U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

MONTANA/DAKOTAS STATE OFFICE

A GUIDE TO INTERPRETING THE GEOGRAPHIC COORDINATE DATA BASE

GCDB

10/23/96

5001 Southgate Drive

BILLINGS, MONTANA 59102

Introduction

This User's Guide has been compiled in order to give the novice user an introduction to corner identification used in the Geographic Coordinate Data Base (GCDB), and to familiarize the user with the output files created by the Public Land Survey System (PLSS), Geographic Measurement Management (GMM), and their functionality.

The GCDB has been developed in order to render the most dependable coordinates available for the US Public Land Survey System (PLSS) corners. The Montana/DAKOTAS State Office has the responsibility of producing the GCDB for those states which fall within our administrative jurisdiction. Those states are North Dakota, South Dakota and Montana. At present, portions of Montana and North Dakota have been produced, but a collection plan for South Dakota has yet to be compiled. The data contained in the GCDB has been collected with a 98% level of accuracy.

To satisfy the need for an accurate and complete set of coordinates of PLSS corners, a system of computer programs, GMM, has been utilized to:

1.Compute the geographic coordinates of PLSS corners using official cadastral survey record data.

2.Provide an estimate of the approximate relative position coordinate dependability.

Where State Plane Coordinates (SPC) are used, the coordinates and associated reliability are expressed in feet. GCDB also produces Universal Transverse Mercator (UTM) coordinates, stored in the .UTM file. The coordinates and their reliability are in meters. They are not a reflection of true (absolute) coordinate reliability but rather reflect the integrity of the survey information used.

CAVEAT

The geographic coordinates, and their by-products, were generated from either Public land Survey System Coordinate Computational Software (PCCS) or geographic coordinate data base measurement management (GMM) software, using official Public Land Survey System (PLSS) records (and when deemed necessary, State, County, and private survey records) or digitized coordinates from various cartographic and photographic products. Except where a corner monument has been used as a first or second order control point and the results are of public record, the coordinate values used by GCDB are established with varying reliability based on the source material and method of data input. These coordinate values will be updated as better data and

methodology are available. Graphic representations using these values depict the most probable township configuration and may change as a result of such updates.

The geographic coordinates and their associated products have NO legal significance. These coordinates can not be used as a substitue for a legal boundary survey. They can be used for record keeping, mapping, graphics and planning purposes only.

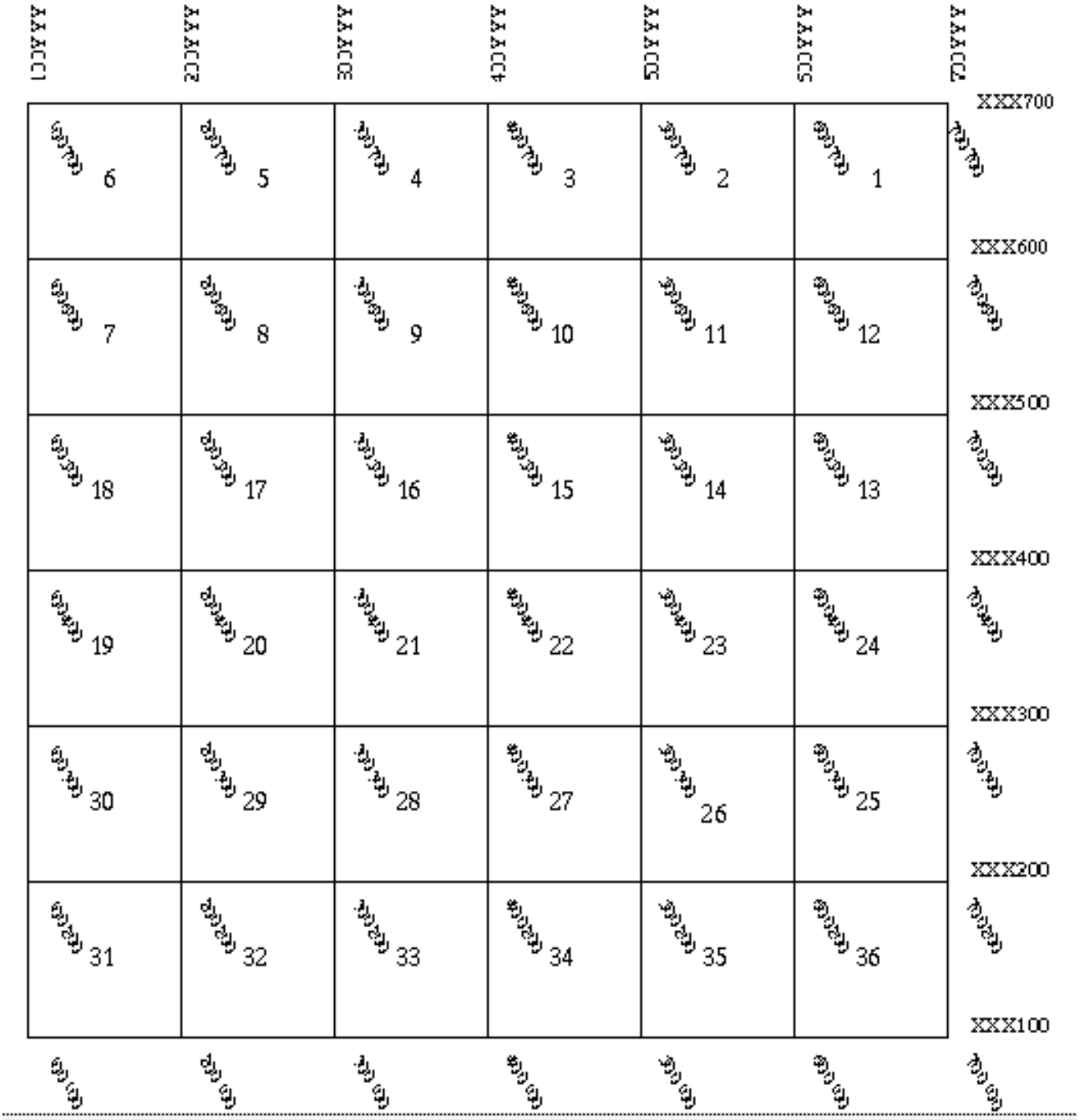
No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by BLM.

For Additional information concerning the GCDB, contact

the GCDB staff at the Montana State Office, (406) 255-2722

GMM Corner Identification

GMM uses a six-digit, fixed length, numerically logical point identification code for all PLSS corners. The following diagram illustrates the point ID scheme used for breaking down a standard township into 36 individual sections:



The User will note that a grid, of seven North-South, and seven East-West lines has been constructed. The prefixes of the North-South lines begin with the number 100, on the western most line, beginning with section 31, and increase in 100 unit increments as the lines proceed easterly, to the eastern most line, which is identified by the prefix of 700 on the east boundary of section 36.

Secondly, note that the seven East-West lines begin with a suffix of 100, at the southern most line in the township, beginning with sections 31 through 36, and increasing in 100 unit increments, to the northern most line, which is identified by the suffix of 700, in sections 1 through 6.

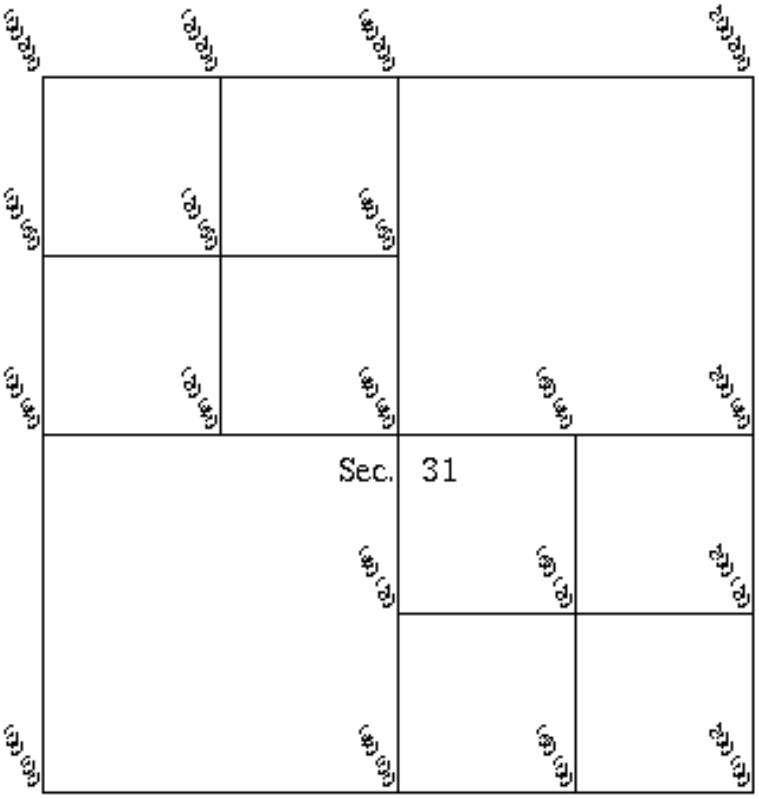
Subdivision Point Identification

The previous set of point IDs can be utilized to define the four corners of specific sections within a township, but a further dissection is necessary if all PLSS corners are to be identified which were created in the subdivision of

sections. The following diagram illustrates the point ID scheme used to identify 1/4 corners

and 1/16 corners created in the subdivision of a standard section. Section 31 will be used to demonstrate this strategy.

The user will notice that the 1/4 section corners are located between their respective section corners and that the 1/16 section corners are between their respective subdivided corners. Also note how the corner's prefix and suffix correlates with its own position.



Special Point Identification

The previous section dealt with Standard, Rectangular point Ids. GCDB also identifies PLSS corners which fall outside the rectangular survey system.

Non-Rectangular surveys, as the term is used in GCDB, include river meanders, small holding claims, grant boundaries, reservation boundaries, mineral surveys, homestead entry surveys, tracts, etc. These non-rectangular surveys have been broken down into four categories:

1. Special Surveys

2. Boundaries/Mileposts

3. Mineral Surveys

4. Meanders

The following list identifies Prefix point Ids used to describe these

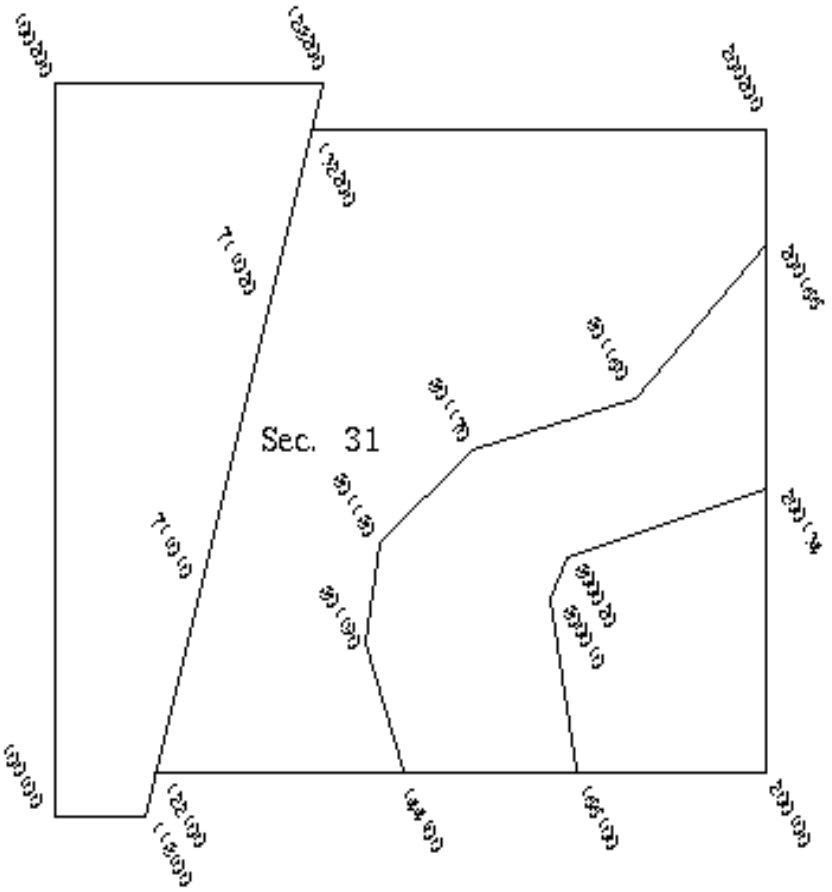
non-rectangular surveys:

1. 711 - 799 Boundaries with Mileposts

2. 800 - 836 Meanders

3. 837 - 899 Tracts

4. 900 - 999 Mineral Surveys, Homestead Entries, etc.



GMM Files

GMM files can be divided into two major groups, survey computation data and attribution data.

The following list describe the files which are included for each Township requested and a brief description of the contents thereof:

SURVEY COMPUTATION DATA

.ADD -Additional computation definitions (used in section subdivision)

.CON -Control stations used in analysis (* = Control available but not used)

.COR -State Plane Coordinates (SPC) file in NAD-27

.DEF -Defines Project parameters

.GEO -Geographic coordinate file

.IRR -Irregular section subdivision information

.INT -Intersections of special surveys, contains polygons

.LSA -Formatted data file, used in analysis

.PGC -Geographic coordinates and reliability values

.RAW -Raw (plat) data file with source document id code

.SD -File containing error estimates used in analysis

.SID -Source document id (Source, Date, Survey type, Surveyor)

.UTM -Universal Transverse Mercator (UTM) coordinates (meters)

ATTRIBUTION DATA

.AN -Polygon identifiers and data

.IID -Polygon identification with point identifiers

.LOT -Government lot locations and and record acreage

.LX -Point specific data, latitude, longitude, reliabilities and UTM data

.LXN -Lines file, can be converted to/from LX file

.NOT -Identifies lines and or points not displayed in graphic mode

.RPO -Identifies non standard polygon

SURVEY COMPUTATION DATA FILES

ADD File

The ADD file is populated as shown below. It consists of eight columns, the first of which is the **TYPE OF COMPUTATION**, a code that identifies a traverse proportion, an intersect, or an add line. The second, third, and fourth columns consist of the **POINT IDs**. The second column is the point being computed. The third and fourth columns identify the line along which the second column point ID is being computed. Column four can also consist of a quadrant, 1 through 4, for a bearing used in the computation. The fifth column is used to identify the **DIRECTION OF THE LINE** (bearing) used in the computation. The sixth column is the **COMPUTATION BEARING CODE** used to determine how the line for the computation is being used, such as the straight line or mean bearing. The seventh and eighth columns consist of the **PROPORTIONAL DISTANCES** that are used in the computation.

1 120250 120240 120260 .00000 1 .000 .000

1 130260 120260 140260 .00000 1 .000 .000

1 140250 140260 140240 .00000 1 .000 .000

1 130240 140240 120240 .00000 1 .000 .000

2 130250 120250 140250 .00000 1 .000 .000

2 0 130240 130260 .00000 1 .000 .000

1 140210 140200 140220 .00000 1 **.000 .000 (PROPORTIONAL DISTS)**

1 150220 140220 160220 .00000 1

1 160210 160220 160200 .00000 **1 (COMPUTATION BEARING CODE)**

1 150200 160200 140200 .00000

2 150210 140210 160210 **.00000 (DIRECTION OF LINE)**

2 0 150200 150220

1 **140230 140220 140240 (POINT IDs)**

1

1 (TYPE OF COMPUTATION)

CON File

Geographic CONtrol used for GCDB is derived from a variety of sources. The CON file stores the control available in the creation of the data set. If available at creation but not used it will be marked with a * in column 1. Since control from various sources will have varying weight the reliability columns here show the relative weight of each particular control point. Digitized points from USGS Quadrangles (1:24,000 maps) have a reliability of 30 to 40 feet.

01/05/95 0080N 0370E 20 CONTROL

ORIGIN

100100 462356.5278 1081647.9505 3300.000 40 40

100197 462447.4801 1081646.3381 3300.000 40 40

100200 462448.3334 1081646.2811 3475.000 40 40

100300 462539.5600 1081647.2204 3505.000 40 40

100397 462631.3595 1081647.7830 3300.000 40 40

100400 462631.7373 1081647.8111 3396.000 40 40

100497 462721.6544 1081649.2799 3300.000 40 40

100500 462723.9278 1081649.2974 3273.000 40 40

100600 462816.0842 1081645.8351 3143.000 40 40

167700 462931.1726 1081526.8976 3300.000 40 40

200200 462447.6987 1081516.9930 3300.000 40 40

200400 462631.1612 1081517.7882 3300.000 40 40

200400 462631.7735 1081517.7969 3363.000 40 40

199401 462631.7735 1081517.7969 3363.000 **40 40 (Reliability)**

200600 462814.6096 1081517.5849 3300.000

200600 462816.1535 1081517.6587 **3319.000 (Elevation)**

199601 462816.1535 1081517.6587

300300 462539.2434 **1081402.1587 (Longitude)**

300700 462932.0377

400100 **462355.7663 (Latitude)**

400500

500100 (Point ID)

DEF File

The .DEF file contains the project parameters and variables. These include items such as the datum, project elevation, error estimates, etc.

Y (Switch indicates if a projection has been defined, Yes or No)

85 MONTANA SOUTH LAMBERT (Defines projection table number, state and projection)

1

2

2700.000 (Project elevation in feet)

N (Switch which indicates if elevations are read from the project

.LEV file, Yes or No)

.100 1000.0 (Default for distance error estimates. The first number is an actual value and the second number is a parts per million value)

4.0 (Default for angle error estimates)

120.0 (Default for bearing error estimates)

30.000 (Default for control N error estimate)

30.000 (Default for control E error estimate)

Y

.000

.0

.0

Y (Switch indicates if error ellipses are to be computed, Yes or No)

N (Switch indicates to readjust with robusted error estimates, Yes or No)

N

Y (Switch indicates if unique error estimates are to read from the project .SD file)

T06NR37E (Project Name, Township and Range)

20 (Meridian code)

MT (State)

13 (UTM Zone Number)

RAW File

This is the raw (record) data on which GMM performs computations. It is created by abstracting survey records.

Record one of the file contains the Township header which identifies the data set by township, range, meridian (a number code), state. Record two is not utilized by the GMM software, but is included in this file structure to ensure compatibility with earlier systems. For your purposes, this record contains no usable information.

Below the 999999 (line 3) are a series of lines which are the raw data. The fields are from and to point Ids, ground distance (in chains), quadrant code, geodetic mean bearings (DDMMSS.ss) and source document id (SID).

T08NR28E 20 MT

11111 0.000 0.000 3200.000 1 1

999999

100100 100140 40.000 4 .0 12892

100140 100160 21.200 4 .0 12892

100160 100197 18.800 4 .0 12892

100197 100200 1.200 4 .0 12892

100200 100237 38.800 4 .0 12892

100600 100603 2.110 1 24000.0 12897

100603 100640 37.935 1 24000.0 12897

100640 100643 5.115 1 24000.0 12897

100643 100660 14.905 1 24000.0 12897

100660 100667 6.595 1 24000.0 12897

100667 100670 13.425 1 24000.0 **12897 (SID)**

100667 100670 13.425 1 **24000.0 (bearing 2 40' 00")**

100667 100670 13.425 **1 (quadrant code)**

100667 100670 **13.425 (distance ch.)**

100667 **100670 ("to" point id)**

100667("from" point id)

SID File

The Source IDentifier number (SID) file contains information about the surveys used for the township. The .SID file begins with the letter S in column one indicating the SID number. This is followed with error estimates to be applied to every line of data from this specific survey. The lines following, indicated with the letter C in column one, are "comments" about the particular survey. The first line of comments is a structured metadata line which contains: Source Agency Name, Date Approved, Survey Type, and Surveyor(s) Name. Any subsequent comment lines contain unstructured comments about the survey or record.

Special SID NOTE:

The SID number found in the RAW file is also used to indicate curve data. This data is categorized into two main themes, Circular Curves and Spiral Curves. The circular curves are further divided into Tangent Curves and Non-Tangent Curves. Tangentcy is determined from the way the preceding line segment transitions into the curve and the following line segment transitions from the curve. Refer to the appendix for a detailed explanation of this subject.

S12907 .100 1500.0 480.0 30.000 30.000

C GLO 07-MAY-1913 O RILEY,HJ/LYMAN,RY/KESTER,TP

C T8NR28E COMPLETION SURVEY

S12903 .100 10000.0 3600.0 **30.000 30.000 (Reliability)**

C GLO 13-MAR-1894 O GALLAHER,PM

C 1892 PARTIAL SUBDIVISION

S12892 .100 50000.0 **18000.0 (Error Estimate Arc Seconds)**

C GLO 26-MAY-1884 O THOMPSON,JP

C 1884 SUBDIVISION

S12897 **.100 1500.0 (Error Estimate: Constant + PPM)**

C GLO 07-MAY-1913 D RILEY,HJ

C 1913 RESURVEY PORTION EAST BDY T8NR27E

S11219 (SID Identifier Number)

C GLO 11-NOV-1909 O RILEY,HJ

S14390 .100 1000.0 240.0 30.000 30.000

C BLM 12-NOV-1979 D LARUE,J (Agency, Date, Survey Type, Surveyor)

S14440 .100 750.0 180.0 30.000 30.000

C BLM 09-JUN-1980 D BAXTER,R

C PARTIAL WITH SECTION SUBS **(Free Form Comments)**

ATTRIBUTION DATA FILES

PGC File

This is the final geographic coordinate file created by the GMM process. This file provides Latitude, Longitude, elevation and reliability for each point ID.

01/05/95 0080N 0370E 20 CONTROL

ORIGIN 462700.0000 1081230.0000 3300.000 0 0

100100 462356.0673 1081647.9587 3300.000 59 62

100140 462421.5889 1081647.3252 3300.000 181 308

100160 462435.2485 1081647.1491 3300.000 138 233

100197 462447.3767 1081647.0107 3300.000 38 40

100200 462448.1559 1081647.0460 3300.000 37 39

100237 462513.2535 1081647.3193 3300.000 216 372

100297 462539.1217 1081647.6100 3300.000 23 25

100300 462539.7535 1081647.6158 3300.000 23 25

100337 462605.1579 1081647.8474 3300.000 23 24

100397 462631.1941 1081648.0847 3300.000 21 22

100400 462631.8259 1081648.1009 3300.000 21 22

100437 462656.3337 1081648.8268 3300.000 22 23

100497 462721.4726 1081649.5739 3300.000 21 22

100500 462724.0622 1081649.4006 3300.000 21 22

100537 462749.4833 1081647.7818 3300.000 22 23

100600 462816.1211 1081646.0900 3300.000 22 22

100603 462817.4941 1081645.9974 3300.000 22 22

100640 462842.1758 1081644.3082 3300.000 22 24

100643 462845.5040 1081644.0833 3300.000 22 24

100660 462855.2022 1081643.4255 3300.000 22 24

100667 462859.4934 1081643.1354 3300.000 22 24

100670 462908.2286 1081642.5433 3300.000 22 24

100677 462913.4828 1081642.1879 3300.000 22 24

100680 462921.2550 1081641.6613 3300.000 22 24

100700 462930.2700 1081641.0500 3300.000 22 24

200100 462357.0310 1081516.6074 3300.000 61 63

200140 462422.5835 1081516.3184 3300.000 61 63

200200 462448.1359 1081516.0294 3300.000 38 39

200240 462513.9506 1081516.4913 3300.000 38 39

200300 462539.7653 1081516.9531 3300.000 23 25

200340 462605.4820 1081517.3462 3300.000 **23 24**

199340 462605.8207 1081517.3512 3300.000 **[Reliability]**

200400 462631.1986 1081517.7390 **3300.000**

199401 462631.8760 1081517.7490 **[Project Elev.]**

200440 462657.0535 **1081517.6789**

199440 462657.9459 **[Longitude]**

200500 **462722.9082**

199501 **[Latitude]**

200540

[Point ID]

LXN File

The .LXN file contains topology (lines) information. The file begins with record one which identifies the township, range, meridian, and state. Record two, "ORIGIN" line, contains non-essential data. The following line which contains a single element (39 in this case) indicates that 39 points (nodes) are connected in the following arc. The following line is a variable length record that has been wrapped in this example to show all of the 39 nodes on that arc. Please note that the actual data file does not contain this wrap.

T08NR28E 20 MT

ORIGIN 462700.0000 1081230.0000 714408.535147616.55

39

100100100120100140100160100197100200100220100237100240100260100297100300100320100337100340100360100397100400100420100437100440100460100497100500100520100537100540100560100600100603100620100640100643100660100667100670100677100680100700

4

1106401106701106801107 00

24

1191991202001202201202401202601203001203201203401203601204
0012042012044012046012050012052012054012056012060012062012064012 0 660120670120680120700

5

120100120120120140120160119199

27

1401001401201401401401601402001402201402401402601403001403
2014034014036014040014042014044014046014050014052014054014056014
0
600140620140640140660140670140680140700

27

1601001601201601401601601602001602201602401602601603001603
2016034016036016040016042016044016046016050016052016054016056016
0
600160620160640160660160670160680160700

999999 (End of File Marker)

LX File

This file contains point specific data. Township, Range, Meridian, State, and Date, are on line one. The "ORIGIN" line contains Latitude and Longitude (NAD-27) and UTM Coordinates.

T08NR28E 20 MT

ORIGIN 462700.0000 1081230.0000 714408.535147616.55

100100 462356.4696 1081647.1314 3300.00 60 63 1 1 2 **709118.02 5141760.78**

[UTM Coordinates]

100120 462409.1129 1081647.0847 3300.00 180 306 **1 1 3**

[Pen Instructions]

100140 462421.7562 1081647.0380 3300.00 **180 306**

[Reliability in feet]

100160 462435.3496 1081647.0121 **3300.00**

[Average Elevation of Twp.]

100197 **462447.4258 1081646.9918**

[Latitude and Longitude NAD-27]

100200

[Point ID]

100220 462501.0909 1081647.1960 3300.00 37 38 1 1 3 709048.01 5143755.17

100237 462513.2758 1081647.3569 3300.00 214 369 1 1 3 709031.63 5144131.12

100240 462513.9761 1081647.3665 3300.00 37 38 1 1 3 709030.68 5144152.73

100260 462526.8613 1081647.5420 3300.00 37 38 1 1 3 709013.25 5144550.28

100297 462539.1147 1081647.7089 3300.00 23 25 1 1 3 708996.67 5144928.34

GCDB Data Access Procedures

1. Members of the public ask the Public Room for GCDB data by Township and Range.

2. Instruct customer of GCDB user guide.

3. After determining the necessary data being requested, either hard copy or diskette of GCDB data, the public room employee will phone GCDB section.

4. Public room rep. will tell GCDB personnel which files are wanted and what medium (diskette, paper copy or tape) and wait while GCDB personnel check the availability and size of requested information.

5. GCDB personnel will supply the public room employee with the number of pages to be printed for hard copy requests such as manuals or printed data. The cost of digital data for "micro" computers (PC) has been established at $8.00 administrative fee, plus research time at $18.60/hr., plus the cost of the media (diskette, tape, CD-ROM), plus postage. The Public Room is responsible for billing and collecting these fees. The Public Room will accept VISA and Master Charge and phone orders. No data will be released before payment has been made. GCDB is responsible for assuring that the data is wanted at the established rates.

6. For "walk-in" data requests, the Public room representative will fill out 1370-44 form for cost recovery and will have the customer pay for the requested information at the cashier's window. The Customer will then be directed to the GCDB section with receipt in hand indicating payment has been made. They will have the opportunity to ask any questions and be supplied with the appropriate media or hard copy.

7. If the information requested is larger than a 5 township area, the public room employee will inform the customer that a waiting period of 3 working days is necessary before the information will be available. The information can be mailed or picked up when ready.

Special Note

The GCDB data can be found on the InterNet at:

/

This is the prefered method for public access to this data and there is no charge for using this method.

APPENDIX

The curve elements that will be populated on the target system for LRIS (Land and Resources Information System) are:

1. Curve Line Long Chord Distance Measure - a straight line connecting the beginning point of curvature and the ending point of curvature.

2. Curve Line Long Chord Distance Unit of Measure Code - the units of measure with which a curve long chord measurement is taken.

3. Curve Line Long Chord Direction Measure - the azimuth or bearing of the long chord for a curve.

4. Curve Line Long Chord Direction Quadrant Code - the quadrant of the direction when it is a bearing.

5. Curve Line Long Chord Direction Unit of Measure Code - the unit of measure for direction (example Degrees-Minutes-Seconds DdMmSs.sss)

6. Curve Line Direction of Concavity Code - the direction of concavity of a curve relative to the long chord direction.

7. Curve Line Type Code - the code that identifies the type of curve (domain values are CIR for circular curve, PAR for parabolic curve, and SPI for spiral curve).

8. Curve Line Spiral Length Measure - the nominal distance around a spiral curve segment.

9. Curve Line Spiral Length Unit of Measure - the units of measure used for the distance measurement for a spiral curve.

10. Curve Line Radius Beginning Point Distance Measure - the length of the radius at the beginning point of a curve.

11. Curve Line Radius Ending Point Distance Measure - the length of the radius at the ending point of a curve.

12. Curve Line Radius Distance Unit of Measure Code - the units of measure with which the radius, at either the beginning or ending points of an appropriate curve, is measured.

The above curve elements, not collected, will be derived during the GCDB Data Conversion process. All examples in this document that refer to measurements of a curve (circular and spiral) do not represent actual values and are present only to show how the information is to be collected.

Curve Elements for PCCS or GMM Computed Townships

1. Circular curves being collected by either the Long Chord (LC), Radius (R), or a series of sub-chords along the arc of a circular curve.

2. Spiral curves.

All curves have a distinct Source/Survey Identifier (SID) so multiple curves from the same source document can be uniquely identified

Tangent Curves

A tangent curve is defined as: An arc that is tangent to two line segments, the beginning of the curve (BC), more commonly known as the point of curvature, and the end of the curve (EC), more commonly known as the point of tangency.

For the Long Chord (LC) identified in the RAW DATA file, an extension is added to the distinct SID for the curve in the following manner:

/TCnnLC, where TC represents a Tangent Curve and nn is the number of the curve identified in the RAW DATA file, (should start with 1 and increment by 1, for a maximum of 99, for each new tangent curve encountered within a township) and LC is the curve element.

The LC of the Tangent Curve must be connected in the RAW DATA file to the line segments leading into the BC and out of the EC.

Example of a tangent curve collected in the RAW DATA file.

837010 837020 4.750 3 283145.0 100049 (Line segment into BC)

837020 837030 2.530 2 614815.0 100049/TC01LC (Long Chord)

837030 837040 4.150 3 264145.0 100049 (Line segment from EC)

837040 837050 6.760 4 632945.0 100049

GCDB collects curve elements 1, 3, and 4. Curve elements 2, 5, 6, 7, 10, 11, and 12, along with the element Line Geometry Type Code, will be derived during data conversion.

Nontangent Curve

A nontangent Curve is defined as a curve that is not tangent at the BC and/or EC. For nontangent curves with the LC identified in the RAW DATA file, an extension is added to the distinct SID for the curve in the following manner:

/CnnLC, where C represents a nontangent circular curve and nn is the number of the curve identified in the RAW DATA file, (should start with 1 and increment by 1, for a maximum of 99, for each new circular curve encountered within a township) and LC is the curve element.

Additional elements are added to collect enough curve information for LRIS. Immediately following the LC line segment in the RAW DATA file the line segment depicting the radius line from the BC to the Radius Point (RP) is added.

/R, where R is the radius line segment from the BC to the RP.

GCDB collects curve elements 1, 3, 4, 10, and 11. Curve elements 2, 5, 6, 7, and 12 along with the element Line Geometry Type Code will be derived during data conversion.

Example of a nontangent circular curve collected in the RAW data file.

837010 837020 4.750 3 283145.0 100049 (Line segment into BC)

837020 837030 2.530 2 614815.0 100049/C01LC (Long Chord)

837020 837025 4.500 1 612815.0 100049/R (Radius from BC to RP)

837030 837040 4.150 3 264145.0 100049 (Line segment from EC)

837040 837050 6.760 4 632945.0 100049

Note: Colorado collected curves through the RP, and therefore only needs to add the LC to the data conversion input RAW file.

Moving of circular curve elements during Data Conversion from the RAW file to the SID file.

The curve elements (collected and derived) will be located in the SID file as shown in the example below. This will include the original line segments of the curve used for computations and the line segments added to collect additional curve elements. This process will occur during the data conversion process.

Example of circular curve elements collected in the .SID file:

S100049/C01 0.100 30000.0 10800.0 25.000 25.000

C/* (retained comments from original .SID file)

C/ (structured comments from original .SID file)**

CRV/ 1234.567 A 4 898989.9 H L CIR CRV

CRV/ 1234.567 3 595959.9 A

CRV/ 837020 837030 837025

Breakdown of the circular curve element definitions in the .SID file:

CRV/ 1234.567 A 4 898989.9 H L CIR CRV

{--} {------} {------} {-} {-}

1 2 3 4 5 6 7 8 9

1 - Designates a curve in the SID file

2 - Curve Line Long Chord Distance Measure

3 - Curve Line Long Chord Distance Unit of Measure Code

(Chains - Ground)

4 - Curve Line Long Cord Direction Quadrant

5 - Curve Line Long Chord Direction Measurement

6 - Curve Line Long Chord Direction Unit of Measure Code

(Degree- Minutes-Seconds)

7 - Curve Line Direction of Concavity

8 - Curve Line Type Code

9 - Line Geometry Type Code

CRV/ 1234.567 3 595959.9 A

{------} {------}

1 2 3 4

1 - Curve Line Radius Beginning Point Distance Measure

2 - Quadrant of Radius from the BC to the RP

3 - Bearing of the Radius from the BC to the RP

4 - Curve Line Radius Distance Unit of Measure Code (Chains - Ground)

CRV/ 837020 837030 837025

{----} {----} {----}

1 2 3

1 - Beginning of Curve Point ID

2 - End of Curve Point ID

3 - Radius Point ID (Colorado Only)

Example of a circular curve (tangent and nontangent) in the TOWNSHIP.RAW file after conversion:

837010 837020 4.750 3 283145.0 100049 (Line segment into BC)

837020 837030 2.530 2 614815.0 100049/C01LC (Long Chord)

837030 837040 4.150 3 264145.0 100049 (Line segment from EC)

837040 837050 6.760 4 632945.0 100049

Example of a Colorado circular curve in the TOWNSHIP.RAW file after conversion:

837010 837020 4.750 3 283145.0 100049(Line segment into BC)

837020 837030 2.530 2 614815.0 100049/C01R (Radius BC to RP)

837030 837035 4.500 1 612815.0 100049/C01R (Radius RP to EC)

837035 837040 4.150 3 264145.0 100049 (Line segment from EC)

837040 837050 6.760 4 632945.0 100049

Curves portrayed by subchords along the arc of the curve.

A curve portrayed by subchords is defined as: A curve that has two or more subchords. No restriction is placed on the number or length of the subchords. Subchords must be identified in the RAW DATA file with an extension to the SID in the following manner:

/Vnn, where V identifies the line segment as a sub-chord, and nn represents the number, (start with 1 and increment by 1, for a maximum of 99, for each new sub-chord within the RAW DATA file).

Curves portrayed by subchords must have the following line segments added to the RAW DATA file: the LC as the record immediately preceding the subchords and the radius from the BC to the RP as the record immediately following the subchords. The LC and Radius must have the SID

extension as defined previously for a nontangent curve.

GCDB State Offices must collect curve elements 1, 3, 4, 10, and 11. Curve elements 2, 5, 6, 7, and 12 along with the element Line Geometry Type Code will be derived during data conversion.

Example of subchords collected in the RAW DATA file before conversion:

837010 837020 4.750 3 283145.0 100049 (Line segment into BC)

837020 837030 2.530 2 614815.0 100049/C01LC (Long Chord)

837020 837021 0.500 2 333333.0 100049/V01 (Subchord 1)

837021 837022 0.500 2 433333.0 100049/V02 (Subchord 2)

837022 837030 1.540 2 533333.0 100049/V03 (Subchord 3)

837020 837025 4.500 1 612815.0 100049/R (Radius BC to RP)

837030 837040 4.150 3 264145.0 100049 (Line segment from EC)

837040 837050 6.760 4 632945.0 100049

Example of curve elements in the .SID file for curves collected by subchords:

S100049/C01 0.100 30000.0 10800.0 25.000 25.000

C/* (retained comments from original .SID file)

C/ (structured comments from original .SID file)**

CRV/ 1234.567 A 4 898989.9 H L CIR CRV

CRV/ 1234.567 3 595959.9 ARV/ 837020 837030 837025

Breakdown of the curve element definitions in the .SID file for curves collected by subchords:

CRV/ 1234.567 A 4 898989.9 H L CIR CRV

{--} {------} {------} {-} {-}

1 2 3 4 5 6 7 8 9

1 - Designates a curve in the SID file

2 - Curve Line Long Chord Distance Measure

3 - Curve Line Long Chord Distance Unit of Measure Code

(Chains - Ground)

4 - Curve Line Long Cord Direction Quadrant

5 - Curve Line Long Chord Direction Measurement

6 - Curve Line Long Chord Direction Unit of Measure Code

(Degree- Minutes-Seconds DdMmSs.sss)

7 - Curve Line Direction of Concavity

8 - Curve Line Type Code

9 - Line Geometry Type Code

CRV/ 1234.567 3 595959.9 A

{------} {------}

1 2 3 4

1 - Curve Line Radius Beginning Point Distance Measure

2 - Quadrant of Radius from the BC to the RP

3 - Bearing of the Radius from the BC to the RP

4 - Curve Line Radius Distance Unit of Measure Code (Chains - Ground)

CRV/ 837020 837030 837025

{----} {----} {----}

1 2 3

1 - Beginning of Curve Point ID

2 - End of Curve Point ID

3 - Radius Point ID (Colorado Only)

Example of subchords collected in the RAW DATA file after conversion:

837010 837020 4.750 3 283145.0 100049 (Line segment into BC)

837020 837021 0.500 2 333333.0 100049/V01 (Subchord 1)

837021 837022 0.500 2 433333.0 100049/V02 (Subchord 2)

837022 837030 1.540 2 533333.0 100049/V03 (Subchord 3)

837030 837040 4.150 3 264145.0 100049(Line segment from EC)

837040 837050 6.760 4 632945.0 100049

Spiral Curves

Spiral curves should be identified in the RAW DATA file with an extension to the SID in the following manner:

/SnnLC, where S represents Spiral curve and nn is the number of the spiral curve identified in the RAW DATA file (should start with 1 and increment by 1 to a maximum of 99 for each new spiral curve encountered within a township) and LC is the chord (distance from the beginning to the end of the spiral curve).

/SnnR#, where Snn matches the same value from the chord, and R is the radius line segment and # is equal to:

1. When the radius of the spiral to curve occurs at the beginning of the spiral curve.

2. When the radius of the spiral to curve occurs at the end of the spiral curve.

Note: For a spiral curve the spiral to curve radius is a known value while the tangent to spiral radius has an infinite value. The value of 1 and 2 above is intended to portray the radius of the spiral to curve. This will depend on the direction of the traverse and if the spiral to curve radius is at the beginning or end of the spiral curve.

Example of a spiral curve collected in the RAW file:

836090 837000 4.750 3 283145.0 100049 (Line Segment into Spiral)

837000 837010 0.500 4 452619.0 100049/S01LC (Spiral Curve Chord)

837010 837015 4.500 1 612815.0 100049/S01R2 (Spiral to Curve Radius)

837000 837010 0.650 0 0.0 100049/S01LS (Length of Spiral)

837010 837020 2.530 2 614815.0 100049/C01LC (Circular Curve Long Chord)

837010 837015 4.500 1 612815.0 100049/R (Circular Curve Radius)

837020 837030 0.500 3 001515.0 100049/S02LC (Spiral Curve Chord)

837020 837025 4.500 2 351515.0 100049/S02R1 (Spiral to Curve Radius)

837020 837030 0.650 0 0.0 100049/S02LS (Length of Spiral)

837040 837050 4.150 3 264145.0 100049 (Line Segment from Spiral)

837050 837060 6.760 4 632945.0 100049

Example of spiral curve elements added to the .SID file.:

S100049/S01 0.100 30000.0 10800.0 25.000 25.000

C/* (retained comments from original .SID file)

C/ (structured comments from original .SID file)**

CRV/ 1234.567 A 4 898989.9 H L SPI CRV

CRV/ 1234.567 3 595959.9 A 2 1234.567 A

CRV/ 837000 837010 837015

Breakdown of the spiral curve element definitions in .SID file:

CRV/ 1234.567 A 4 898989.9 H L SPI CRV (Long Chord - Curve

Elements Line 1)

{--} {------} {------} {-} {-}

1 2 3 4 5 6 7 8 9

1 - Designates a curve in the SID file

2 - Curve Line Long Chord Distance Measure

3 - Curve Line Long Chord Distance Unit of Measure Code

(Chains - Ground)

4 - Curve Line Long Cord Direction Quadrant

5 - Curve Line Long Chord Direction Measurement

6 - Curve Line Long Chord Direction Unit of Measure Code

(Degree- Minutes-Seconds DdMmSs.sss)

7 - Curve Line Direction of Concavity

8 - Curve Line Type Code

9 - Line Geometry Type Code

CRV/ 1234.567 3 595959.9 A 2 1234.567 A Spiral to Curve Radius and {--}{------} {------} {------} Length

1 2 3 4 5 6 7

1 - Designates a curve in the SID file

2 - Curve Line Radius Distance Measure

3 - Quadrant of the Spiral to Curve Radius

4 - Bearing of the Spiral to Curve Radius

5 - Curve Line Radius Distance Unit of Measure Code (Chains- Ground)

6 - Spiral to Curve Radius Code

7 - Curve Line Spiral Length Measure

8 - Curve Line Spiral Length Unit of Measure Code (Chains- Ground)

CRV/ 837000 837010 837015

{----} {----} {----}

1 2 3

1 - Beginning of Spiral Curve Point ID

2 - End of Spiral Curve Point ID

3 - Spiral to Curve Radius Point ID

Example of a spiral curve in the RAW file after conversion.

836090 837000 4.750 3 283145.0 100049 (Line Segment into Spiral)

837000 837010 0.500 4 452619.0 100049/S01LC (Spiral Curve Chord)

837010 837020 2.530 2 614815.0 100049/C01LC (Circular Curve Long Chord)

837020 837030 0.500 3 001515.0 100049/S02LC (Spiral Curve Chord)

837030 837040 4.150 3 264145.0 100049 (Line Segment from Spiral)

837040 837050 6.760 4 632945.0 100049

NOTE:

The above reference to *Data Conversion* is a process where the GCDB data, produced on a DOS PC platform, is converted in preparation for use on a UNIX platform. The additional curve data derived through data conversion will not normally be available until all data has been converted and ported to the UNIX platform.