GCDB USER'S GUIDE

Welcome to the BLM, Nevada **Geographic Coordinate Data Base (GCDB)** user's guide.

INTRODUCTION

This User's Guide has been compiled in order to give the novice user an introduction to the **Geographic Coordinate Data Base (GCDB).** The guide will familiarize users with corner identification (point identification [PID]) and some of the file formats used in the files created by the various software packages including **Public Land Survey System Coordinate System (PCCS)** software, **GCDB Measurement Management (GMM)** software, and **National Integrated Lands System (NILS)**.

The GCDB has been developed in order to render the most dependable coordinates available for the **U.S. Public Land Survey System (PLSS)** corners. The Nevada State BLM Office has the responsibility of producing the GCDB for the state of Nevada. Of the over 3300 townships in the State of Nevada, 3187 have GCDB data available on the Nevada Land Records web site (http://www.nv.blm.gov/LandRecords). Several other townships will be added in the future, except for townships in the Nellis Air Force Range and Nevada Test Site.

To satisfy the need for a more accurate and complete set of coordinates of the PLSS corners, a system of computer programs, PCCS, GMM and NILS, have been developed 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.

BLM began the GCDB project using PCCS software and changed to GMM software which is currently being used. This software is available for PC's. Many of the townships computed with PCCS have been converted to GMM, but over 700 townships remain in PCCS format.

BLM is participating in a project with US Forest Service to develop new software to replace GMM. The new product is called NILS (National Integrated Lands System), and is expected to be deployed in mid-2007.

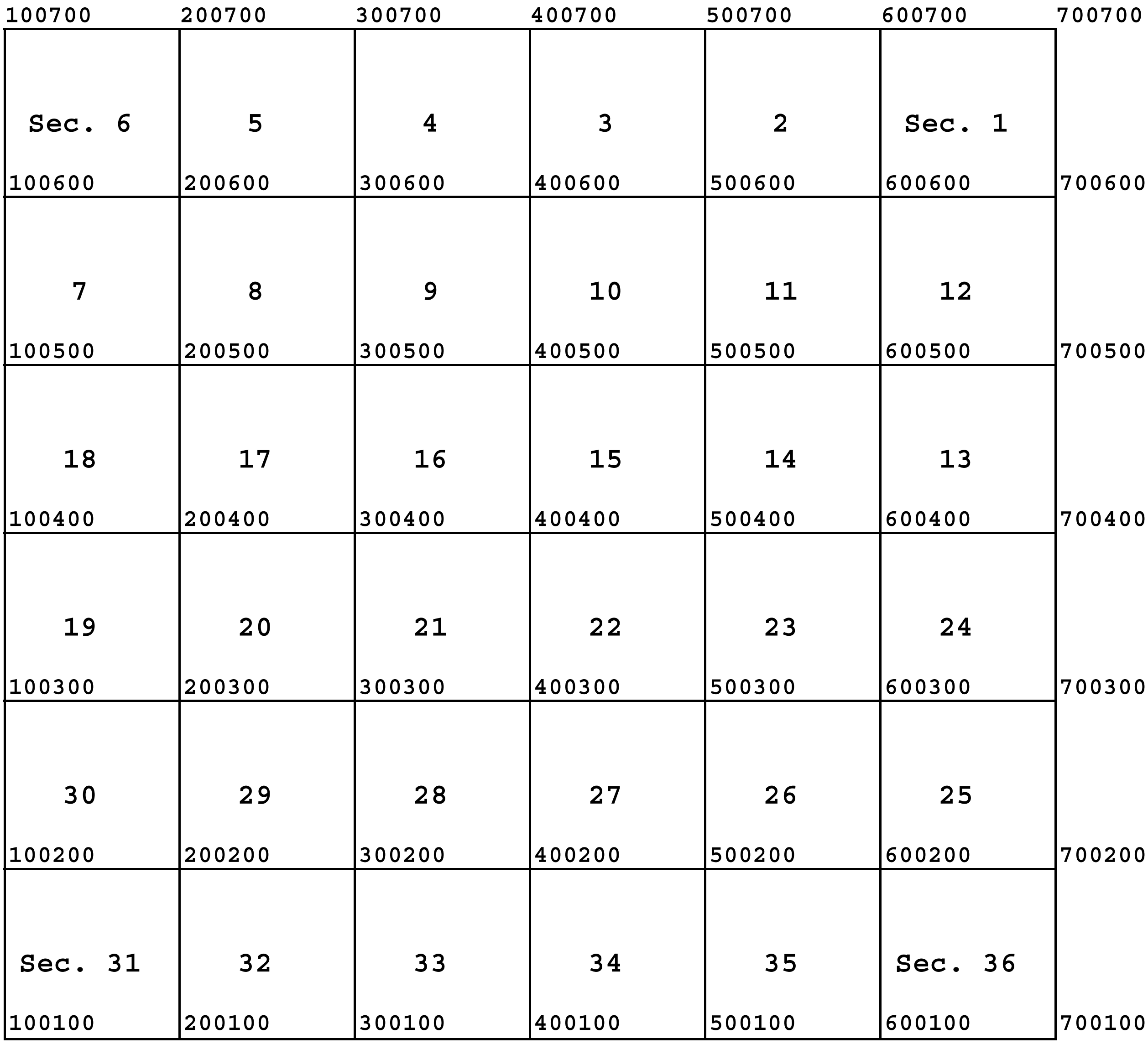
The geographic coordinates are computed using the North American Datum 1927 (NAD27). With the deployment of NILS, all existing data will be converted to NAD83, and future calculations will take place in that datum.

The data obtained from this computer software provides the theoretical positions of PLSS corners. The information is used primarily for a Geographic Information System (GIS) type environment to give the relationship of the townships to a point on the earth's surface. These geographic positions should never be used to replace lost or missing PLSS corners. Refer to the Manual of Surveying Instructions, 1973 for official survey procedures.

For additional information concerning the GCDB, contact the Contact Specialist in the BLM IAC or the State Data Administrator. Detailed information can be obtained from the GCDB staff in the Nevada State Office, (775) 861-6400.

PLSS Corner Identification

PCCS, GMM and NILS utilize a six digit, fixed length, numerically logical point identification code for all PLSS corners. The following diagram illustrates the point ID (PID) scheme used to identify the section corners of a standard township:

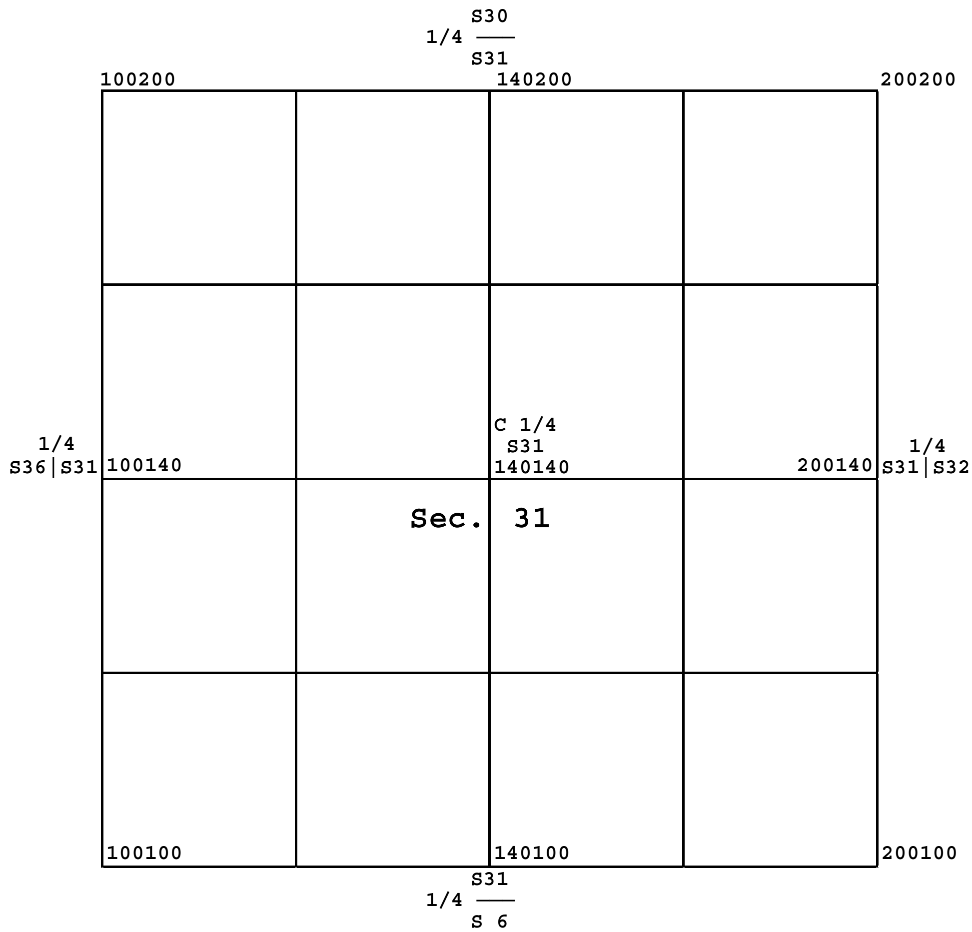


The user will note that a grid of 7 north-south and 7 east-west lines has been constructed. The *prefixes* of the north-south lines begin with the number 100, on the westernmost line, beginning with Section 31, and increase in 100 unit increments as the lines proceed easterly, to the easternmost line, which is identified by the prefix of 700, on the east boundary of Section 36.

The 7 east-west lines begin with a *suffix* of 100, at the southernmost line in the township, beginning with Sections 31-36, and increase in 100 unit increments, to the northernmost line, which is identified by the suffix of 700, in Sections 1-6.

One-Quarter Section Corner Identification

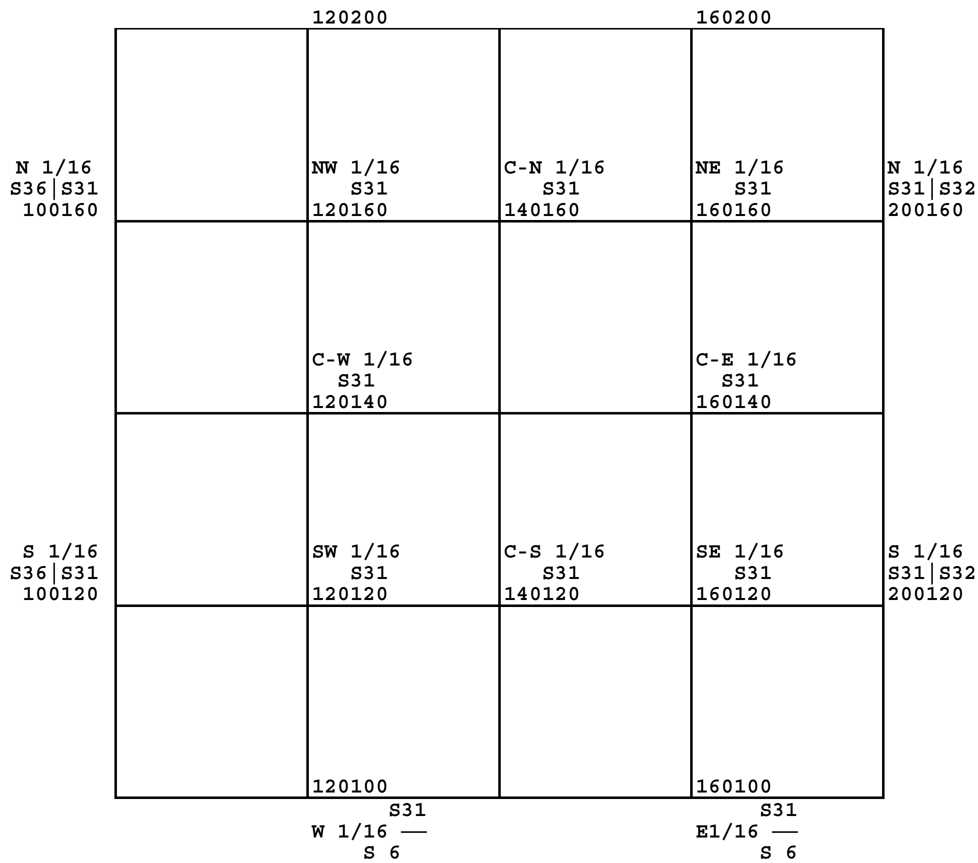
The previous set of point IDs is utilized to define the four corners of specific sections within a township, but a further dissection is necessary if PLSS corners are to be identified which were created in the subdivision of sections. The following diagram illustrates the point ID scheme used to identify 1/4 section corners created in the subdivision of a standard section. Section 31 will be used to demonstrate this strategy:



The user will notice that the four 1/4 section corners of section 31 are located at midpoint between respective section corners, and that the 1/4 section corners that fall on the east-west lines are identified with the **prefix** 140yyy, while the north-south lines have 1/4 section corners are identified by a **suffix** of xxx140.

One-Sixteenth Section Corner Identification

The following diagram of Section 31 illustrates the point ID scheme used to further identify 1/16 section corners created in the subdivision of a standard section.



This next division identifies 1/16 section corners, which are located at midpoint between respective 1/4 section corners. Notice that the south 1/16 section corner, on the west boundary of section 31 is identified with the **suffix** of xxx120. A standard section will identify eight exterior 1/16 section corners, and eight interior 1/16 section corners as illustrated. Further subdivision of sections is possible which identifies subdivisional corners subdivided below 1/16 section corners, using this same strategy for point identification.

Non-Rectangular Surveys in GCDB

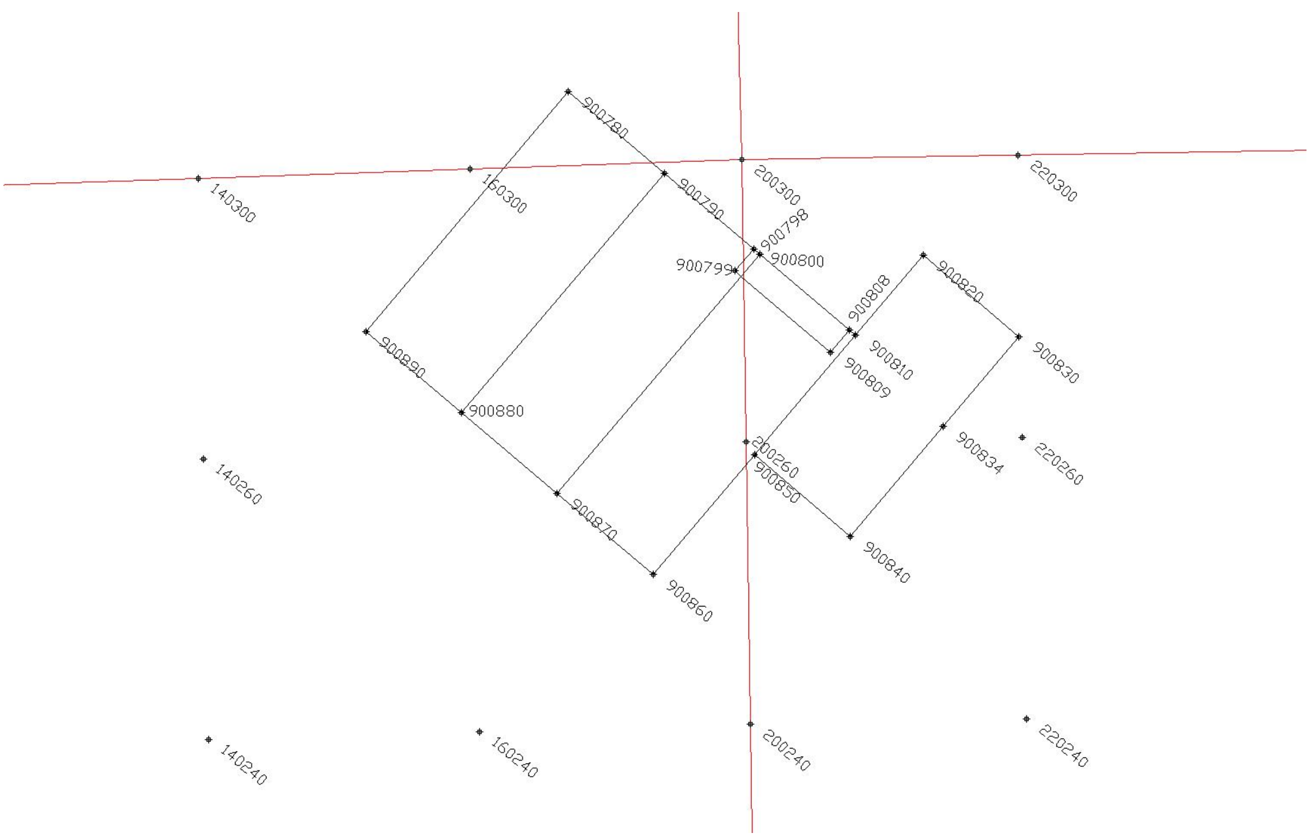
The previous section dealt with standard rectangular point IDs, but GCDB also identifies PLSS corners which fall outside the rectangular survey system. **Non-Rectangular surveys**, as the term is used in GCDB, includes meanders, small holding claims, grant boundaries, reservation boundaries, mineral surveys, homestead entry surveys, tracts, etc. These non-rectangular surveys have been broken down into four categories:

1. Boundaries with Mileposts
2. Meanders
3. Tracts
4. Mineral Surveys, Homestead Entry Surveys (HES), etc.

The following list identifies point ID prefixes 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 Entry Surveys, etc.

An example of Mineral Survey Point ID's:



FILE NAMING AND FORMATS

PCCS Files

The following list describes the most important files which were created by the PCCS process and a brief description of their contents:

File Names are usually 7 characters with a maximum of 8 characters and have no extension except the SCRIPT file (see below).

?ttN/SrrE, (e.g., R20N20E) where **?** is:

- R - Raw data file contains bearings and distances, with Source Identification Document (SID) code.
- B - Boundary transfer file. (Adjusted coordinates)
- C - Contains those coordinates used as control for the adjustment process of a particular township, expressed in latitude, longitude, and Cartesian coordinates.
- U - Final coordinates expressed in Universal Transverse Mercator (UTM) format.
- L - File with PID's, latitude, longitude, mean state elevation, reliability (average and maximum), and UTM coordinates.

tt	is the township number
N/S	for north or south
rr	is the range number
E	for east.

Half townships and half ranges are designated with a 2 added to the township or range number. R012N69E is the RAW file for T 1½ N R 69 E, and U37N232E is the UTM file for T 37 N R 23½ E. There are 9 instances in Nevada of townships designated as ½ township-½ range. Only one of these is still in PCCS format, and the file names for that one township (?412N232E) have been changed to exceed the 8 character limit.

SCRIPT File

TttN/SrrE.SCR (e.g., T20N20E.SCR)

AutoCAD Script File, used for graphics representation using AutoCAD software.

The files are text files and have internal formats as follows:

R-File

R-file The R-File contains distance, bearing, and source ID, used to compute coordinates from one point to another within a township. (Some of the oldest PCCS files do not have a Source ID column.)

SAMPLE R-FILE (R44n56e)

```
    TWP 44N   RNG 56E   PM Mnt Diablo     Nevada(NV)   DATE 92/02/25
    999999← start of file mark
  **700100   700137   40.000  4     2100.  R0533:0099
    700137   700140    0.180  4     2100.  R0533:0099
    700140   700157   19.820  4      500.  R0533:0099
    700157   700177   20.000  4      500.  R0533:0099
    700177   700200    0.330  4      500.  R0533:0099
    700200   700217   19.670  4      500.  R0533:0099
    700217   700237   20.000  4      500.  R0533:0099
    700237   700240    0.480  4      500.  R0533:0099
    700240   700257   19.520  1     2700.  R0533:0099
    700257   700277   20.000  1     2700.  R0533:0099
    700277   700300    0.420  1     2700.  R0533:0099
    700300   700317   19.580  1      400.  R0533:0099
    700317   700337   20.000  1      400.  R0533:0099  ← Source ID1
    700337   700340    0.580  1      400.
    700340   700357   19.420  1      900. ← Bearing (900 = 00°09'00")
    700357   700400   20.680  1
    700400   700440   40.100  1  ← Quadrant (1=NE 2=SE 3=SW 4=NW)
    700440   700464   28.300
    700464   700500   11.660   ← Distance in Chains
    700500   700540
    700540   700600    ← Course from PID to PID
    ...
    999998← end of file mark
```

****Explanation of first data entry line above:**

From point id 700100 (the cor. of Tps. 43 and 44 N., Rs. 56 and 57 E.) to PID 700137 (the ¼ sec. cor. of sec. 31, T. 44 N., R. 57 E.) 40.00 chains distance at a bearing in quadrant 4 of 21' 00" (N 0° 21' 0" W)

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1. Source ID (SID):

Refers to a volume and a page number in a BLM field note record.

"R" refers to a rectangular Contract or Group survey record.
"M" refers to a Mineral Survey record.
"H" refers to a Homestead Entry Survey record.
"I" refers to a survey record of an Indian Reservation.
"B" refers to a State boundary survey.

L-File

The L-File has PID's, latitude, longitude, mean state elevation, reliability (average and maximum) and UTM coordinates.

SAMPLE L-FILE

```
TWP ??N   RNG ??E   PM Mnt Diablo   Nevada(NV)   DATE 92/02/28

100100 391718.9492 1192029.4353  6000.00 105  243  1 0 2  298054.33 4351208.51
100120 391732.0948 1192029.5571  6000.00 108  376  1 0 3  298061.90 4351613.88
100140 391745.2401 1192029.6792  6000.00 108  376  1 0 3  298069.47 4352019.24
100160 391758.3856 1192029.8010  6000.00 108  376  1 0 3  298077.05 4352424.61
100200 391811.5310 1192029.9230  6000.00  40   40  1 0 3  298084.63 4352829.98
100220 391824.4878 1192029.9934  6000.00 108  376  1 0 3  298093.29 4353229.50
100240 391837.4445 1192030.0640  6000.00 108  376  1 0 3  298101.94 4353629.02
100260 391850.4013 1192030.1345  6000.00 108  376  1 0 3  298110.61 4354028.54
100300 391903.3580 1192030.2050  6000.00  40   40  1 0 3  298119.27 4354428.06
100320 391916.4178 1192030.3637  6000.00 108  376  1 0 3  298125.90 4354830.81
100340 391929.4775 1192030.5225  6000.00 108  376  1 0 3  ↑
100360 391942.5373 1192030.6812  6000.00 108  376  1 0 3  └─ UTM Coordinates
100400 391955.5970 1192030.8400  6000.00  40   40  1 0 3     (metric)
100420 392008.6386 1192030.7719  6000.00 108  376  1 0 3
100440 392021.6803 1192030.7038  6000.00 108  376  ↑
100460 392034.7219 1192030.6356  6000.00 108  376  └─ Pen codes for graphics[2]
100500 392047.7636 1192030.5675  6000.00 108  376
100520 392100.8052 1192030.4994  6000.00 108  376  ←Reliability[3]
100540 392113.8468 1192030.4313  6000.00
100560 392126.8884 1192030.3631  6000.00  ← State mean elevation
100600 392139.9300 1192030.2950
100620 392152.9847 1192030.1274  ← Latitude and Longitude
100640
100660  ← Point ID
```

2 The pen codes are a remnant of old technology, and consist of three columns:

First column	line number
Second column	line color
Third column	pen commands

2	pen down (start new line)
3	continue
4	pen up (finish line)

3 Reliability is indicated by two values. The first value is the average distance in feet and the second value is the maximum distance in feet that points adjusted for a particular survey. Control points in PCCS do not adjust and will have the same average and maximum reliability as shown below.

1	1	(ft.) 3rd order control or better
10	10	(ft.) 4th order control
40	40	(ft.) Digitized control points from 7 1/2 min. USGS quads.
100	100	(ft.) Digitized control points from 15 min. USGS quads.

GMM SECTION

The following list describes some of the files which are created by the GMM process using the method of least squares analysis and a weighting process with initial error estimates based on the year of the survey.

File names have the general format of: TttN/SRrr.eee (i.e., T20NR20E.RAW) where

- tt is the township number
- rr is the range number
- eee is the extension as follows:
  - . CON Control available, typically from National Geodetic Survey (NGS, formerly U.S. Coast and Geodetic Survey (USC&GS), U.S. Geological Survey (USGS), Nevada Department of Transportation (NDOT) and digitized found corners from USGS quadrangle maps 7 1/2 and 15 min. series).[4]
    - This file is similar to the CttN/SrrE in PCCS.
  - . COR Coordinates in feet listed by PID.
    - See the .DEF file for State Plane Zone.
  - . DEF The Definition file for GMM. Sets parameters for use by GMM software, prominent among which is the State Plane Zone used by GMM for calculations.
  - . DXF AutoCAD file, used for graphics and hard copies using AutoCAD, ArcMap and other software. DXF files use either State Plane coordinates in feet, or Universal Transverse Mercator (UTM) coordinates in meters. These files are not coded for projection system, but examination of coordinate values can be used to determine the projection. State Plane values for northing are less than 2,700,000, and the northings for UTM are greater than 3,800,000.
    - This file replaces the .SCR file of PCCS
  - . LX latitude, longitude, elevation, accuracy indicators, pen commands and coordinates expressed in Universal Transverse Mercator (UTM) format. (Nevada is in Zone 11)
    - This file is identical with the LttN/SrrE in PCCS.
  - . PGC File containing latitude, longitude, state mean elevation (6000 ft.), accuracy indicators and tangent plane coordinates in chains.
    - This file is identical with the XttN/SrrE in PCCS.
  - . RAW Contains point ID's, distance, bearing, and source ID, used to compute coordinates from one point to another within a township.
    - This file is identical with the RttN/SrrE in PCCS.
  - . SID Source Identifier file. Contains the Roll and page identifier, the error estimate and description for each survey. (See footnote 1 on page 7.)
  - . UTM latitude, longitude, elevation, accuracy indicators, and coordinates expressed in Universal Transverse Mercator (UTM) format. (Nevada is in Zone 11)
    - This file is identical with the UttN/SrrE in PCCS.

Half townships and half ranges are designated with an H replacing the township or range (T or R) designation. H37NR43E.eee is for T 37 ½ N R 43 E, and T13NH31E.eee is for T 13 N R 31 ½ E. There are 9 instances in Nevada of townships designated as ½ township-½ range. The eight of these that are in GMM format use a double H coding, for instance H03NH51E.eee, or format similar to PCCS, such as T0062N0472E.eee.

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4 Control:

Control points are allowed to move as much as 3 times their error estimates.

Typical error estimates:

- .001 (ft.) 3rd order control or better. These control point values do not move in the Least Square Analysis.
- 5. (ft.) 4th order control
- 25 (ft.)digitized control points from 71/2 min. USGS quads.
- 50 (ft.)digitized control points from 15 min. USGS quads.

SAMPLE FILES

.COR file --

```
 100100               688111.535   2417980.301
 100700               688120.379   2418085.995
 200100               693376.133   2418008.509
 200700               693375.706   2418061.014
 300100               698741.889   2418045.397
 300700               698741.769   2418059.849
 400100               703898.934   2417761.512
 400700               703896.392   2418057.970
 500100               709134.025   2417789.453
 500700               709131.673   2418056.805
 600100               714369.173   2417818.395
 600700               714367.024   2418056.772
 700100               718091.286   2417774.392

 160700               692056.997   2417997.290
 220700               694694.996   2418019.768
 260700               697377.873   2418038.215
 320700               700032.949   2418059.271
 360700               702612.576   2417786.679
 420700               705207.790   2417768.360
 460700               707825.335   2417782.320← State Plane Northing (ft)
 520700               710443.043
 560700               713060.617← State Plane Easting (ft)
 620700
 660700 ← Point ID
```

.DEF file --

```
Y
  33 NEVADA EAST MERCATOR  ← State Plane Zone
1
2
   6000.000← Mean elevation (ft)
N
Y
       .100      200.0
        4.0                ← Default error estimates
       30.0
     25.000
     25.000
Y
       .000
         .0
         .0
Y
N
N
Y
H40NR63E
MDM     ← Principal Meridian
NV
 11← UTM Zone
```

.PGC-file The .PGC-File contains point ID's, latitude, longitude, mean state elevation, accuracy indicators and UTM coordinates.

```
TWP 16N   RNG 20E   PM Mnt Diablo       Nevada(NV)   DATE
ORIGIN    391440.0000 1194356.0000 6000.000   0    0  2000.0000 5000.0000
 700100    391203.5896 1194035.3435 6000.000  12   12  2239.4107 4760.2346
 700140    391229.7929 1194035.3026 6000.000 126  127  2239.4348 4800.4145
 700200    391255.9962 1194035.2616 6000.000 126  127  2239.4590 4840.5944
 700240    391322.1620 1194035.3573 6000.000 126  127  2239.3202 4880.7168
 700300    391348.3277 1194035.4529 6000.000  53   53  2239.1814 4920.8393
 700340    391414.5026 1194035.4277 6000.000  54   54  ↑
 700400    391440.6774 1194035.4024 6000.000  54   54  └─ tangent plane
 700440    391506.2502 1194035.7857 6000.000  ↑          coordinates in chains
 700500    391531.8230 1194036.1690 6000.000  └─ Accuracy Indicators
 700540    391558.4227 1194035.7319 6000.000
 700600    391625.0225 1194035.2949 6000.000   ← State mean elevation
 700640    391651.1307 1194035.4386
 700660    391704.1793 1194035.4745   ← Latitude and Longitude
 700700
 600100   ← Point ID
```

.RAW file The .RAW file contains point ID's, distance, bearing, and source ID, that are used to compute coordinates from one point to another within a township. This file is identical with the RttN/SrrE in PCCS.

```
T44NR56E            MDM                NV
999999← start of file mark
200100   200110   13.450  4      400.0 R0448:0019
200110   200120   20.000  4      400.0 R0448:0019
200120   200140   20.000  4      400.0 R0448:0019
200140   200200   40.000  4      400.0 R0448:0019
*200200  200240   40.000  4      400.0 R0448:0019
200240   200300   40.000  4      400.0 R0448:0019
200300   200340   40.000  4      400.0 R0448:0019 ← Source ID see note 1 p 7
200340   200400   40.000  4      400.0
200400   200440   40.160  1     2400.0 ←Bearing (2400.0 = 0°24'00.0")
200440   200500   40.030  1
200500   200540   40.030  1   ← Quadrant (1=NE 2=SE 3=SW 4=NW)
200540   200600   40.040
200600   200640   40.000  ← Distance in Chains
200640   200660
200660   200700   ← Point ID (From PID to PID)
...
999998← end of file mark
```

***Explanation of data entry line above:**

From point id 200200 (the SW cor. of Sec 29) to PID 200240 (the ¼ cor. of Secs. 29 and 30) 40.00 chains distance at a bearing in quadrant 4 of 4' 00" (N 0° 4' 0" W)

.SID file The .SID-File contains source ID codes, error estimates and descriptions

```
SR0272:0000           .100 10000.0  3600.0
C  GLO 10-NOV-1882 01 MYRICK, WK
C  NORTH, EAST, SOUTH & WEST BOUNDARIES
SR0272:0220           .100 10000.0  3600.0
C  GLO 10-NOV-1882 01 MYRICK, WK
C  SUBDIVISION
SPD176:U081           .100 40000.0 14400.0
C BLM 22-JAN-1964 09
```

Where:

S…← ***Indicates line is a SID line***

`SR0272`← ***Roll designation in field note records***

`SR0272:0220`← ***page number of beginning of field note record***

`SR0272:0000           .100`← ***Distance error estimate constant***

`SR0272:0000           .100 10000.0`← ***Distance error estimate parts per million***

`SR0272:0000           .100 10000.0  3600.0`← ***Angular error estimate (seconds)***

`C  GLO 10-NOV-1882 01 MYRICK, WK`← ***Comments***

.UTM file The .UTM-File contains point ID's, adjusted latitude and longitude, accuracy indicators[5] and UTM coordinates.

```
   TWP 16N   RNG 20E   PM Mnt Diablo           Nevada(NV)   DATE 92/02/19
ORIGIN    391440.0000 1194356.0000 6000.000   0    0  264204.144347253.13
700100    391203.5896 1194035.3435 6000.000  12   12  268872.594342286.82
700140    391229.7929 1194035.3026 6000.000 126  127  268897.444343094.70
700200    391255.9962 1194035.2616 6000.000 126  127  268922.304343902.59
700240    391322.1620 1194035.3573 6000.000 126  127  268943.864344709.42
...
600100    391203.6136 1194142.5178 6000.000  37   37  267261.034342335.34
600140    391229.7023 1194142.5706 6000.000  87   86  267283.704343139.76
600200    391255.7910 1194142.6233 6000.000  87   86  ↑
600240    391321.8949 1194142.7316 6000.000  87   86  └──UTM Coordinates
600300    391347.9987 1194142.8398 6000.000  49   49        (Meters)[6]
600340    391414.2938 1194142.7800 6000.000  83   83
600400    391440.5888 1194142.7202 6000.000  83   83
600440    391506.7067 1194142.7401 6000.000  83   83 ← Accuracy Indicators
600500    391532.8247 1194142.7601 6000.000
600540    391558.9713 1194142.3971 6000.000    ← State mean elevation
600600    391625.1180 1194142.0341
600640    391651.2135 1194142.0285    ← Latitude and Longitude
600660
600700     ← Point ID
```

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5 The accuracy indicators are the radii in the north and east directions of the error ellipse generated by the least squares adjustment process.

6 These are easting and northing run together with no space between. They carry 2 decimal places, and the northing begins with column 65.