

# GCDB Accuracy Enhancement Processes

## Montana Cadastral Project

*CEP 07-DOA-GIS .*

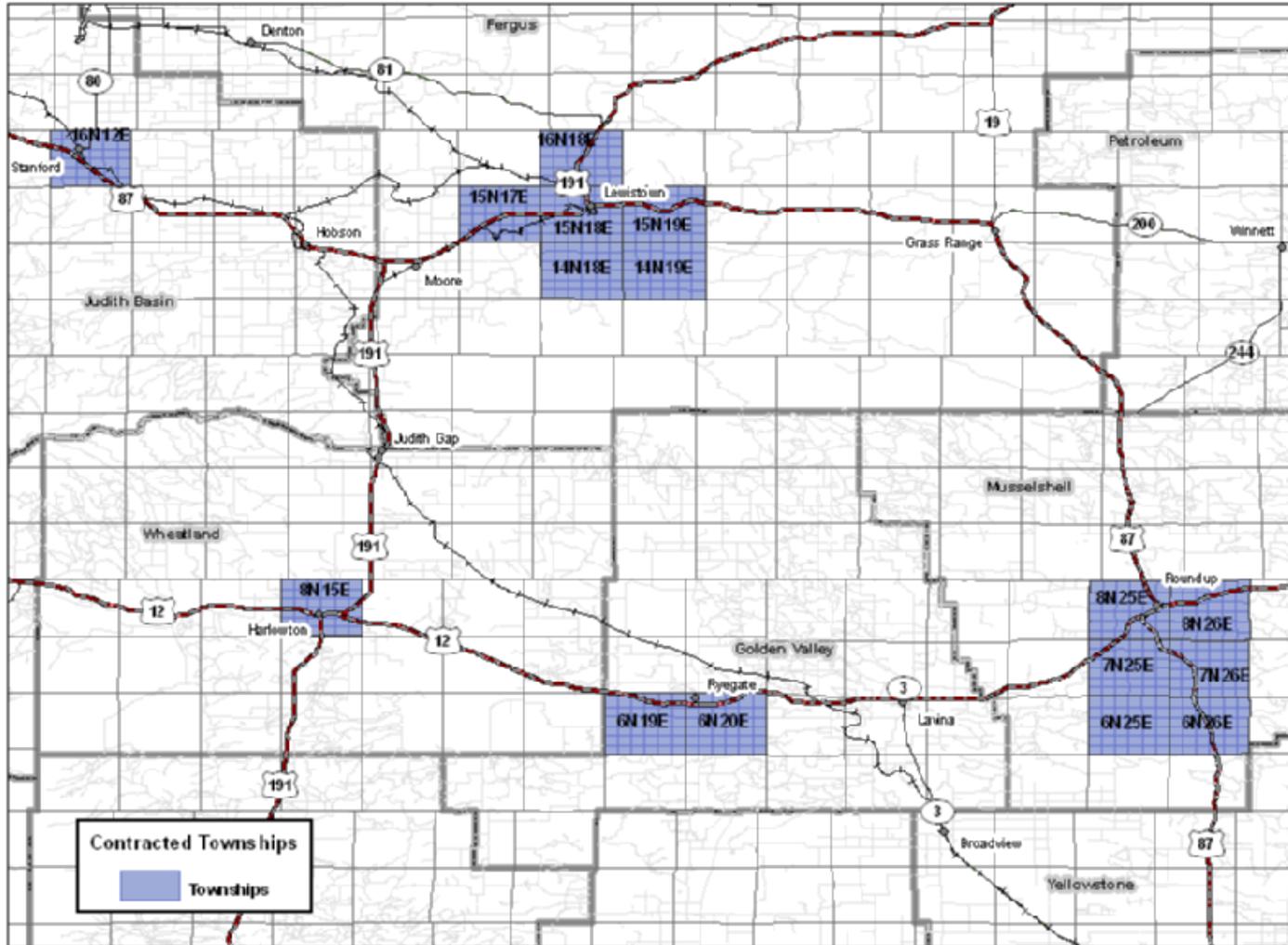
Premier Data Services Inc.



# Introduction & Purpose

- GCDB Enhancement Process
- Five Major Tasks
  - Define Collection Areas
  - Corner Recordation Research
  - Coordinate Collection
  - GCDB Adjustment
  - Billings Redline Area Parcel Adjustment
- Tasks contracted under 06-1263B, Master Contract for IT Services. State of Montana

# Define Collection Areas



Collection areas are established in collaboration with County Tax Assessors and State Coordinator

Collection Areas
Lewistown
Harlowton
Roundup
Ryegate
Stanford

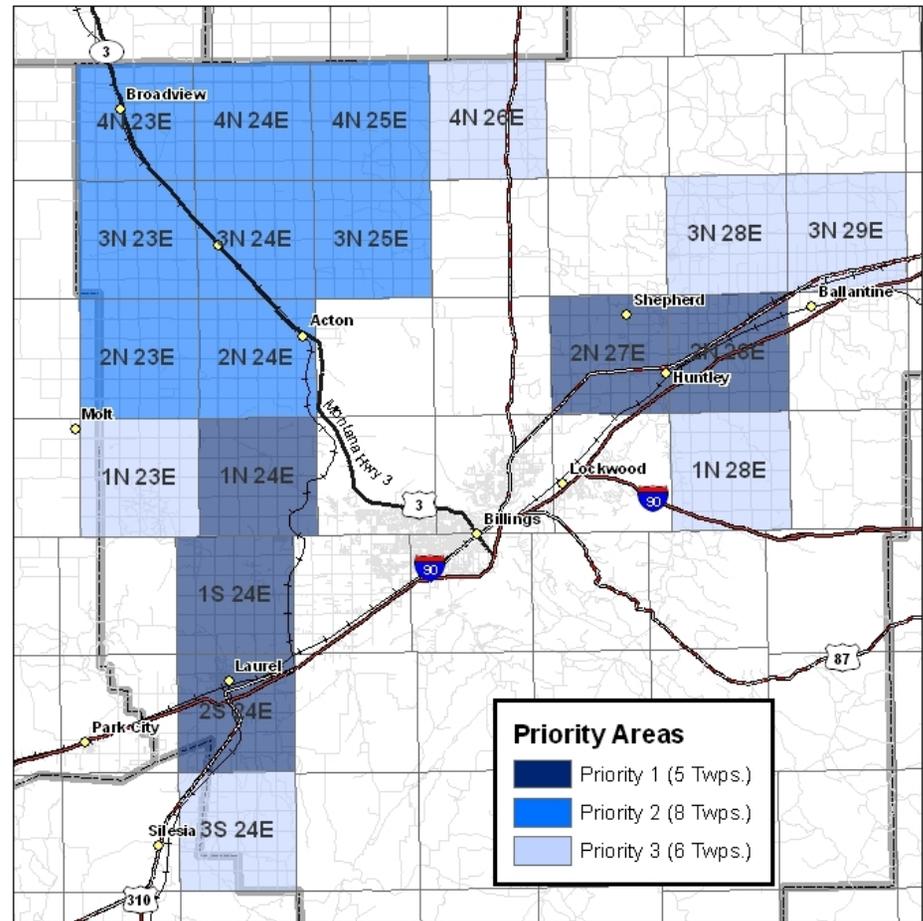
# Priority Areas, GCDB Enhancement Billings Area

Nineteen townships within Yellowstone County were targeted for GCDB enhancement (tasks 1 through 3)

**Priority Area 1:** 5 Townships

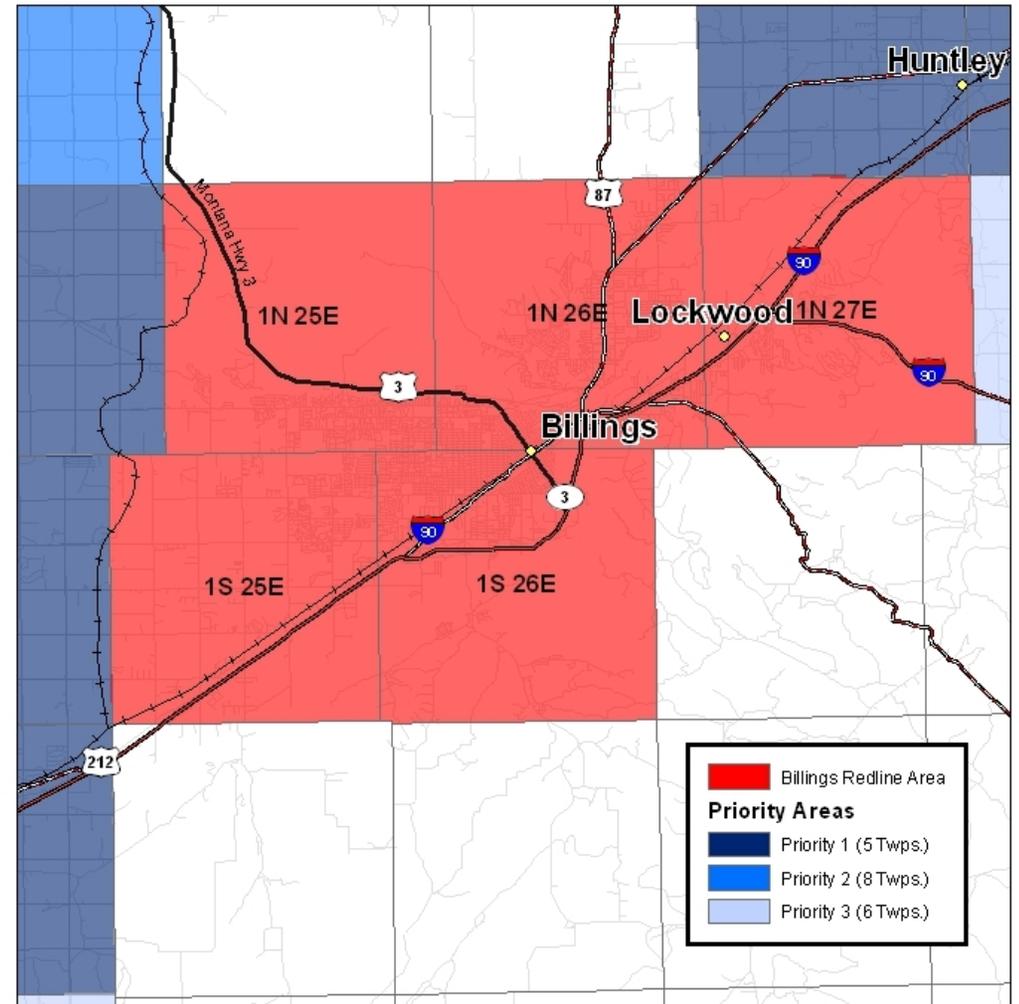
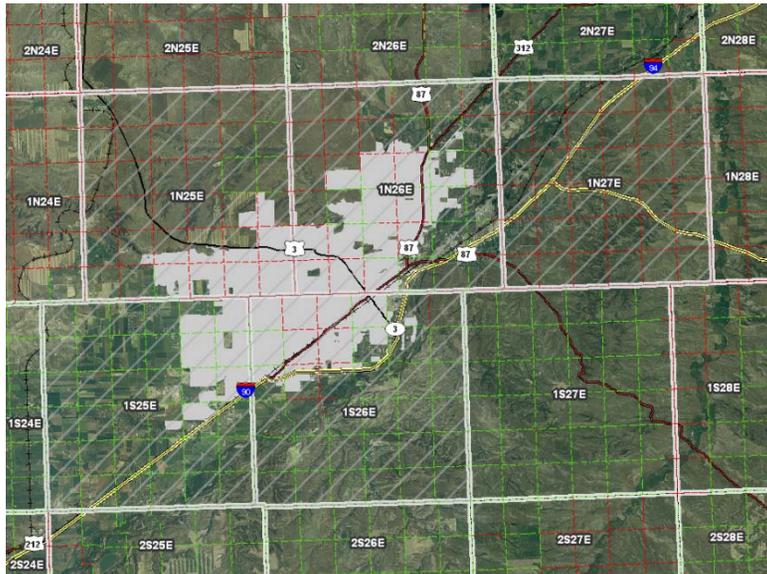
**Priority Area 2:** 8 Townships

**Priority Area 3:** 6 Townships



# Billings Redline Area – Parcel Adjustment

Billings Redline Area: 5 Twps.



# Design and Development Approach

- **Corner Recordation Research**

- **Surveying Contractor**

- Acquire and evaluate all corner recordation records
- Records for the adjacent townships are evaluated as required
- Each corner record is reviewed and interpreted by an experienced Land Surveyor
- A data matrix is developed to prioritize the land corners in each contracted township

# Corner Matrix Parameters

- Chain of history to original corner
- Geographic coordinates
- Local coordinates
- Local control
- Historic use
- Established by proportion

# Complete Corner Analysis Task

## Legend

### Cross Index Priority Weighting

	GLO
	Geographic Coordinates
	Local Control
	Other
	Unknown
	Existing CTRL
	100 + ft.
	21 - 100 ft.
	Less Than 21 ft.
	Less Than 21 ft.

### Definitions for the Matrix Rows

**GLO:** Existent corner, original corner or chain of evidence on the corner record that can be used to trace the corner to the original alignment.

Monument has a chain of history on the record form that traces the monument to the original monument set by the GLO

**Geographic Coordinates:** Information on the corner form that provides Geographic Coordinates and metadata for the corner. The corner is tied to the National Spatial Reference System. *(Very few if any corners on the CCR's may meet this definition.)*

**Local Control:** Physical Evidence accepted by local land owners to be at the corner of the public land survey. Also recognize as a local point of control. *(Most of the records from the Yellowstone County Surveyor will fall in this classification.)*

**Historic Use:** A point of local control that has been used to control land descriptions. Corners that appear on a subdivision plat that purport to be in the position of the original PLSS corner.

**Established by Proportion:** Corner that has been established by one of seven methods of proportion. These corners most likely lie between corners of local control.

These corners most likely have a historic use, or were established to control a subdivision or other property development.

**Local Coordinates:** Corners that have a relationship to adjacent corners. The corner form shows the bearing and distance to adjacent corners. May have been established by proportion between corners of local control.

# Corner Records Research

PLSS Corner History									
T.	R.	CORNER LOCATION	CROSS INDEX	GLO	GEOGRAPHIC COORDINATES	LOCAL CONTROL	HISTORIC USE	ESTAB. BY PROPORTION	LOCAL COORDINATES
13N	99W	S. 6 NW	A-1			Y	Y		
13N	99W	S. 3, 4	A-13			Y			
13N	99W	S. 3 N 1/4	A-15			Y			Y
13N	99W	S. 4, 5	A-9						Y
13N	99W	S. 3, 4 1/4	C-13				Y		Y
13N	99W	S. 2, 3 1/4	C-17	Y			Y		
13N	99W	S. 6, 7	E-1					Y	Y
13N	99W	S. 3, 10 1/4	E-15			Y			Y
13N	99W	S. 6, 7 1/4	E-3			Y			Y
13N	99W	S. 5, 6, 7, 8	E-5			Y	Y		
13N	99W	S. 7, 8 1/4	G-5			Y	Y		
13N	99W	S. 7, 18	J-1			Y	Y		Y
13N	99W	S. 10, 15 1/4	J-15			Y	Y		Y
13N	99W	S. 10, 11, 14, 15	J-17			Y	Y		Y
			J-5			Y	Y		
			N-17			Y	Y		
			N-19			Y	Y		
				Y		Y	Y		

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These corners most likely have a historic use, or were established to control a subdivision or other property development.

**Local Coordinates:** Corners that have a relationship

State of Wyoming Corner Record  
 Record of original survey and chain of evidence of original subdivision of corner to be established. Description of corner monumentation includes final survey instrument and monument established by program for Section of Corner. Date of survey includes of original, subsequent, and reference points only, except and depends on reference corner of subdivision as noted. Initial and returns for monumentation of lot or subdivision corner.

Record of... 1937 - McDonald  
 40.00  
 1/4 Sec. 10, T. 13N., R. 99W., S. 10, 11, 14, 15

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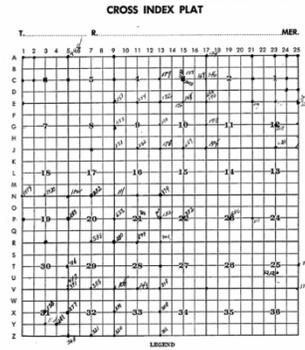
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 40.00  
 1/4 Sec. 10, T. 13N., R. 99W., S. 10, 11, 14, 15



Township Point ID Codes	
6	5
4	3
2	1
7	8
9	10
11	12
18	17
16	14
13	
19	20
21	22
23	24
30	29
28	26
25	
31	32
33	34
35	36

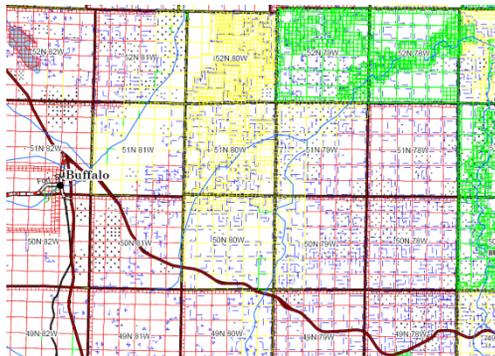
wy06t0023n0990w\_z1\_100100  
 GCDB Township ID Cross Index GCDB  
 Plat ID Point ID

# GCDB Reliability

- Reliability values are computed using GMM/PCCS software tools
- Each coordinate is assigned a reliability factor indicating the error ellipse in feet, in both northing and easting

**General error estimate values are as follows:**

Code	Method	Error Estimate
1	First Order Survey	1 foot or less
2	Second and Third Order Surveys	3 feet or less
3	Photogrammetric Tie Point	10 feet or less
4	Digitized 7.5 Minute Quad Sheets USGS Solid Lines	40 feet or less
5	Digitized 15 Minute Quad Sheets	100 feet or less
6	Other	> 100 feet

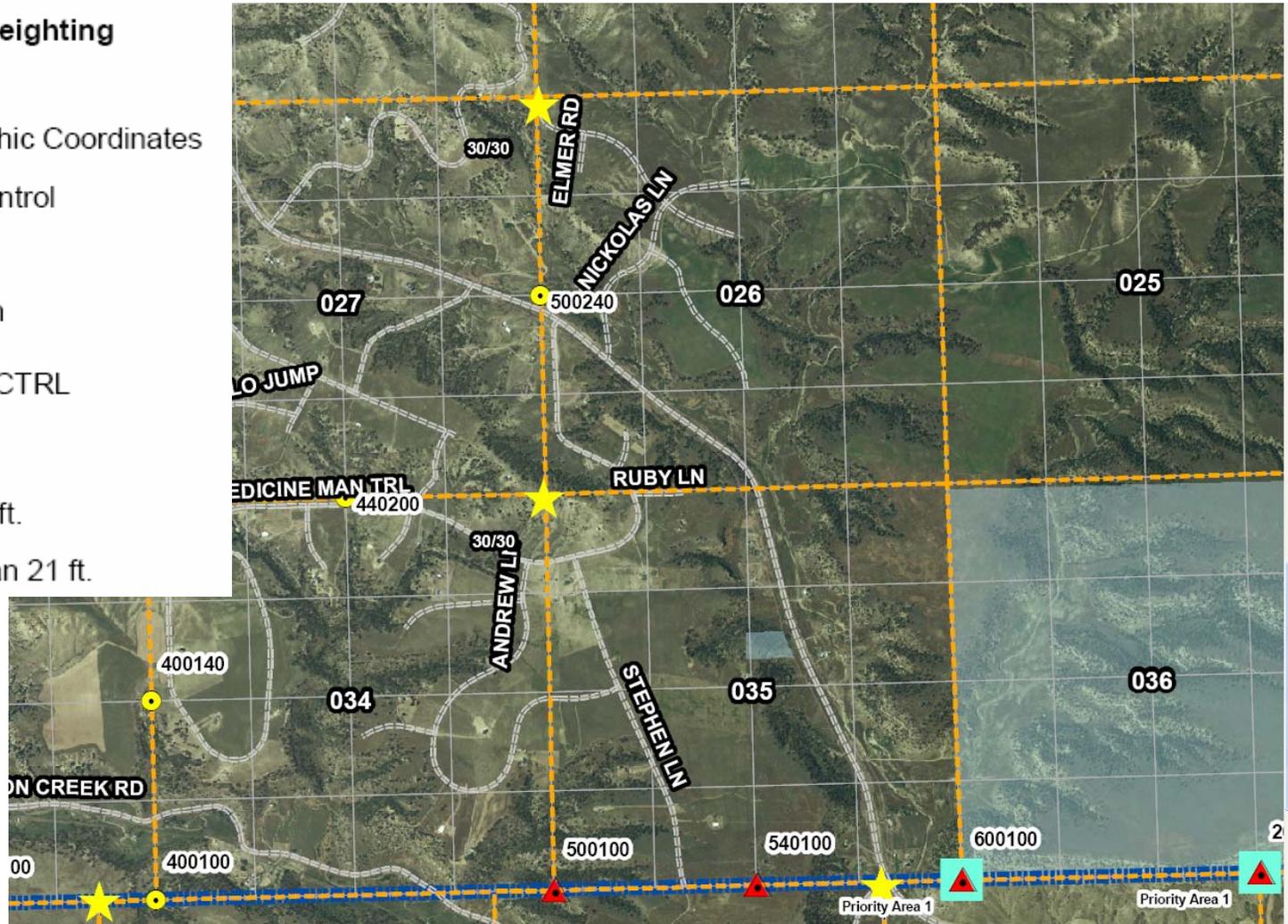


# Reliability Analysis

## Legend

### Cross Index Priority Weighting

-  GLO
-  Geographic Coordinates
-  Local Control
-  Other
-  Unknown
-  Existing CTRL
-  100 + ft.
-  21 - 100 ft.
-  Less Than 21 ft.





# Coordinate Collection

- Establish coordinate collection priority
  - Group meeting
  - Identify surface land ownership (Fed/State/Fee)
  - Identify owners from CAMA parcels
  - Make contact for an appointment for access

An aerial photograph of a rural landscape with a grid of land parcels. A yellow circle highlights a specific parcel. Overlaid on the map is a search interface for 'DEX'. The interface includes a search bar, a 'New search' button, a 'Modify search' button, and a list of search results for 'Elmer C Kaseman'.

**DEX**

YELLOW PAGES WHITE PAGES

[New search](#) [Modify search](#)

**Elmer C Kaseman**  
1116 Buffalo Trail Rd  
Molt, MT 59057-2178  
(406) 628-7265  
[Find Neighbors](#)

[Map this location](#)  
[Area Code Map](#)  
[E-mail Listing to Friends](#)

**Identify Results**  
Layers: <Top-most layer>  
Location: (670338.850314 5071333.621908)

Parcels (CAMA)  
0309250620101

Field	Value
FID	4976
Shape	Polygon
OBJECTID	26342839
AREA	1100880.60765
PARCELID	03092506201010000
DWNCCLASS	Private
DWNCCLSCD	10000
GENDESCRIP	Private
OWNR_NAM1	KASEMAN, ELMER C & ESTHER TRUS
OWNR_NAM2	KASEMAN FAMILY TRUST
SUBDIVISIO	
SHT_LEG_DS	S2Nw.N2Sw.N2Sw4NE.N2S2Sw4NE4, N:
PROP_NUM	01116
PROP_ST	BUFFALO TRAIL RD
PROP_CITY	MOLT
PROP_ZIP	59057
MAIL_ADDR	1116 BUFFALO TRAIL RD
MAILCITY_S	MOLT MT 590572178
PROPTYPE	farmstead rural
ACCESS	paved road
RESPROPNID	Dwelling
COMBLDGTYP	
DNIT_DROP	0
FALLOW_ACR	32.86
GRAZING_AC	198.2
IRRIG_ACRE	0
TIMBER_ACR	35
WILD_HAY_A	0
TOT_ACRES	267.06

# Survey Community Involvement

- Sponsor an informational meeting/data call
  - Federal
  - State
  - Local (utilities)
  - Private land surveyors
  - Utilities
  - Other...
- Seek useable geographic coordinates that each entity may possess and be willing to submit to the project.

# Coordinate Collection Cont...

- Surveying contractor begins coordinate collection for approved corners.
- Collection Steps;
  - Determine if the targeted corners still exist.
  - Search each corner with the following information in hand:
    - GCDB search radius coordinate
    - Certified corner record
    - RTK set up to navigate to the position
  - When found, the corner is observed and recorded, the antenna data dumped, re-observed and recorded. The coordinates values are evaluated in the field before leaving.
  - Prior to certifying existing corners with coordinates, surveyors perform a thorough review of the methods and accuracy standards that were incorporated in the data collection. (coordinates obtained from third parties)
  - New coordinates are submitted to the National Geodetic Survey (NGS) Online Positioning Users Service (OPUS) solution program.



# Coordinate Collection Cont...

- Collected coordinates and Metadata are entered into the Microsoft EXCEL Workbook that meets the specifications of the State Survey Control database.
- Records
  - Surveyor Identification

	<u>Surveyor Name</u>	<u>License Number</u>	<u>Phone</u>	<u>Business Name</u>	<u>Address 1</u>	<u>Address 2</u>	<u>City</u>	<u>State</u>	<u>Zip</u>
1									
2	Dr Bob Plumb ESQ	999999LS	012-345-6789	Sample Engineering & Land Surveying	99999 North Last Chance Gulch Drive East	Suite 111	Survey City	MT	99999

## – Project Information

	<u>Project Name</u>	<u>Project ID</u>	<u>Project Date</u>	<u>Project Coordinate System</u>	<u>Horizontal Datum</u>	<u>Vertical Datum</u>	<u>RefDoc</u>	<u>Comments</u>
1								
2	XLS Test Project	1	4/11/2007	Montana State Plane	NAD83	NAVD88	CS01812	replace this line with your data

## – Point Information

	<u>Point Name</u>	<u>Point Alias</u>	<u>Vertical Method</u>	<u>Cap Type</u>	<u>Monument Type</u>	<u>Monument Description</u>	<u>Meridian</u>	<u>Township</u>	<u>Range</u>	<u>Section</u>
	Sample Point 1		Differential	Traverse Station	#7 Rebar					



# GCDB Adjustment

- Premier Obtains the most current GCDB data from the BLM
- Add the control data collected by Survey Contractor
- Perform least-squares adjustment on each township using the BLM's GMM software
- Following the and approval from the Project Team, Premier performs a regional adjustment on the contracted and adjoining townships.
- Township validation:
  - Process flat files through the BLM's DCCS/Data Prep Version 1.04-11162001
  - Standard processing errors are reported in error logs and are corrected prior to submittal to the BLM.
  - **Discretionary Task:** Premier processes the contracted and adjoining townships through FIXLX, which validates topology along the boundaries (corner and boundary line positions).

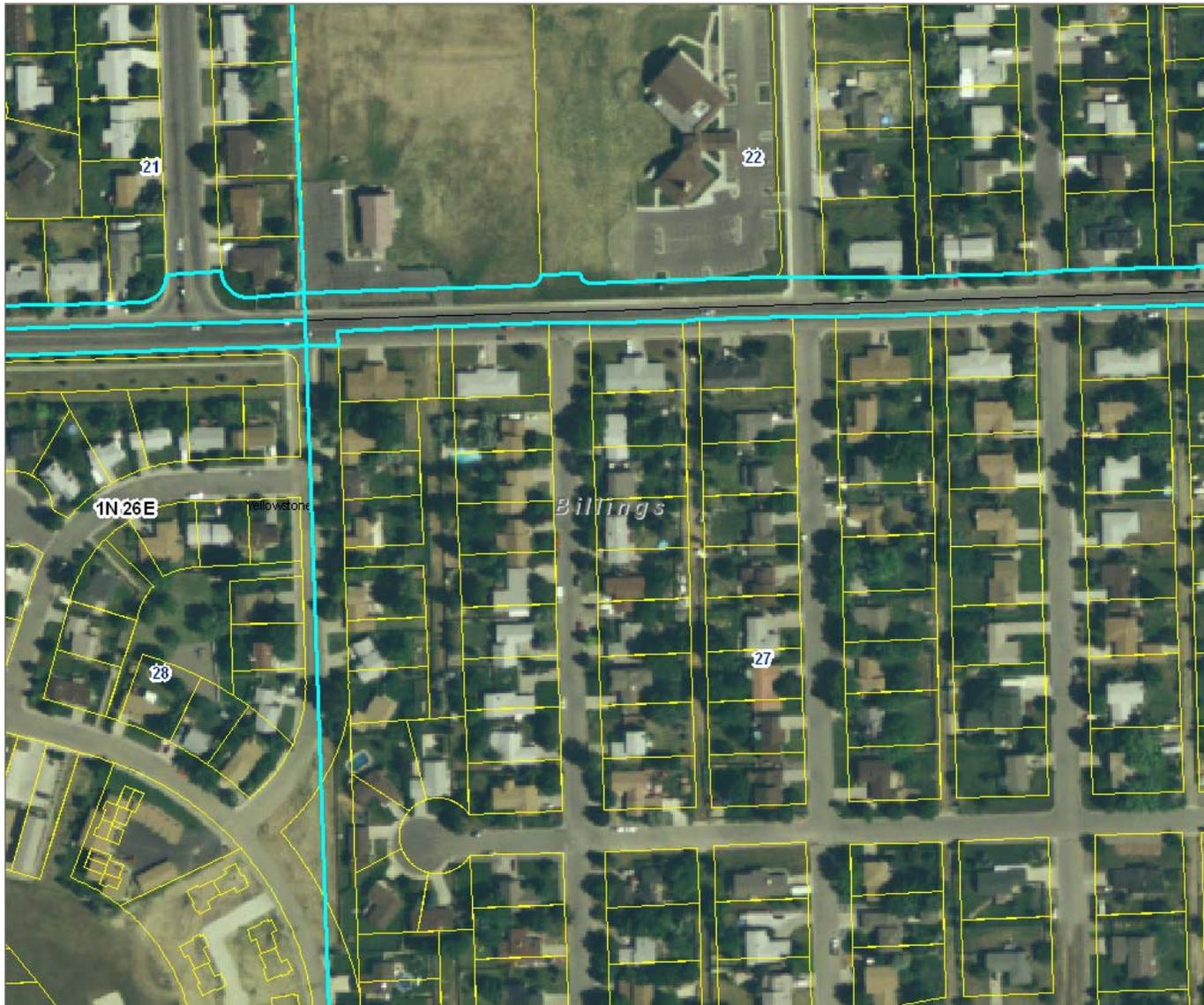
# Billings Redline Area Parcel Adjustment

- Define and develop methods & procedures based upon approved specifications & source data
  - Identify a pilot area(s)
  - Discuss initial data collection methods
  - Identify reference themes
    - Subdivision Plats
    - Block boundary data
    - Edge of pavement data
    - Street centerlines
    - Sources of imagery
      - Visual evidence...
      - If multiple reference themes exist, which is the ruling source
  - Document inspection criteria
  - Document acceptance criteria
- Complete pilot area and submit data for evaluation
  - Discuss/demonstrate production methodology with the project team
  - Define and document the approved processes and proceed with production

# Parcel Registration



# Parcel Structure Cont...



# Parcel Adjustment

Before



After



# Communications Plan

- **Weekly Reports**

- Survey Firm reports to Premier COB, each Friday
- Premier reports to team COB, each Monday

- **Report Contents**

- **Accomplishments**
  - By production task (Corner inventory, adjustment, parcel alignment, etc.)
- **Current Problems**
  - By production task
  - Proposed resolution
- **Technical Requests**
- **Risks Identified**
  - Risk impacts/mitigation measures
- **Recommendations**
- **Deliveries**

# Communications Cont...

- Requests for technical direction (ReqTec)
  - Each request contains:
    - ID number
    - Date submitted
    - Description of the problem
    - PDS suggested resolution
    - Customer defined resolution
    - Date issue was resolved

Request for Technical Direction  
BOR – Ephrata, WA

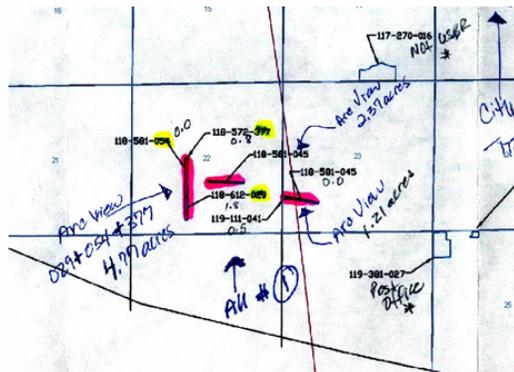
REQTEC # 12

Date: 11/2/06  
Technician: Kim McAndrews

**Location**  
Irrigation District:  
Block:

**Description:**  
In T9N, R29E, the plat for 0929\_0001\_3 (the entire township) shows easements in sections 22 and 23. I did not find a supplemental plat for more information to digitize these easements and attribute the correct width of the easement. Is there any more information regarding these easements and their widths, and if not, how would you like us to capture this information?

Thank you!



REQTEC TEMPLATE.doc Page 1 of 2

# Project Team

Stewart Kirkpatrick, State of Montana

Annette Cabera, Yellowstone County

Tom Tully, City of Billings

Mike Birtles, Bureau of Land Management

Bill Grayson, Bureau of Land Management

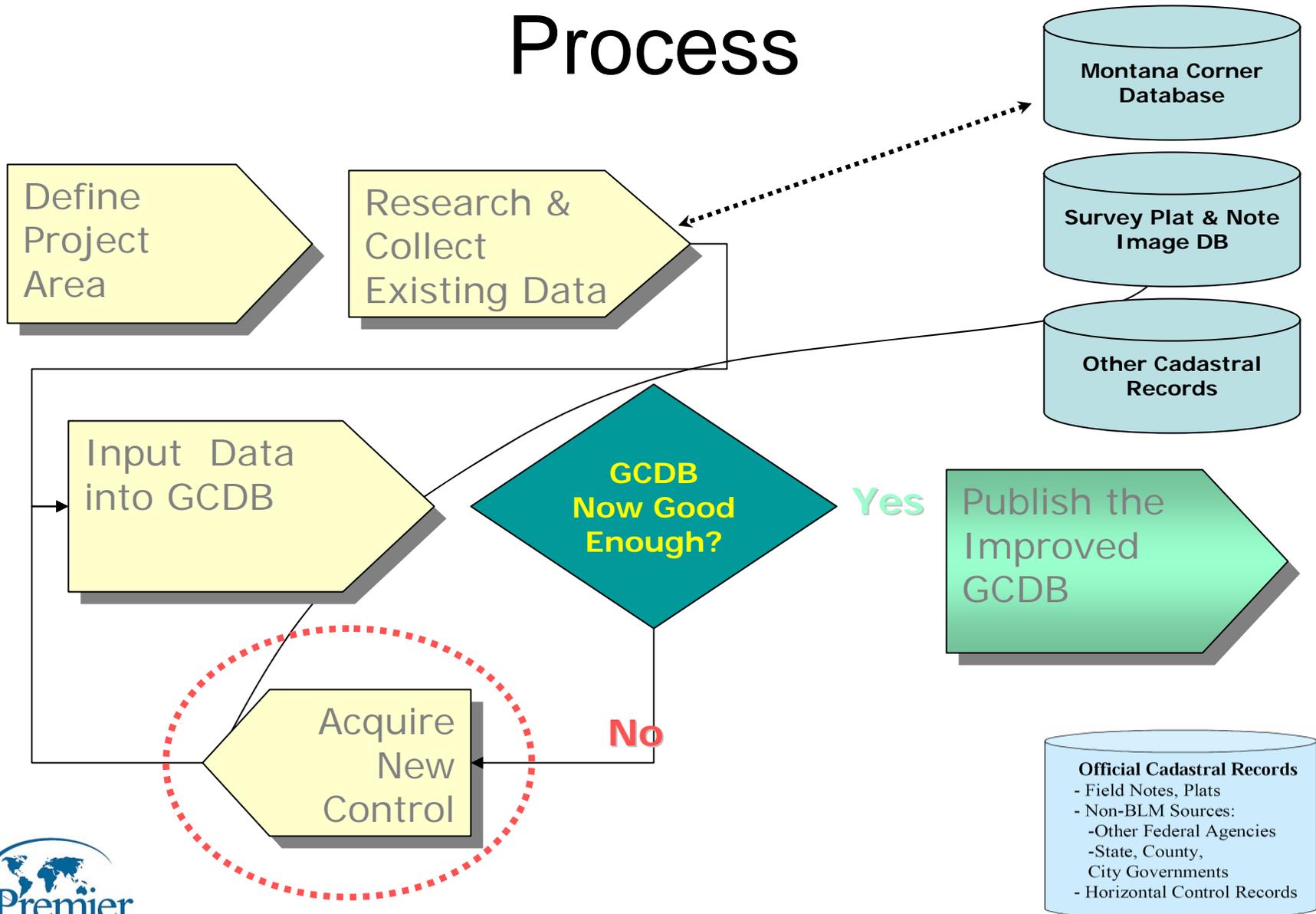
Gerald Pavlick, Morrison Maierle

Scott Slotsve, Morrison Maierle

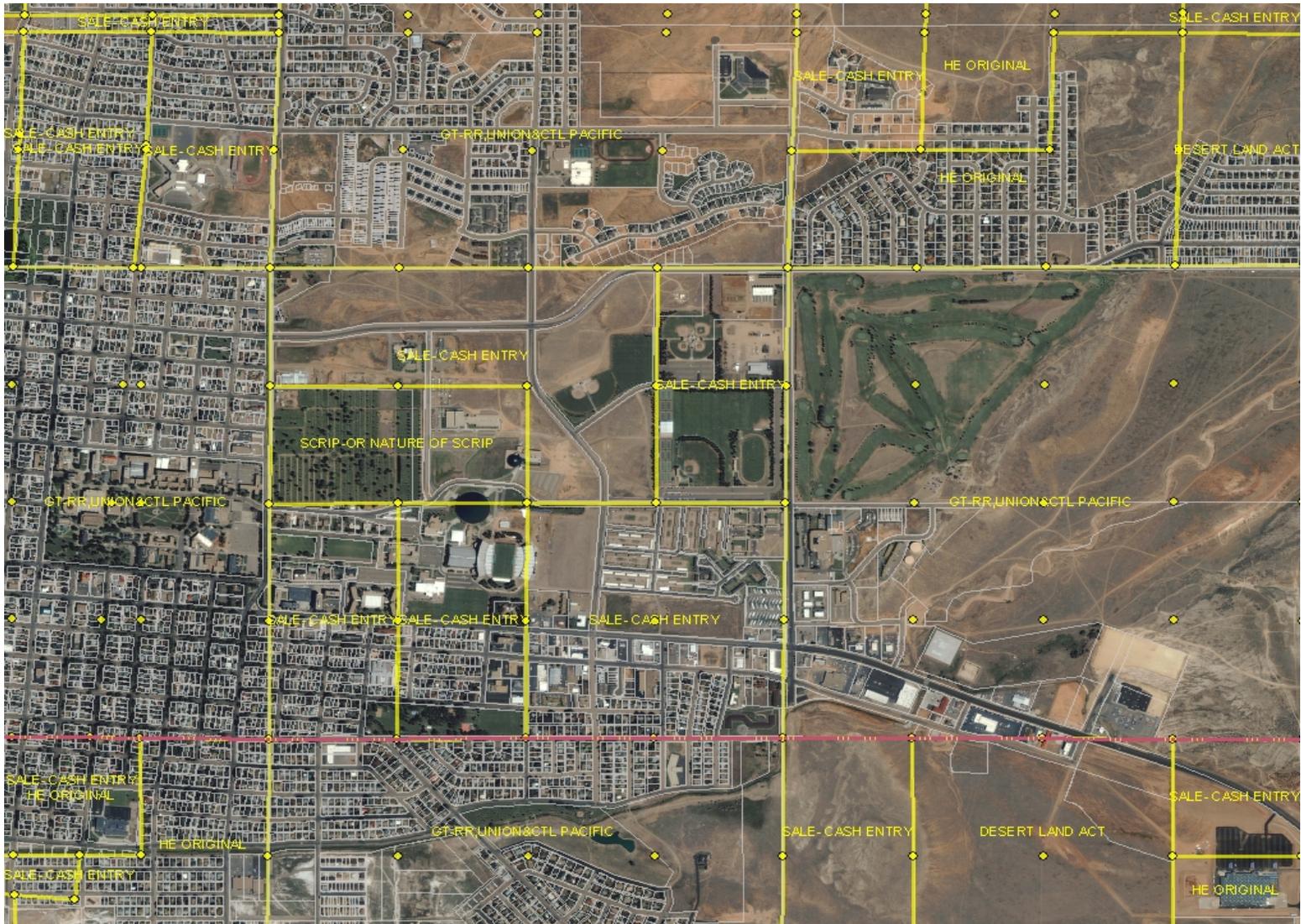
Bob Johnson, Premier Data Services

Ben Knott, Premier Data Services

# GCDB Accuracy Improvement Process



# Putting It All Together



# Discussion/Follow-up

