and cannot be known at this time. The reader is strongly encouraged to make careful note of the assumptions made during the costing process. Without that knowledge, the estimate is meaningless.

A number of assumptions and caveats are associated with this preliminary design. The Project Manager worked with representatives from TAB Electronics in Glendive, and East-Mont Communications in Miles City to create this preliminary design. Additionally, the Project Manager drew on the experience of the Northern Tier Interoperability Consortium to refine the costing assumptions used to derive the estimate.

The description of existing equipment at existing sites is not repeated here. The reader is referred to Section 4.3, *Site Surveys By County (Map & Description)* for a full description of each existing site.

4.8.4 Assumptions And Caveats

1. It is assumed that all counties will want to keep their existing equipment and frequencies. As a result, this preliminary design assumes new equipment for the P25, trunked system.

2. It is assumed that a microwave tie-in with the Northern Tier will be accomplished through a corridor coming down the far-eastern side of the state, through Culbertson and/or Bainville Jct., Fairview, Sidney, etc. This microwave system will then fork at or about Glendive and proceed in three directions from there.

3. The assumption was made to use existing sites, towers, and buildings whenever possible. Approximately half of the existing ETIC towers and/or buildings may be capable of effectively supporting the new P25, trunked or non-trunked equipment and/or microwaves. In order to come up with a worst-case scenario from a costing perspective, those sites deemed incapable assume erecting a new tower and building at each site, unless indicated otherwise in the detail for each site.

4. Unless noted otherwise, all trunked sites are assumed to have three repeaters. All non-trunked sites are assumed to have one repeater.

5. Costs for renting land or towers is not included in the estimate.

6. For costing purposes, the following questions were asked about each potential site:

   A. Will we use an existing tower, building, and power supply, or will we need to build a new one?
   B. Will the site be trunked or conventional (non-trunked)?

7. The individual estimated costs used to derive the site estimates are as follows:
   A. Cost per trunked repeater: $70,000
   B. Cost per non-trunked repeater: $40,000
   C. Average cost for combining equipment: $38,000 (This can vary from $15,000 to $100,000 or more, depending on the frequencies.)
   D. Microwave cost per hop: $85,000. This includes installation.
   E. Building a tower and running power: $100,000. This obviously can vary by the characteristics of the site and the tower itself.
   F. Building a building: $25,000
   G. Labor costs are assumed at 50% of the cost for the equipment, excluding the microwave, the cost of which already includes labor.
   H. Total cost for acquiring licenses for repeaters: $70,000.

8. These estimates do not include the costs for acquiring P25-compliant radios by individual counties. Each agency will need to determine for itself what kind of equipment and how many radios they need to buy.

   For estimating purposes, however, the following numbers can be used by counties:

   A. P25-compatible Trunking Control Station – $6,000 each.
   B. P25-compatible Mobile Unit – $4,000 each.
   C. P25-compatible Portable Unit – $5,000 each.

9. The estimate does not include the cost of one or more Project Managers, should the consortium choose to hire them for a portion or all of the next phase.

4.8.5 Carter County

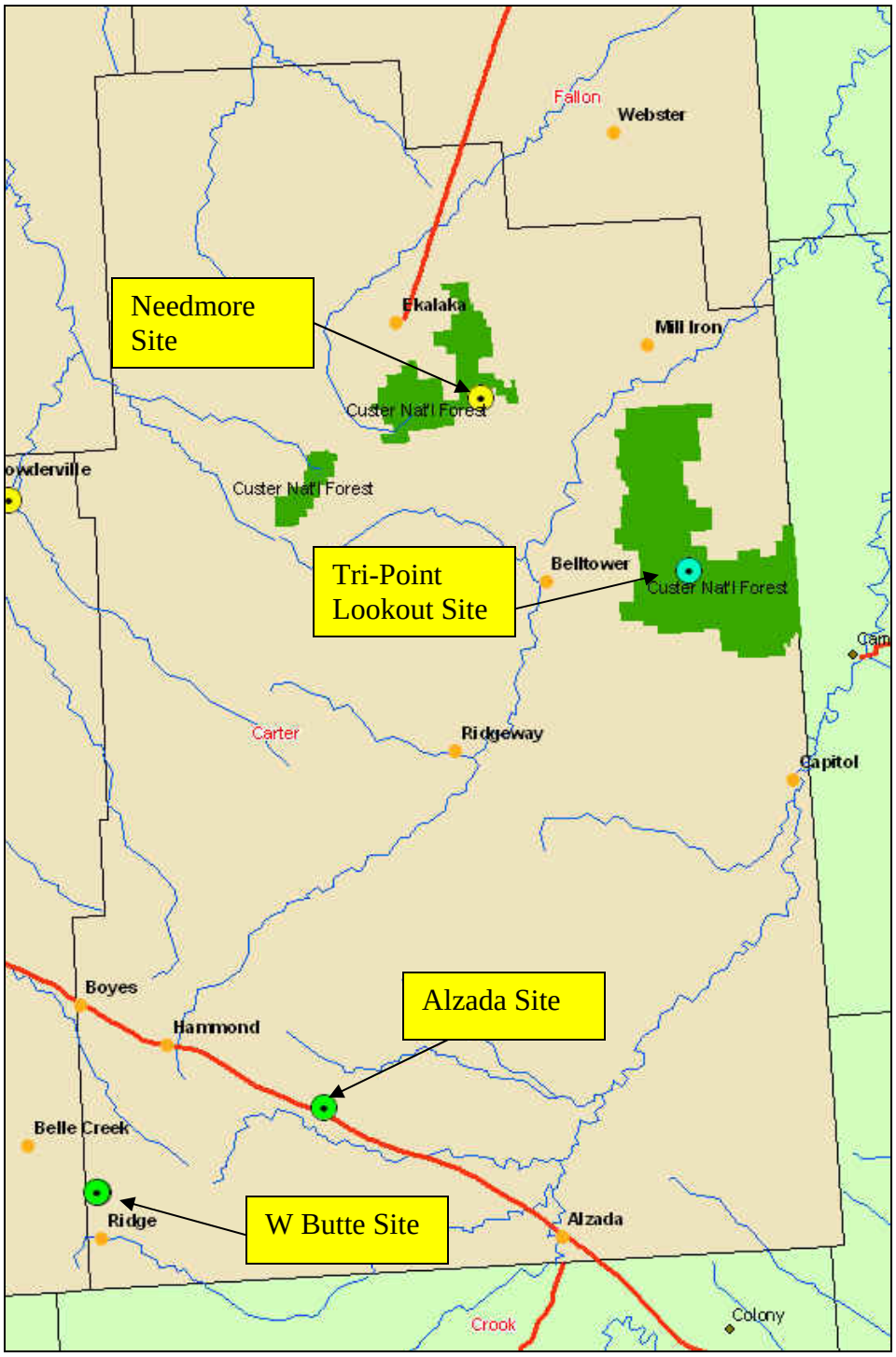

Figure 67 – Preliminary Design, P25, Trunked Sites, Carter County

4.8.5.1 Alzada Site

Costing Assumptions: A non-trunked site. The existing tower, building, and power can be used. It is a 250' tower and 7.5x10' building owned by Carter County.

Total Cost: $145,000

4.8.5.2 Needmore Site

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 100' tower and 10x18' building. It is not known who owns it.

Total Cost: $457,000

4.8.5.3 Tri-Point Lookout Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.5.4 W. Butte Site 1

Costing Assumptions: A non-trunked site. The existing tower, building, and power can be used. It is a 120' tower and 8x9' building owned by Powder River County.

Total Cost: $145,000

4.8.6 Custer County

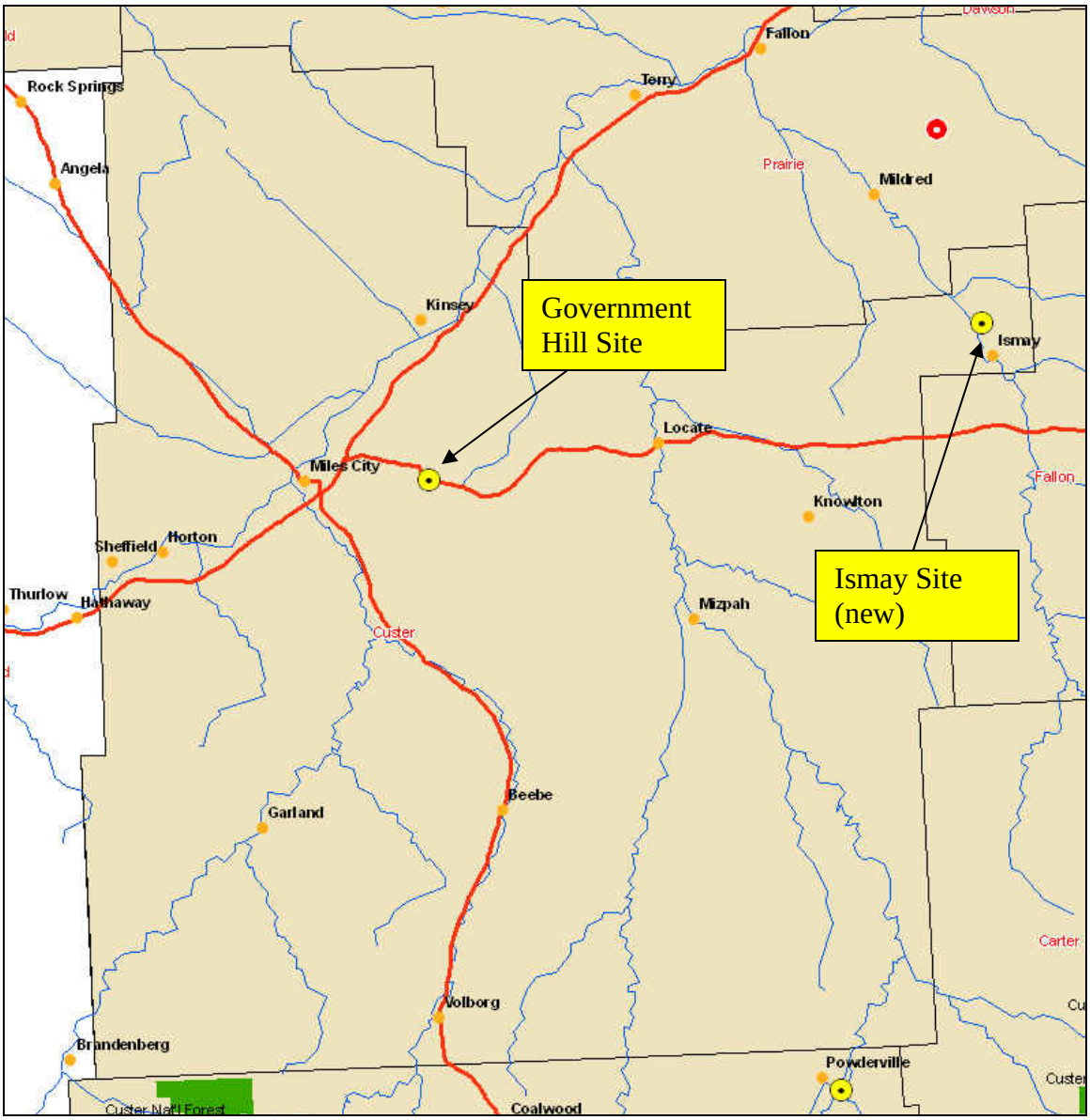

Figure 68 – Preliminary Design, P25, Trunked Sites, Custer County

4.8.6.1 Government Hill Site

Costing Assumptions: A trunked site with four repeaters. The existing tower, building, and power can be used. It is a 180' tower and 12x12' building. It is not known who owns it.

Total Cost: $562,000

4.8.6.2 Ismay Site (new)

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.7 Dawson County

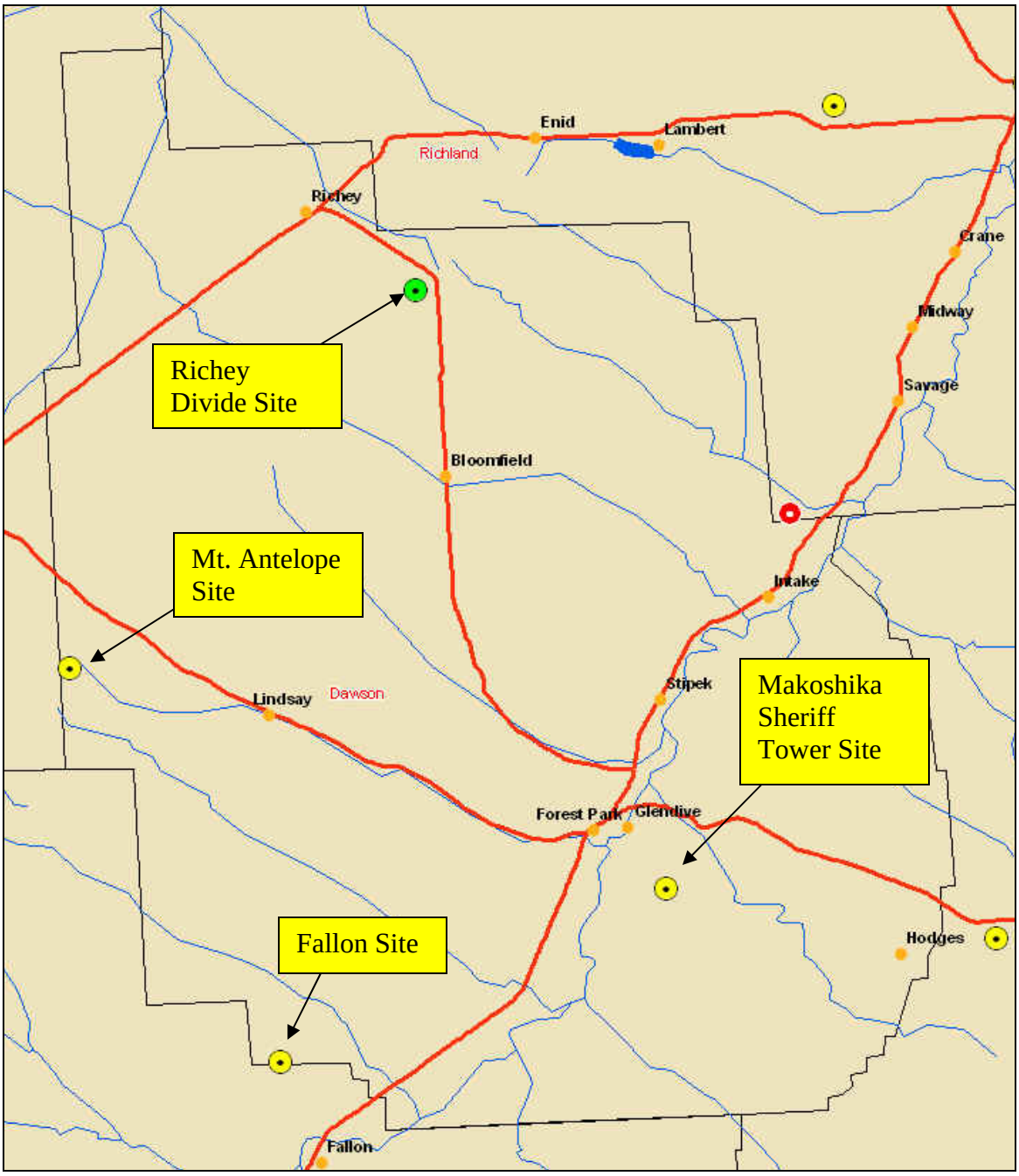

Figure 69 – Preliminary Design, P25, Trunked Sites, Dawson County

4.8.7.1 Fallon Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.7.2 Makoshika Sheriff Site

Costing Assumptions: A trunked site with four repeaters. The existing tower, building, and power can be used. It is a 100' tower and 8.5x9' building. It is not known who owns it.

Total Cost: $562,000

4.8.7.3 Mt. Antelope Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.7.4 Richey Divide Tower Site

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 100' tower and 5x7.5' building. It is owned by Dawson County.

Total Cost: $457,000

4.8.8 Fallon County

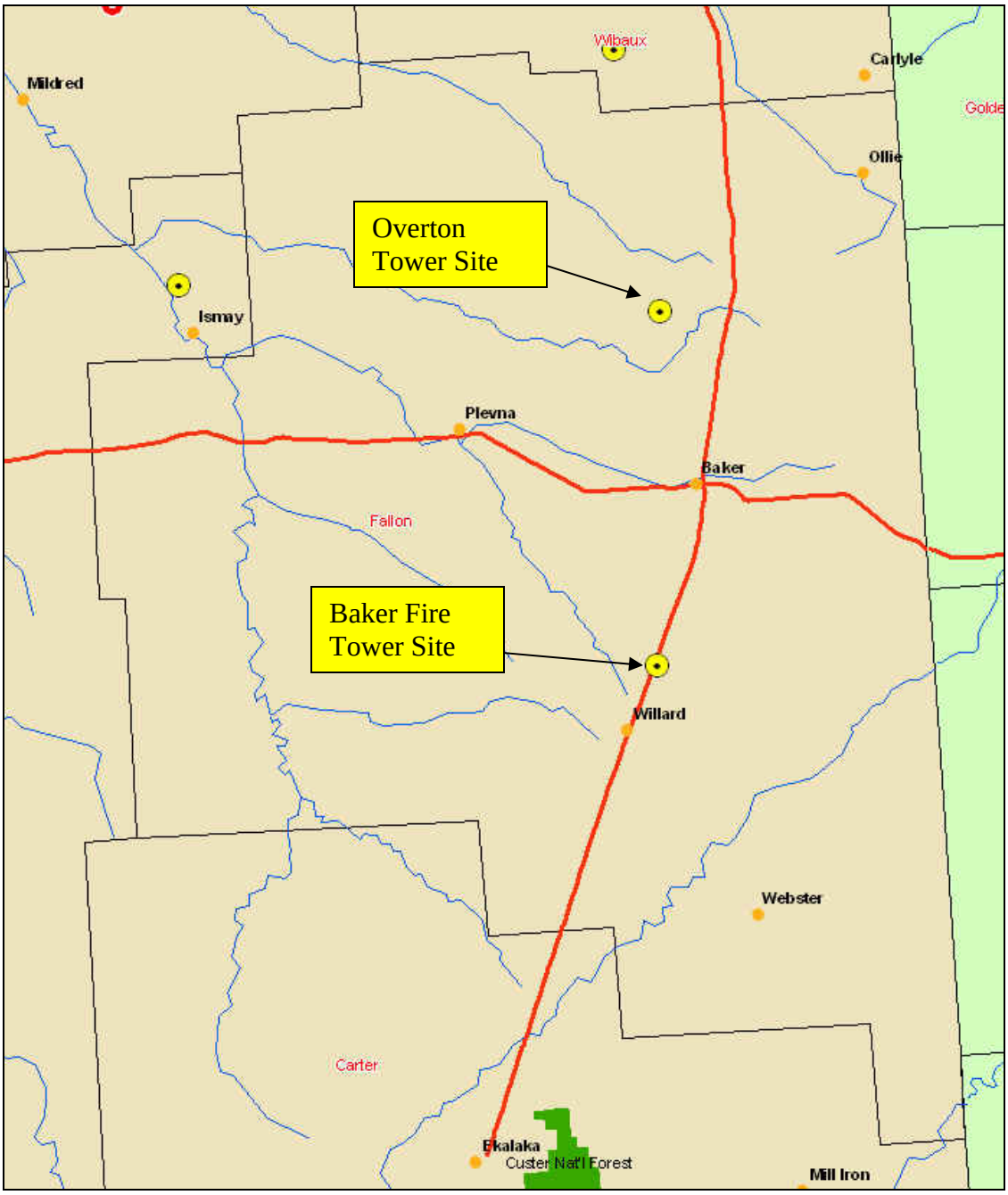

Figure 70 – Preliminary Design, P25, Trunked Sites, Fallon County

4.8.8.1 Baker Fire Tower

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 170' tower and 10.5x8.5' building. It is owned by Baker Rural Fire.

Total Cost: $457,000

4.8.8.2 Overton Tower Site

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 220' tower and 8x8' building. It is not known who it is owned by.

Total Cost: $457,000

4.8.9 Garfield County

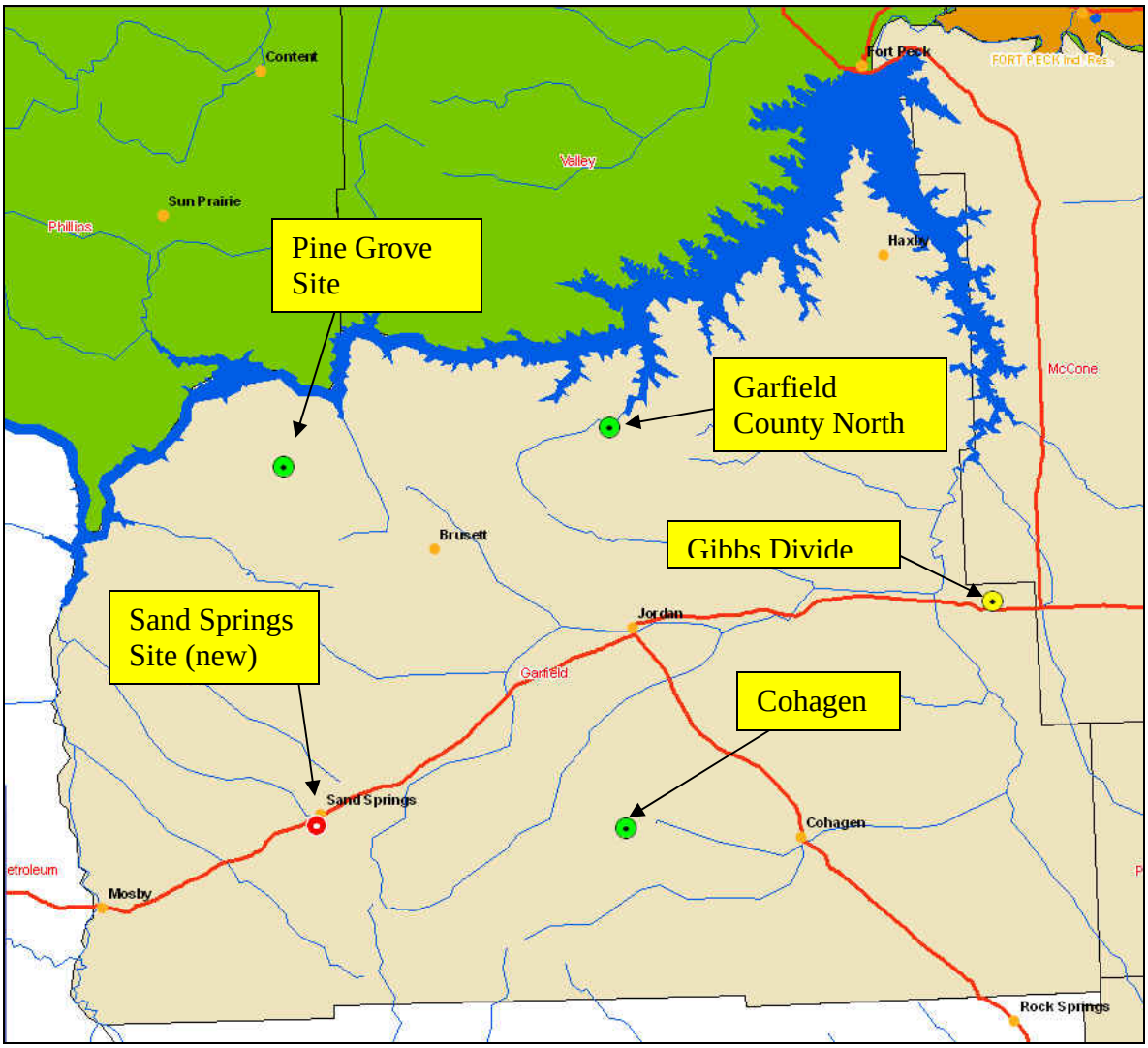

Figure 71 – Preliminary Design, P25, Trunked Sites, Garfield County

4.8.9.1 Cohagen Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.9.2 Garfield North Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.9.3 Gibbs Divide Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.9.4 Pine Grove Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.9.5 Sand Springs Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.10 McCone County

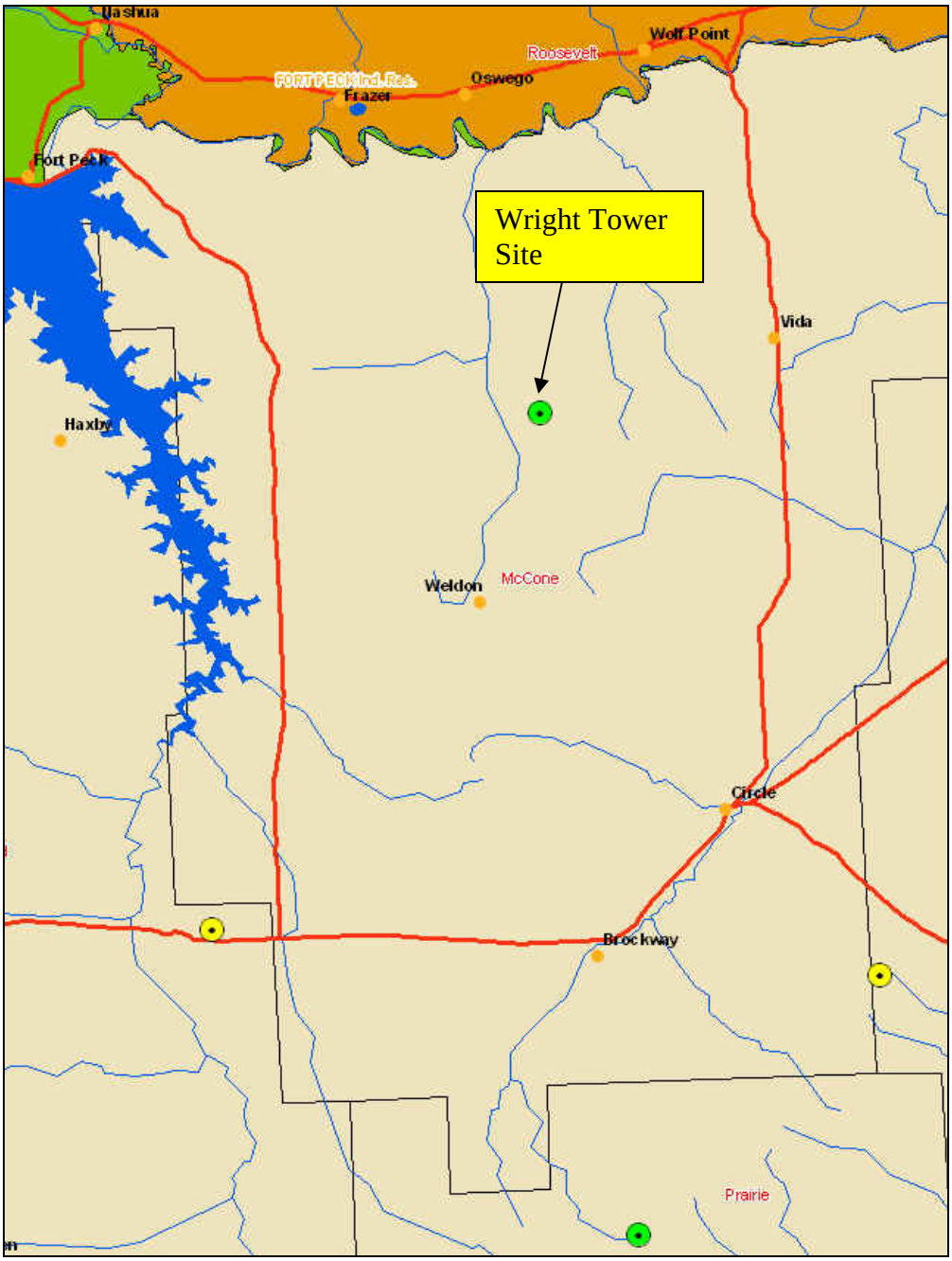

Figure 72 – Preliminary Design, P25, Trunked Sites, McCone County

4.8.10.1 Wright Tower Site

Costing Assumptions: A non-trunked site. The existing tower, building, and power can be used. It is a 180' tower and 9x9' building. It is owned by McCone County.

Total Cost: $145,000

4.8.11 Powder River County

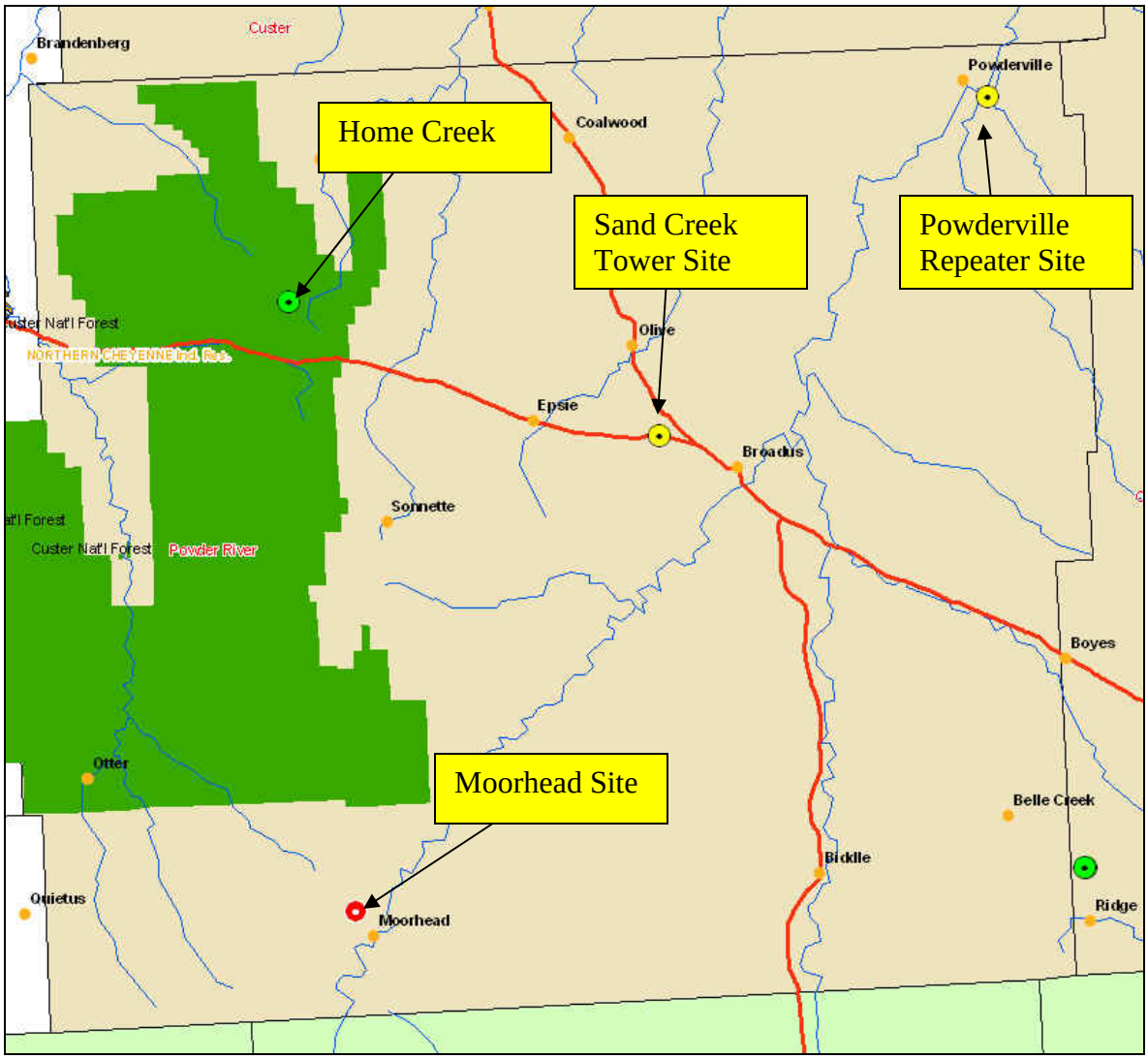

Figure 73 – Preliminary Design, P25, Trunked Sites, Powder River County

4.8.11.1 Home Creek Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.11.2 Powderville Repeater Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.11.3 Sand Creek Tower Site

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 150' tower and 9x9' building owned by Powder River County.

Total Cost: $457,000

4.8.11.4 Moorhead Site (new)

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.12 Prairie County

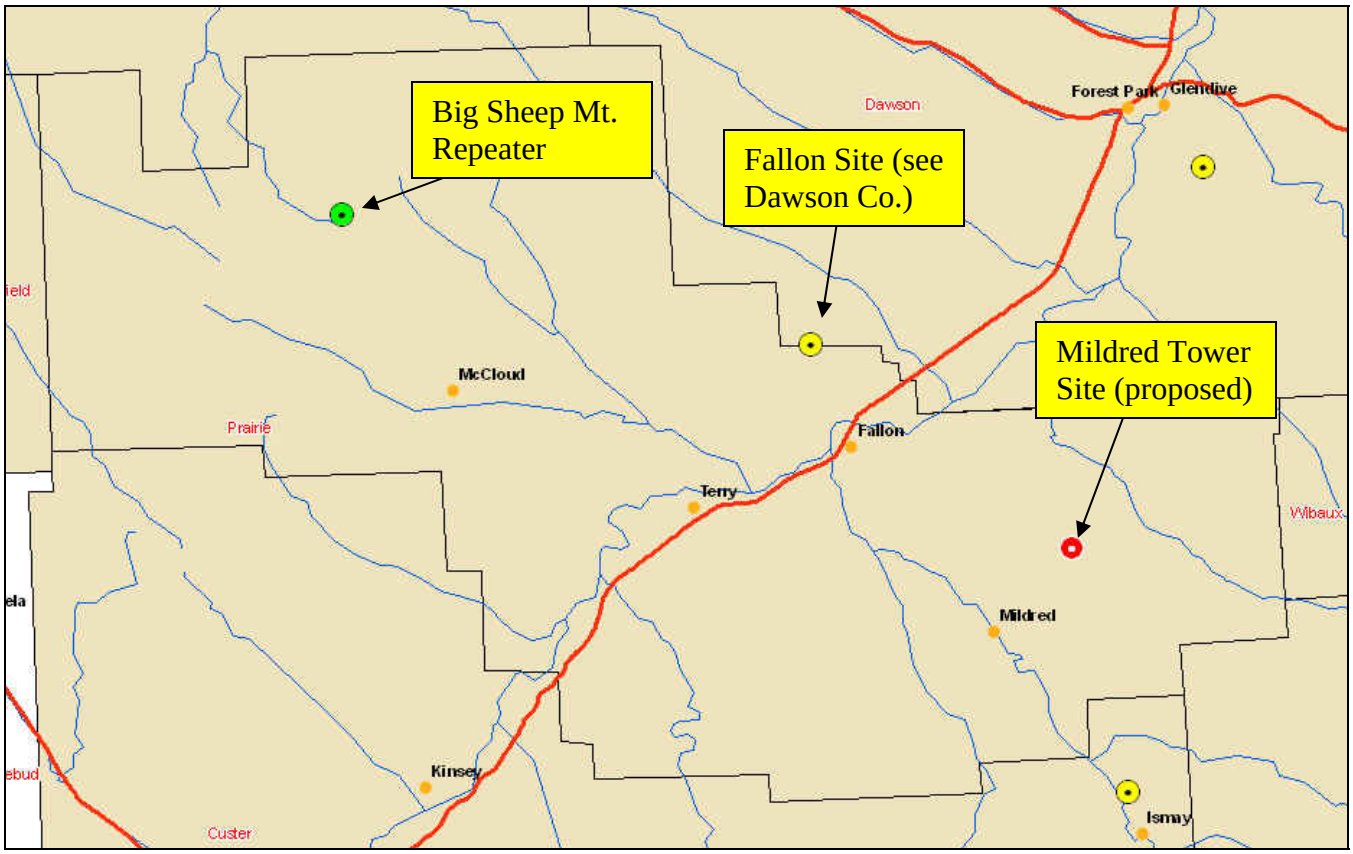

Figure 74 – Preliminary Design, P25, Trunked Sites, Prairie County

4.8.12.1 Big Sheep Mt. Repeater Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.12.2 Mildred Tower Site (proposed)

Costing Assumptions: A non-trunked site. The existing tower, building, and power can be used. It is a 180' tower. It is not known who owns it.

Total Cost: $145,000

4.8.13 Richland County

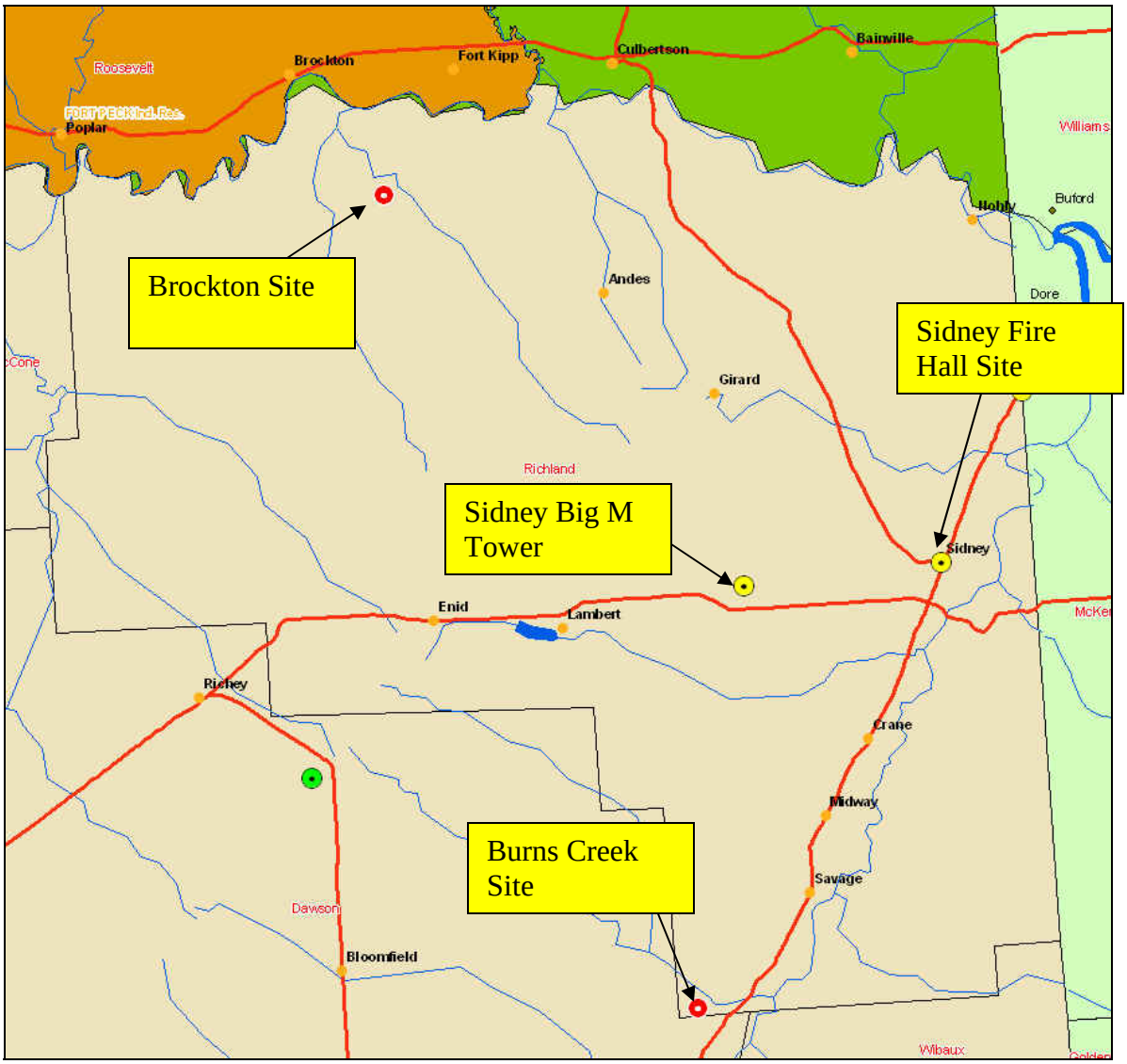

Figure 75 – Preliminary Design, P25, Trunked Sites, Richland County

4.8.13.1 Brockton Site (new for ETIC)

Costing Assumptions: A non-trunked site. The existing tower, building, and power can be used. It is currently being used by the Northern Tier. It is not known who owns it.

Total Cost: $145,000

4.8.13.2 Fairview Fire Hall Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.13.3 Richland County Courthouse Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.8.13.4 Sidney Big M Tower

Costing Assumptions: A trunked site with four repeaters. The existing tower, building, and power can be used. It is a 180' tower. It is owned by Glenn Miller.

Total Cost: $562,000

4.8.13.5 Burns Creek Site

Costing Assumptions: A non-trunked site. A new tower, building, and power source will be needed.

Total Cost: $332,500

4.8.14 Wibaux County

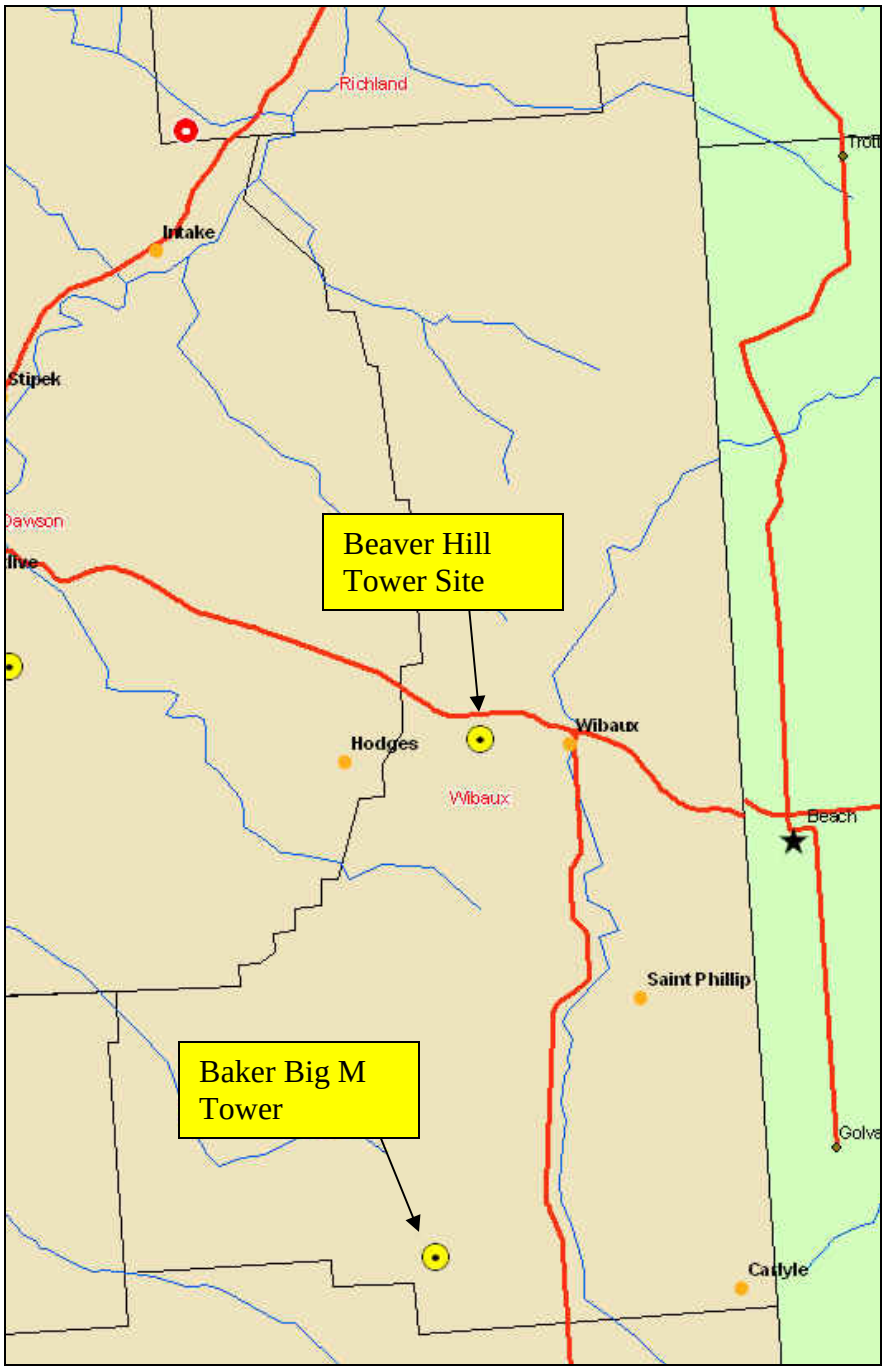

Figure 76 – Preliminary Design, P25, Trunked Sites, Wibaux County

4.8.14.1 Baker Big M Tower

Costing Assumptions: A trunked site. The existing tower, building, and power can be used. It is a 480' tower with a 20x11' building. It is owned by Glenn Miller.

Total Cost: $457,000

4.8.14.2 Beaver Hill Site

Costing Assumptions: A trunked site. A new tower, building, and power source will be needed.

Total Cost: $644,500

4.9 Comments On The Preliminary Design

The following comments on the Final Draft of the Needs Assessment document were received by Chief Alan Michaels.

4.9.4 Custer County

The following letters were received from Custer County:

"August 30, 2005

ETIC
Chief Alan Michaels
P.O. Box 1372
Glendive, Montana 59330

Be advised that the ETIC Interoperable Communications Plan Project Needs Assessment does not adequately address the needs of Custer County.

Deficiencies in the assessment are:

3. In section 2.3 this assessment states: A plan which is affordable and a practical system to meet immediate and future needs. We are very concerned about the cost of this project. $13,500,000.00, for this project is excessive and we have concerns that this project will never be fully built.
4. Goal of the ETIC to become P25 compatible. Since all future Homeland Security grants are now being diverted to the ETIC there is no money available to upgrade existing communications equipment and systems to P25 compatible within Custer County. Our agencies can not afford to spend $1700.00 for a handheld, $3200.00 for a 100 watt mobile and $20,000.00 for a repeater to become P25 compatible.
5. Two P25 trunked sites will not adequately cover Custer County. Additional trunked sites are needed at Knowlton, Moon Creek, Kinsey, Mizpah area and in northwestern Custer County."

The letter is signed by:

Tony Harbaugh, Sheriff
Kevin Krausz, MCPD
Mike Preller, CCRVFC
Jim Zabrocki, Custer County DES

"August 30, 2005

Eastern Tier Interoperability Consortium
Chief Alan Michaels, Acting Coordinator
P.O. Box 1372
Glendive, MT 59330

To Whom It May Concern:

After reviewing the proposed Eastern Tier Interoperability Consortium Project Plan, I have several concerns. It does not appear that the P-25 Trunk Sites will cover Custer County in its entirety. With personal knowledge of this county the North, South and Western parts will still not have radio coverage as the plan is now drafted. It appears that Dawson County is well covered for its area. Custer County must be addressed in much the same way.

This project is critical to the community, and to the surrounding area service providers that use communications for the people they serve. We realize that the cost of this project is substantial, but adequate communications may mean the difference between life and death for our firefighters, citizens and all the emergency responders.

Thank you for considering our requests.

Sincerely,

Derrick Rodgers, Acting Fire Chief/County Fire Warden
Custer County Fire

Cc: Jim Zabrocki, DES"

4.9.5 Northrop Grumman Project Manager Follow-Up

There is obviously serious concern in Custer County that the preliminary design does not provide adequate coverage for the county. In this respect, the preliminary design has met its primary goal, which is to serve as an instrument to stimulate discussion and refinement.

The next phase of the project will contain several iterations of the design, as more and more decisions are made and more and more facts become known. One of the first steps should be to validate the coverage in Custer County using scientific means, such as coverage propagation maps using more refined assumptions about antenna heights, locations and power.

The question from a consortium viewpoint must be, "Will all counties in the consortium be adequately covered," not "Which counties are the sites located in?" When the preliminary design was created, the communications engineers from TAB Electronics and East-Mont Communications believed the coverage from the sites surrounding Custer County would be

adequate to cover Custer County. They may be wrong, and if they are, the next phase of the project will determine that for a fact, and the design will be changed.

The specific questions which must be answered with respect to Custer County are:

1. Will the proposed Big Sheep Mountain site in Prairie County provide adequate coverage for the northern and northwestern areas of Custer County?
2. Will the proposed Ismay site in Custer County provide adequate coverage for the far eastern and Knowlton areas of Custer County?
3. Will the proposed Government Hill site in Custer County provide adequate coverage for the Mizpah area of Custer County, as well as the area directly west of Miles City?
4. Will the proposed Powderville site in Powder River County provide adequate coverage for the southeastern portion of Custer County?
5. Will the proposed Home Creek site in Powder River County provide adequate coverage for the southwestern portion of Custer County?
6. Will the overlap of the Home Creek and Powderville sites provide adequate coverage for south-central Custer County?
7. Is there a site in Rosebud County near Rosebud or Forsyth that will provide adequate coverage for the area west of Miles City and possibly overlap with the coverage area from the Government Hill site? Rosebud County is in the Big Sky 11 consortium. It was not known at the time of the creation of this document what the final plans were for that area of that consortium.

If the answer to one or more of these questions is no, then the communications engineers must once again be consulted during phase 2 to determine how to make up for the deficit(s).