

# *Enhancement of Geodetic Control in Powell County*



A grant application submitted to the

## **Montana Land Information Act (MLIA) Grant Program**

By  
**Powell County**  
February 11, 2016

**Primary Applicant:**

Name of principle individual: **Ricki Ann Bauer, GIS Analyst Powell County**

Name of agency\entity: **Board of Powell County Commissioners**

Street: **409 Missouri Ave.**

City: **Deer Lodge**

County: **Powell**

State: **Montana**

Zip Code: **59722**

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Date Submitted (Required):

Date Received by State:

**February 11, 2016**

Descriptive Title of Applicant's Project (Required):

**Enhancement of Geodetic Control in Powell County**

# 1. Relevance and Public Benefit

Montana’s cadastral framework layer is based on the Bureau of Land Management (BLM) Geographic Coordinate Database or GCDB (now referred to as CadNSDI). This database is known to be spatially inaccurate in some areas of Powell County. The accuracy of the CadNSDI is especially poor in and adjacent to the communities of Elliston, Avon, Helmville, Ovando, Garrison, Racetrack, and Deer Lodge. For example, in Township 8 North Range 9 West, the majority of the geodetic control has an estimated positional error of between 23 -74 feet (Figure 1.). As the result, the positional error of the cadastral layer in the

City of Deer Lodge has been measured to be over 150 feet (Figure 2).

These inaccuracies are especially problematic when more spatially accurate data is overlaid on the cadastral framework in the GIS. These offsets often confuse non-GIS users and may produce inaccurate results when analyzing data which rely on accurate horizontal alignment.

The solution to this problem is to acquire better survey control using Global Navigation Satellite System (GNSS) technology and to contribute this enhanced control to the geodetic control framework. This will ultimately increase the accuracy of the cadastral and other Montana Spatial Data Infrastructure (MSDI) framework layers.

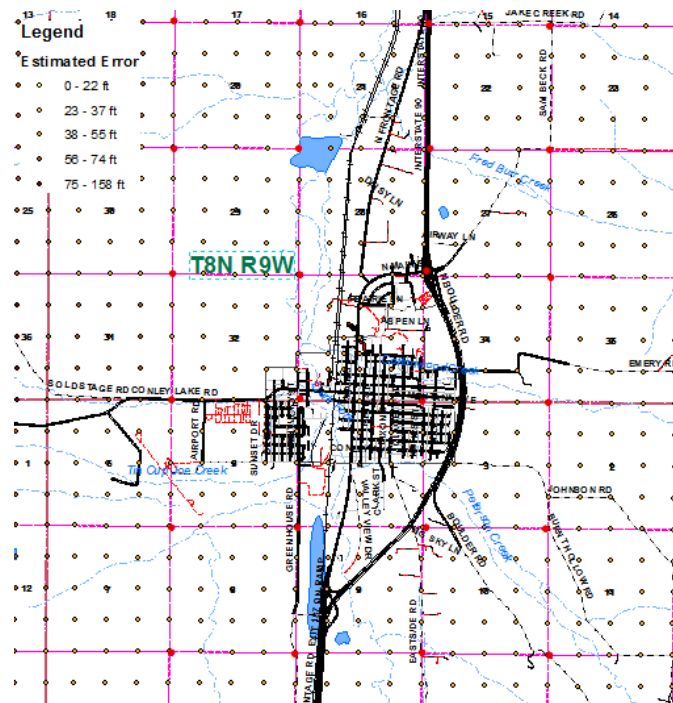


Figure 1. Estimated positional error of survey control in T8NR9W

This solution directly ties to the FY16 Land Plan Priority 1B in which MSDI data partners contribute to statewide framework data. This project will result in the collection of more accurate survey control which will advance the MSDI and benefit federal, state, local government, and private interests in the following ways:

**1. Improve the MSDI geodetic control framework layer**

GNSS positioning of existing survey monuments will be completed as part of this project and new, more accurate coordinates will be contributed to the Multistate Control Point Database (MCPD). The positioning of approximately 69 Public Land Survey System (PLSS) corners will be improved which will benefit the geodetic control framework. It will benefit the MT Department of Transportation doing work along Interstate 90, Highways 12, 141, and 200. This will also benefit the Department of Environmental Quality State Superfund doing remediation efforts in Deer Lodge and the Clark Fork River. Finally, more accurate survey control will benefit consultants doing survey work in Powell County.

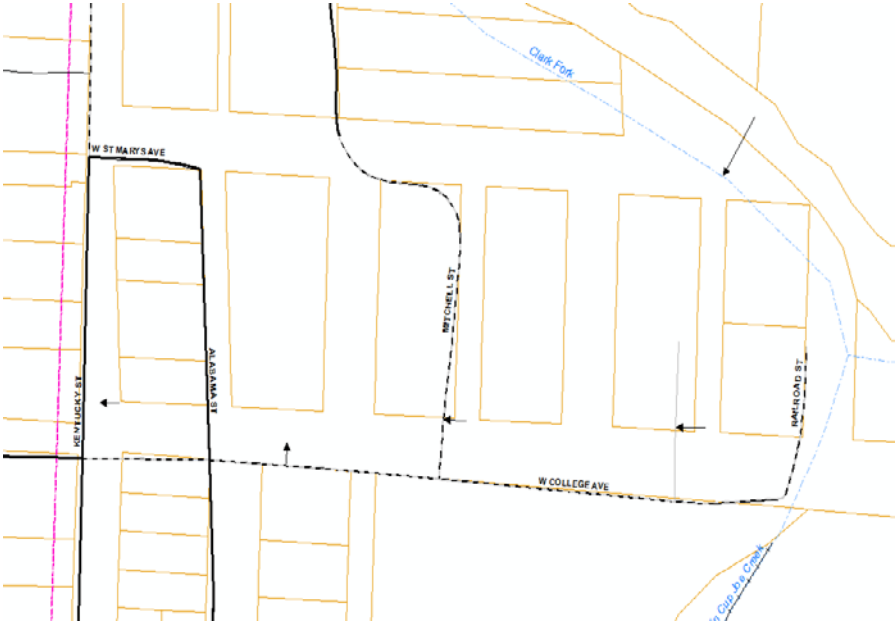


Figure 2. Map showing current cadastral offset in the City of Deer Lodge, These consist of 40 to 50 ft. off between East and West, and 60 to 100 ft. between North and South.

**2. Improve MSDI cadastral framework layer**

Geodetic Control supports accurate horizontal placement of the MSDI cadastral framework layer that is maintained by the Montana State Library (MSL). More accurate cadastral data will directly benefit the MT Department of Revenue in dealing with property assessments (see attached DOR letter of support). Improved cadastral data will also benefit the County in many ways. The cadastral layer is used by the County to develop many other GIS layers such as voting precincts, commissioner districts, emergency service zones, fire districts, zip code boundaries, land use, and others. Improvements to the cadastral layer will contribute to the accuracy of all

derivative, GIS layers. This will benefit not only the County, but property owners in the County and the many public interests that use the Montana Cadastral Map Viewer.

**3. Improve additional MSDI framework layers such as boundaries, orthoimagery and hypsography**

Boundaries for the County, towns, school districts, and other special districts will improve with the addition of more accurate geodetic control. Spatially accurate boundaries will benefit the County and the residents of Elliston, Avon, Helmville, Ovando, Garrison, Gold Creek, Racetrack, and Deer Lodge. MSDI's orthoimagery and hypsography framework programs will also benefit from the improved geodetic control provided by this project.

**4. Establish collaborative partnerships between the GIS and surveying communities in Montana**

Professional Surveyors will benefit from the additional PLSS survey control collected as part of this project. Improved coordinates for survey monuments will be available as part of the MCPD and new PLSS corner records will be filed and kept in the Powell County Clerk and Recorder's Office for future reference by land surveyors and the public.

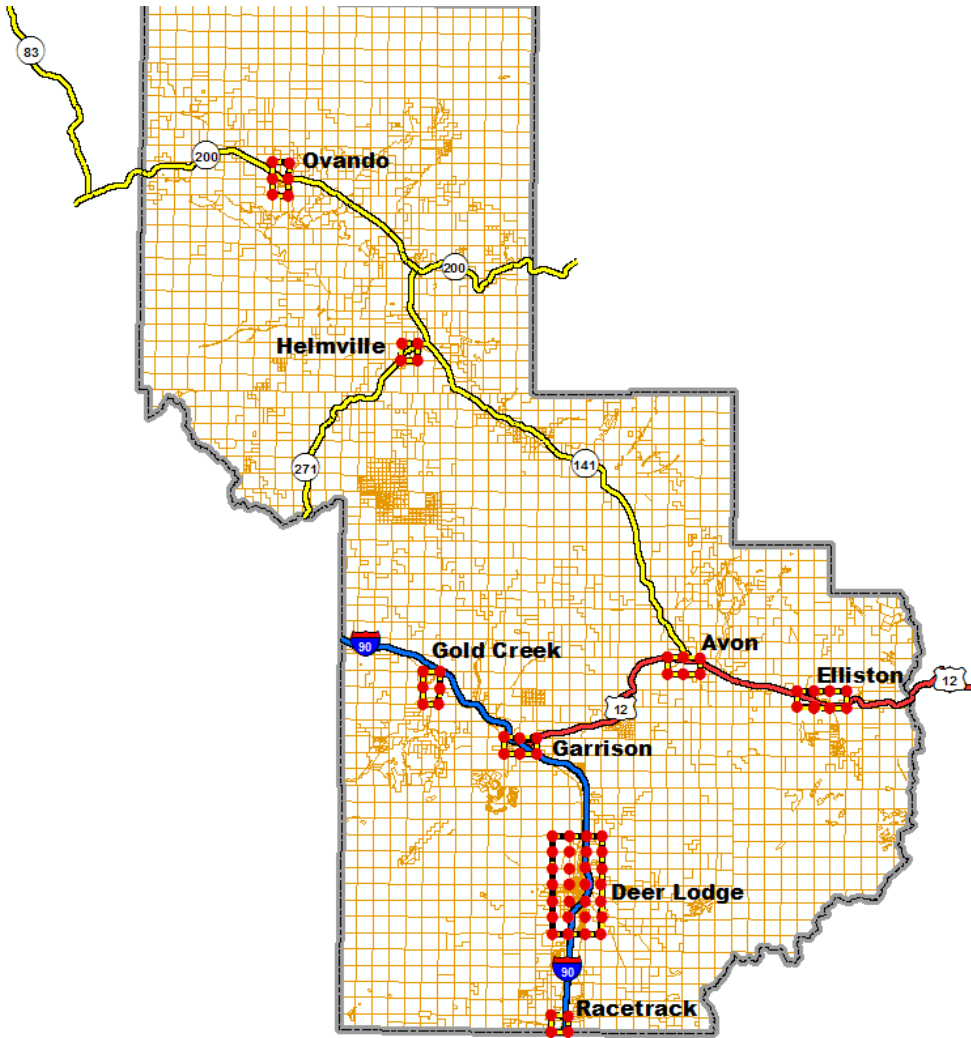


Figure 3. Preliminary selection of sections (31) and section corners (69) to be surveyed as part of this project.

## 2. Scope of Work

### 2.1. Goals and Objectives

**Project Goal.** Improve the spatial accuracy of geodetic control in Powell County.

**Objective 1:** Finalize scope of work. The initial plan is to survey 31 sections (69 section corners; 4 per section) covering all town sites in Powell County (Figure 3). This area includes the following major roads: Interstate 90 and Highways 12, 141, 271, and 200. Communities include the City of Deer Lodge, and the following towns Elliston, Avon, Helmville, Ovando, Gold Creek, Garrison, and Racetrack. These 31 sections were selected based on: 1) Population density; 2) Existing road infrastructure; and 3) Estimated PLSS error. The County will prioritize data collection for this area in the event contractor bids are higher than expected.

*Task 1.1 Powell County will prioritize PLSS corners for collection and develop a final scope of work.*

**Deliverables:**

- Scope of work document
- Maps that prioritize data collection

**Objective 2:** Contract with registered land surveyor to collect PLSS corners.

*Task 2.1 Powell County will create and advertise an Invitation to Bid.*

*Task 2.2 Powell County will review bids and select contractor.*

**Deliverable:**

- Signed contract with registered land surveying firm

**Objective 3:** Research and prepare for field work

*Task 3.1 Powell County GIS Analyst will research survey documents (corner records, plats, existing surveys, etc.) to ascertain if PLSS control has been previously collected and is publicly available.*

*Task 3.2 Powell County will produce field-ready maps for collection area that identify PLSS corners to be collected differentiating those with and without corner records. Maps will contain PLSS, land ownership, water features, road centerlines, and other relevant data.*

*Task 3.3 Contractor will develop a data collection plan based on their estimation of the ease of coordinate collection, availability of existing coordinates, and relative existing accuracy of corners.*

*Task 3.4 Powell County will produce and provide a letter for use by the Contractor to serve as an introduction to landowners as to the purpose of the project.*

**Deliverables:**

- Document describing collection plan
- Field maps of collection area
- Letter describing project Intent

**Objective 4:** Collect/obtain approximately 96 PLSS corner locations

*Task 4.1 Collect survey data. Contractor will collect, or obtain from existing sources, coordinate positions on all points designated in the collection plan. Coordinates collected by the Contractor will have a certifiable accuracy of less than 1 foot using either Real Time Kinematic (RTK) or post-processed GNSS data.*

Contractor must be able to certify accuracy for coordinates obtained from other sources, however that accuracy may not greater than 1 meter.

**Deliverable:**

- Certification by land Surveyor stating that all points collected or obtained from other sources meets accuracy requirements defined by this project.

**Objective 5:** Submit collected data.

Task 5.1 County and Contractor will work collaboratively to submit all metadata on collected or obtained points in a format that meets the specifications of the Multistate Control Point Database (MCPD). The coordinates and metadata will be entered into the MCPD input spreadsheet to meet the specifications of the database.

Task 5.2 Contractor will deliver new/updated corner recordation forms with the Powell County Clerk & Recorder

**Deliverables:**

- Coordinates and accompanying metadata entered in the MCPD Input spreadsheet
- Corner documents are recorded at County

**2.2. Project Schedule**

This project has a planned duration of seven months starting in June and ending in December 2016. The following timeline shows the duration (by month) of the ten planned tasks.

Tasks	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>Task 1.1 Finalize scope of work</b>				■						
GIS/Admin Estimated Hours	10 hours									
<b>Task 2.1 Advertise invitation to bid</b>				■						
GIS/Admin Estimated Hours	10 hours									
<b>Task 2.2 Review bids / select contractor</b>				■						
GIS/Admin Estimated Hours	5 hours									
<b>Task 3.1 Research survey documents</b>				■	■	■				
GIS/Admin Estimated Hours	20 hours									
<b>Task 3.2 Produce field maps</b>					■	■				
GIS/Admin Estimated Hours	40 hours									
<b>Task 3.3 Develop data collection plan</b>					■	■				
GIS/Admin Estimated Hours	10 hours									
<b>Task 3.4 Produce landowner letter</b>					■					
GIS/Admin Estimated Hours	10 hours									
<b>Task 4.1 Collect survey control</b>						■	■	■	■	
GIS/Admin Estimated Hours	40 hours									
<b>Task 5.1 Submit new control to MCPD</b>							■	■	■	
GIS/Admin Estimated Hours	20 hours									
<b>Task 5.2 File documents with County</b>										■
GIS/Admin Estimated Hours	20 hours									
<b>Total GIS/Admin Estimated Hours</b>	<b>185 Hours at 29.31 an Hours = 5422.35</b>									

### **3. Project Management and Organization Capability**

Powell County has the project management and organizational capacity needed to complete this project on time and within budget. The following individuals offer unique combination of knowledge, technical skills, and experience necessary to accomplish the objectives and tasks outlined in this proposal.

#### **Ricki Ann Bauer – Project Manager / GIS Specialist**

The County is supported by Ricki Ann Bauer, GISP, and a County employee who has provided GIS services for the County for the past year. Mrs. Bauer has fifteen years of GIS experience and is registered as a GISP. She has developed nearly all the GIS databases for the County and is familiar with land records management at the County. She has also worked with local Land Surveyors for 6 years for a local land surveying firm and is knowledgeable with the public land survey, CadNSDI, survey control and documentation. Mrs. Bauer has managed one previous MLIA grants for the County and is very familiar with the scope and grant requirements of the program. Mrs. Bauer will serve as project manager and will provide GIS support to the contracted land surveying firm as necessary.

#### **Brian Bender – County Planner**

Brian Bender will provide oversight and assist with the administration of grant funds. Mr. Bender is a member of the American Institute of Certified Planners and the Planning Director of Powell County, Montana since January 2011. Mr. Bender has over fifteen years of experience collaborating with elected and appointed officials in both rural and urban communities on zoning enforcement, plan making and implementation, floodplain administration, and citizen participation.

#### **Jody Walker – Clerk & Recorder; Jarita Neckels Deputy Clerk & Recorder**

They will assist the project manager and the surveyors in researching plats and corner records prior to field season. They will also be responsible for filing the completed corner records upon project completion. The Clerk & Recorder and Deputy have worked for the County for 10 combined years. They are responsible for administering records for the County including all plats, titles, deeds, mortgages, and right-of-ways. They are familiar with land survey principles and are frequent user of the State's cadastral WEB map.



#### 4. Budget Justification Narrative and Tables

The total budget for this project is \$74,724.39 with \$37,622.38 being requested from the MLIA grant program. The applicant will contribute an in-kind match of \$37,102.00 towards the project.

**MLIA Share.** The majority of the MLIA share (\$37,422.39) will be used to update survey control using a contracted, registered land surveyor. We estimate that 69 survey control points can be updated at a cost of \$450 per point at a cost of \$31,050. This estimate is based on Pre-estimate from Powell County's on-call engineering firm (Great West Engineering). We anticipate that some undocumented corners will require additional time to research, locate and collect positions – resulting in a higher cost per point. However, for some section corners it may be possible to collect positions of monuments using a mapping- grade GNSS receiver and post-processing of positions (now approved by MSL and BLM) as long as they meet the accuracy standards of 1 foot or less. Use of mapping-grade GNSS may help offset the additional cost of collecting undocumented corners.

\$2711.19 in MLIA funds will cover grant administration costs associated with this project. \$2711.19 in MLIA funds will cover a portion of the Project Manager/GIS staff time for this project.

The remainder of the MLIA share (\$200) will be used to purchase miscellaneous supplies such as paper and ink for maps, reports, photocopying, etc. No travel is anticipated and no new equipment will be needed to complete this project.

**Applicant Share.** Powell County will contribute in-kind services totaled at \$37,102.00. The County will provide the following in-kind contributions:

- 10 to 15 hours at \$35 per hour (including fringe benefits) for grant administration to manage the budget and submit reimbursement paperwork (Jarita Neckels or Jodi Walker). (\$525.00)

A long term funding plan for this project is not necessary. However, the County is committed to improving its existing GIS layers that are dependent upon the cadastral layer. Once the cadastral layer is adjusted, the County will allocated the resources necessary update any boundaries affected by this adjustment.

Category	MLIA	Applicant	Total
<b>a. Personnel</b>			
Grant administrator	\$ 2711.19	-	\$
Project Manager / GIS	\$ 2711.19	\$ 36577.00	
Clerk & Recorder	\$	\$ 525.00	\$
<b>b. Travel</b>			
N/A	\$	\$	\$
<b>c. Equipment</b>			
N/A	\$	\$	\$
<b>d. Supplies</b>			
Misc. Supplies	\$ 200.00	\$	\$
<b>e. Contractual</b>			
Registered Land Surveyor	\$ 32,000	\$	
<b>f. Other</b>			
N/A	\$ -	\$	\$
<b>Totals</b>	<b>\$ 37622.38</b>	<b>\$ 37102.00</b>	<b>74,724.39</b>

## 5. Statements of Support

Below are statements of support from 1) Scott Owen, Montana State Department of Environmental Quality, 2) Montana Department of Revenue – Property Assessment Division, and 3) Michael Fashoway, Montana State Library.



June 16, 2015

Ricki Ann Bauer, GISP  
Powell County Planning Department  
409 Missouri Ave., Suite 101  
Deer Lodge, MT 59722

Re: Enhancement of Geodetic Control in Powell County, MT

Ricki:

The Montana Department of Environmental Quality (DEQ) is aware that Powell County is applying for a grant to improve the spatial accuracy of geodetic control in Powell County. These improvements would be of great value to work conducted by DEQ.

DEQ conducts work that relies upon accurate mapping of property ownership boundaries. Preliminary project planning often includes notifying parcel owners of sampling to be conducted on their property. Having a readily accessible means of portraying parcel information spatially while preparing GIS based maps early on would greatly aid in making this process more efficient and accurate. This would also aid in eliminating confusion while in the field by having better defined property boundaries to be used in conjunction with GPS units.

DEQ supports Powell County's application for this project.

Sincerely,

A handwritten signature in blue ink, appearing to read "Scott Owen", is written over a light blue circular stamp.

Scott Owen  
Environmental Science Specialist

cc: Cynthia Brooks, DEQ Legal  
Denise Martin, Site Response Section  
Mike Trombetta, DEQ Hazardous Waste Cleanup Bureau  
Jenny Chambers, DEQ Remediation Division



**Mike Kadas**  
Director

## Montana Department of Revenue



**Steve Bullock**  
Governor

12/03/2015

### Letter of Support for the Enhancement of Geodetic Control in Powell County

To whom it may concern:

A project to improve the spatial accuracy of geodetic control in Powell County would be tremendously beneficial both to this office and to the taxpayers in the area.


We (the Property Assessment Division) use that database to help us assess agricultural land among other things. This is very difficult to do correctly when the section corners don't match up to the aerial photos when we are outlining field boundaries.

It is very confusing for taxpayers to look at the cadastral maps on our website, when our ownership boundary lines are so far off compared to what they see. This impacts our relations with our customers in a negative way.

It is sometimes difficult to ascertain on which parcel a building has been built, as well if we cannot verify a property boundary on the ground – the spatial accuracy is so far off that we worry about making mistakes on the tax rolls.

We are most wholeheartedly in support of this project.

Sincerely,

  
Andrew Hagen  
Area Manager  
Region 4

  
Jody Beck  
PVS  
Powell County



PO Box 201800 1515 East 6<sup>th</sup> Avenue Helena, MT 59620 (406) 444-3115

February 10, 2016

Ricki Ann Bauer  
GIS Analyst  
Powell County  
409 Missouri Ave  
Deer Lodge, MT 59722

Dear Ricki:

As the Land Information Lead representing the MSDI theme leads for Cadastral, Geodetic Control and Administrative Boundaries, I strongly support Powell County's enhancement of geodetic control and their FY 2017 request for MLIA funding.

The 2016/2017 Montana Land Information Plan encourages data partners to apply for grant funds to collect local land records and control data that will develop and enhance administration of county records. Powell County's grant proposal meets this goal through improvements to the accuracy of the digital Public Land Survey System (CadNSDI), cadastral, and administrative boundaries, allowing for better vertical alignment with aerial photography and other local data such as road centerlines and address points.

The Montana State Library looks forward to working with Powell County and will assist by performing accuracy adjustment to the CadNSDI, cadastral and administrative boundaries based on the additional control data collected through this grant.

Sincerely,

A handwritten signature in black ink that reads "Michael Fashoway".

Michael Fashoway  
GIS Analyst/Land Information Lead  
Montana State Library

## 6. Renewable Grant Accountability Narrative

Powell County did not apply for a fiscal year 2015 MLIA grant so no progress report is included in this application.

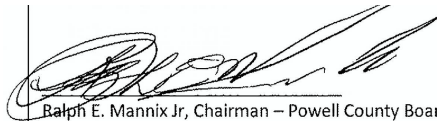
## 7. Signatures

### Authorizing Statement

I hereby certify that the information and all statements in this application are true, complete and accurate to the best of my knowledge and that the project or activity complies with all applicable state, local and federal laws and regulations.

I further certify that this project will comply with applicable statutory and regulatory standards.

I further certify that I am (by my signature) authorized to enter into a binding agreement with the Montana Department of Administration to obtain a grant if this application receives approval.



Ralph E. Mannix Jr, Chairman – Powell County Board of Commissioners