FORWARD

County Assessors must produce fair and accurate tax assessments. It is the role of the County mapping staff to produce assessor's maps that are uniform, clear, complete and accurate at a reasonable expense. The mapping standards in this report are intended to add clarity and standardization, and to eliminate unnecessary information.

It is not the intent of this document to serve as a drafting manual that incorporates instruction in map-drawing techniques, nor is it intended to serve as a GIS technical manual. The Property Tax Division (PTD) does offer specific drafting instruction and GIS technical support (depending on the software a county uses) to county employees engaged in mapping functions and GIS.

The intention of the manual is to assist a county assessor in producing high-quality maps and/or an accurate parcel layer in a GIS format that will provide taxpayers **fair and equitable assessments**.

Should you have further comments and suggestions relative to this specific manual or require technical assistance, please either contact or e-mail the following individual(s) listed below:

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CHAPTER 1: INTRODUCTION

Assessors' maps or parcel layers in a Geographic Information System (GIS) are foundations in the assessors' record systems. Deeds and surveys provide legal descriptions for assessing all parcels of real property for tax purposes. Without assessment maps or digital parcel layer, assessors cannot be sure all property is identified and appraised. Maps and related data provided by the assessors are very beneficial to communities. They provide support for other county departments and generate products for assisting a variety of agencies, firms and individuals.

All basic information should be checked and used in plotting or digitizing each parcel, given the inaccuracies of surveys. The information should be checked and fit together the best possible way. Inaccuracies should be indicated on maps and on property record cards. Caution should be taken when inaccuracies occur. Mappers and assessors do not have the power or authority to correct inaccuracies on deeds or surveys. Courts or the parties involved may correct inaccuracies; however if possible, mapping offices should avoid involvement. Instead, inaccuracies should be noted and owners should be notified.

The International Association of Assessing Officers (IAAO) defines the assessment map as[1]:

> "a graphic representation of a portion of the earth's surface that shows the delimitation of parcels of land and indicates the relative size and position of each parcel in relation to other properties, roads, streams and other major physical and cultural features. It is drawn to an appropriate scale and displays dimensions and areas, with identifying parcel numbers."

As electronic technology progresses, manual mapping will soon become obsolete. A GIS will be in every New Mexico County Assessor's office. GIS is defined in a later chapter of this manual as "… a computer based tool for mapping and analyzing things that exist and events that happen on earth." (ESRI) GIS technology integrates graphical data and a common database, which allow

assessors to query and analyze data. This progression helps assessors' offices to become more efficient by encouraging communication and data sharing with everyone involved in parcel mapping. The role of mapping in the modern assessment office relates directly to the ability to accurately reflect the location, size and shape of each parcel.

GIS allows assessors offices to efficiently maintain maps and keep data current. In addition the digital format of data in a GIS makes assessor's records available to the public through Internet access.

It must be understood that assessment maps represent only one component of valuation systems. Assessment map systems must be designed, constructed and regularly **maintained** to render full support to all activities of assessors.

To reach their full potential as assessment tools, mapping systems must:

1. Locate all parcels
2. Delineate boundaries
3. Identify the legal owners
4. Provide unique identifiers or coding (UPC)
5. Provide an inventory of all parcels
6. Provide for convenient updating and maintenance
7. Provide for easy reproduction
8. Provide a graphic format appropriate for assessment uses.

[1] International Association of Assessing Officers (IAAO). 1997 *Course 600-Principles and Techniques of Cadastral Mapping*.

CHAPTER 2: GEODETIC DATUMS, MAP PROJECTION, COORDINATE SYSTEMS AND MAP DATA

It is essential for county mappers to locate parcels and define their boundaries. Before automating data, you must determine an appropriate datum and map projection. You must determine how the data will be referenced, what units will be used and establish a set of control points in a common coordinate system (ESRI 1994[1]). When implanting the above mentioned data remember that the UPC is determined by using feet. Required formats of digital data that assessors must submit to PTD are in this chapter.

Geodetic datum defines the size and shape of the earth and the origin and orientation of the coordinate systems used to map the earth. Map projections are techniques for transforming the three-dimensional sphere of the earth into the two dimensions of a map (Figure 2.2). Many systems provide location information for a given point on the earth, or a coordinate. There are many different coordinate systems, based on a variety of geodetic datums, units, projections and reference systems in use today (Dana[2]). One of the best-known coordinate systems is latitude and longitude. The original development of the system is unknown, but many historians attribute the initial concept to Phoenician or Egyptian navigators. Latitude and longitude may be used for parcel identification, although, there are other planar (x, y) systems that involve much simpler calculations than the curvilinear geometry of latitude and longitude. Two planar systems are discussed in this chapter they are; Universal Transverse Mercator and State Plane Coordinate System.

[1] Environmental Systems Research Institute (ESRI), Inc. *Map Projections*. 1994
[2] Dana, Peter H., The Geographer's Craft Project, Departments of Geography, The University of Colorado at Boulder. 1995 http://www.colorado.edu/geography/gcraft/notes/

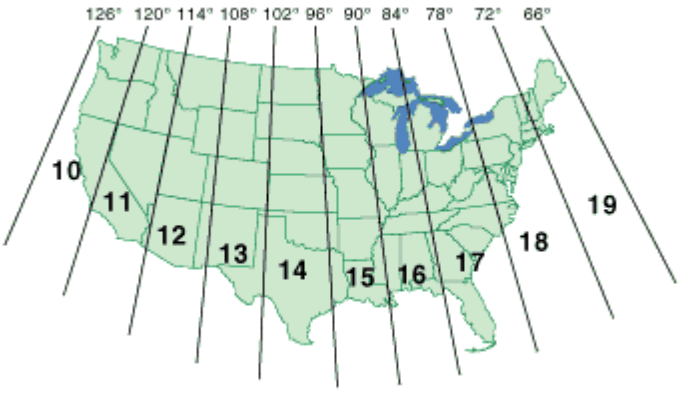
The three (3) basic methods of survey are: metes-and-bounds, Public Land Survey System (PLSS) and coordinates. Metes-and-bounds and the PLSS are the most widely used methods in New Mexico. The above methods are described in this chapter.

GEODETIC DATUMS

Geodetic datums are a reference system to measure positions, compute distances and direction and produce maps, charts and precise surveys. Many different datums, since Aristotle's estimation of the earth's size, have evolved in recent years due to the use of space-based technologies, such as the Global Positioning System (GPS). There are two types of datums, horizontal (latitude and longitude) and vertical (elevation). For the assessors' data we are concerned with the horizontal datum. Datums are an important factor in mapping in a GIS. Geodetic coordinates referred to the wrong datum can result in position errors of hundreds of meters. This chapter will discuss the horizontal datum in which the assessor's data must be when delivering to PTD.

Hundreds of geodetic datums are in use around the world. Most civilian geospatial activities in the United States use the North American Datum of 1983 (NAD83), Figure 2.1, rarely, its now-outdated predecessor, NAD27. ***Assessors are required to reference their submitted data in NAD83***. Furthermore, whenever possible, the most current version of NAD83, as described below should be utilized.

Figure 2.1: Map of the United States Showing North American Datum Zones.



There are presently two slightly different versions of the NAD83 datum in use in New Mexico. Another revision is likely to be performed in the coming years. Users should be particularly careful of identifying/specifying which version they are utilizing. These datum versions are identified by specifying the year in which the adjustment was performed, by the National Geodetic Survey, to determine the published coordinates for points in the National Spatial Reference System. The original version of NAD83 is referred to as NAD83 (1986). Subsequent to the completion of the original adjustment, GPS was used to improve the accuracy of the network and the updated version is referred to a NAD83 (1992) (in New Mexico; the adjustment year varies from state to state). The improved version of NAD83 is known as the High Accuracy Reference Network (HARN) or High Precision Geodetic Network (HPGN) – two names that mean the same thing. It is important to note that these different versions are all NAD83, they are the same datum, simply representing minor refinements to the reference system.

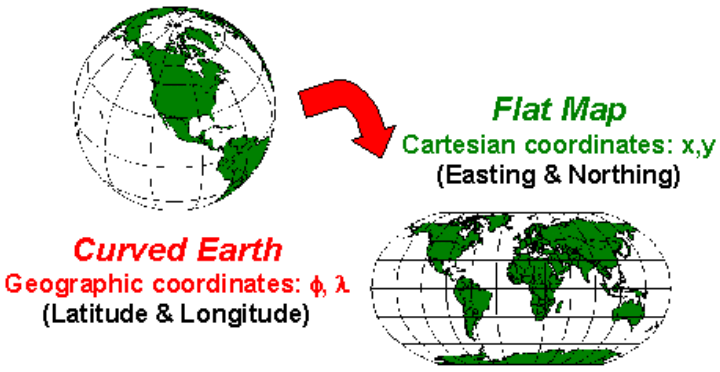
Using a current version of NAD83, the county will be consistent with continuously operating reference GPS stations, and consequently consistent when receiving digital plats and surveys from surveyors.

MAP PROJECTIONS

Since the earth is round and a map is a flat surface, it is impossible to produce a map that combines true shape, true bearing and true distance. Because a cartographer cannot map true shape, true bearing and true size, the cartographer is then faced with mapping distortions. The cartographer has the choice of what distortion to have on the map however. Map projections allow the cartographer to map a spherical surface onto a flat surface mathematically with some distortions. Regardless of what type of projection is used, it is inevitable that some error or distortion will occur in transforming a spherical surface into a flat surface. Ideally, a distortion-free map has four valuable properties (Zuuring):

- Conformality
- Equivalence
- Equidistance
- True direction\

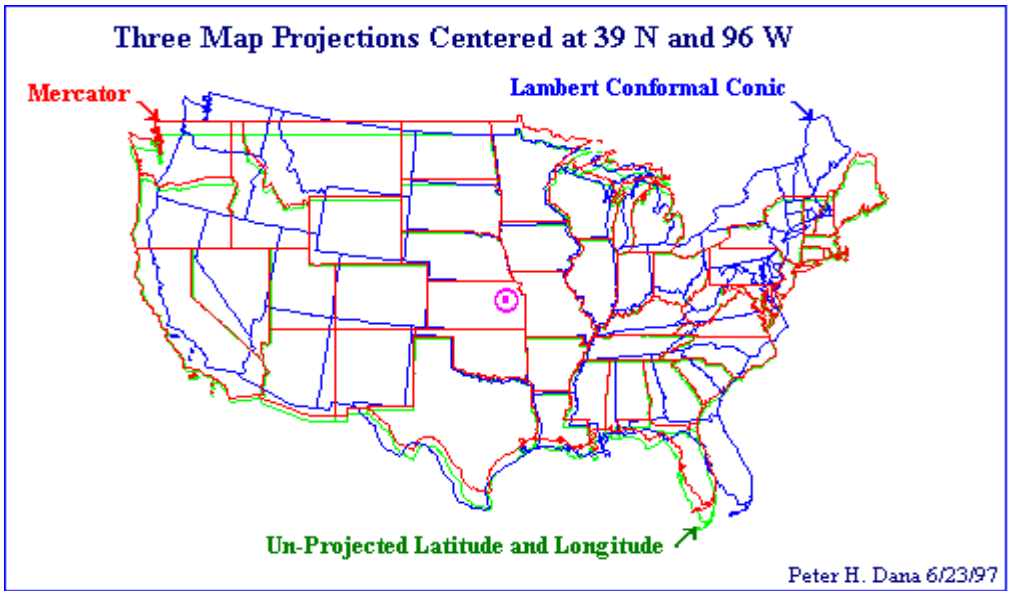
Figure 2.2: Map Projections[3]



Map projections require a point of reference on the Earth's surface. Most often this is the center, or origin, of the projection. This point is defined in two coordinate systems: spherical or geographical (lat, long) and rectangular or planar (x,y). These two coordinate systems are described in the next section.

There are several projection types. Choosing a projection is dependent on the size and shape of the surface being mapped. Figure 2.3 illustrates three different projections of a map. ***The assessors are required to submit the county data in a Transverse Mercator projection, or un-projected (geographic format)***. *All data submitted will have this information attached to it.*

Figure 2.3: Three Map Projections on a Map of The United States[4].



To understand how the projection works, imagine the earth as an orange, with geographical features and the parallels and meridians already drawn in. Now imagine taking a knife, and after slicing off small circles at the poles, make a straight north-south cut in the peel of the orange and repeat this north-south cut at equal intervals until 60 strips or zones have been detached. Each of these zones forms the basis of a separate map projection. The flattening may be envisioned by again considering the detached zone as a strip of orange peel placed on a level surface. By depressing its center, one could force the peel to flatten until all of it touches the smooth surface. This flattening

[3] Maidment, David R., and Wilson, Lesley H. 1998 *Implementation of GIS in Chemical Risk Assessment.*

action causes, a slight distortion of the geographical features within the zone, but because the zone is relatively narrow, the distortion is small and may be ignored by most map-users.

Transverse Mercator Projection

Transverse Mercator projections result from projecting the sphere onto a cylinder tangent to a central meridian. Transverse Mercator maps are often used to portray areas with larger north-south than east-west extent. Distortion of scale, distance, direction and area increase away from the central meridian. (Dana 1995) This projection is best if used in the State Plane Coordinate System.

Universal Transverse Mercator (UTM)

Universal Transverse Mercator (UTM) projection is used to define horizontal, positions world-wide by dividing the surface of the Earth into six-degree zones, each mapped by the Transverse Mercator projection with a central meridian in the center of the zone. UTM zone numbers designate six-degree longitudinal strips extending from 80-degrees South latitude to 84-degrees North latitude. Figure 2.1 illustrates the UTM zones of the United States.

Eastings measure from the central meridian, with a 500km false easting to insure positive coordinates. Northings measure from the equator, with a 10,000km false northing for positions south of the equator. The section below describes UTM coordinates in detail.

Geographic Reference System/Un-Projected

The Geographic Reference System consists of latitude and longitude, it is not a map projection. It is the primary locational reference system for the earth. This system treats the globe as if it were a sphere. Specifying a location on the earth requires determining latitude, the

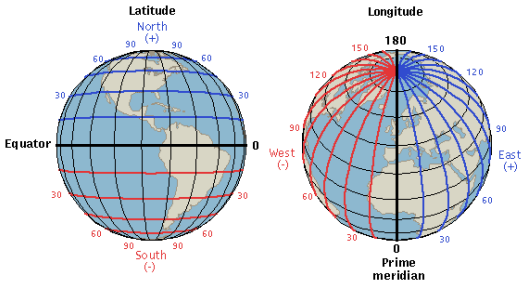
[4] Dana, Peter H., The Geographer's Craft Project, Departments of Geography, The University of Colorado at Boulder. 1995

north-south angular distance from the equator, and longitude, the east-west angular distance from a prime meridian (Figure 2.4).

COORDINATE SYSTEMS

To locate points precisely a coordinate systems must be used. Two coordinate systems are now in general use: spherical or geographic (latitude and longitude) and rectangular or planar (x, y). With spherical coordinate latitude and longitude of a central meridian, define the origin of the projection. Latitude and longitude are defined with respect to an origin located at the intersection of the equator and the prime meridian. The latitude and longitude coordinates are based on an un-projected sphere or geographic reference system (described in above section).

Figure 2.4: Globe Illustrating Latitude and Longitude, Prime Meridian and Equator



Rectangular coordinates, the origin of the projection is defined by values of false easting and false northing. These values are defined with respect to an origin (0,0) typically located south and west of the origin of projection. In practice, this eliminates negative rectangular coordinate value and allows locations on a map projection to be defined by positive coordinate pairs. Values of false easting are entered first and may be in meters or feet. (Zuuring[5]) The State Plane and Universal Transverse Mercator Coordinate Systems are examples of rectangular coordinates. These two systems are described below.

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http://www.colorado.edu/geography/gcraft/notes/

NEW MEXICO STATE PLANE COORDINATE SYSTEM

In 1937, the U.S. Coast and Geodetic Survey (now known as the National Geodetic Survey) began the state plane coordinate system and developed it on a state-by-state basis. New Mexico incorporated it into state statutes in 1957.

Basically, it is a survey that takes into account the curvature of the earth, which is more or less spherical. To minimize distortion the state is divided into three zones, which are defined along county lines: the "east zone" covering the eastern counties; "central zone" covering centrally located counties, and the "west zone" which includes the most western counties in the state.

Figure 2.5: Map of New Mexico Showing the State Plane Coordinate System Zones

Each zone has its own centrally located origin through which passes its own central meridian. A false easting established to the west and south of the zone at 165,000m for the east

[5] Zuuring, Hans http://forestry.umt.edu/academics/courses/for503/part4

zone, 500,000m for the central zone and 830,000m for the west zone. The correct form of written notation for State Plane Coordinates is to express, in order, the easting in feet, then the northing in feet. It may be helpful to remember that coordinates read "right-up." The units used are feet; recently metric equivalents have been published.

The State Plane Coordinate system uses bearings (or azimuths) referenced to the grid. These are simpler to work with than true geodetic quantities which involve more complicated calculations.

Universal Transverse Mercator (UTM)

Universal Transverse Mercator (UTM) coordinates define two dimensional, horizontal positions (Dana 1999[6]). UTM provides a constant distance relationship anywhere on the map. Like the State Plane Coordinate System, UTM coordinates are always positive. The false easting and northing is always located south and east. All UTM coordinates are measured in meters (Maptools[7]).

[6] Dana, Peter H., The Geographer's Craft Project, Departments of Geography, The University of Colorado at Boulder. 1995 http://www.colorado.edu/geography/gcraft/notes/

[7] http://www.maptools.com/UsingUTM/whyUTM.html January 2001

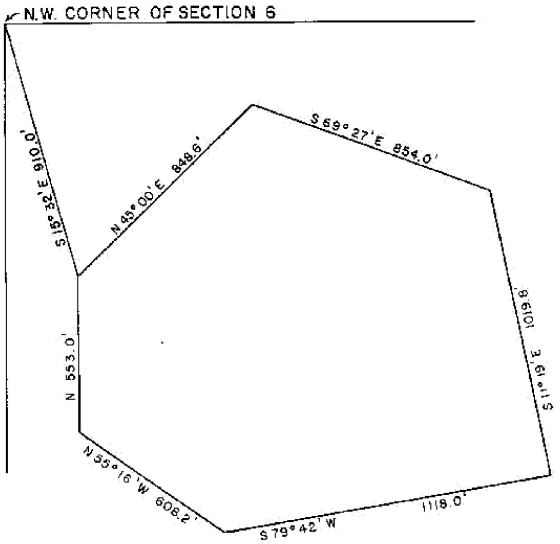
SURVEY METHODS

Metes-and-Bounds Survey System

Every legal description is based upon a survey of the land. One such survey system is the metes-and-bounds survey. Metes-and-bounds, or more literally, "measurements and boundaries," is the oldest-known manner of describing land.

Of prime importance in establishing a metes-and-bounds description is that a particular description must start from a known point (point of beginning) that is readily identified so that it can be re-located with certainty. Of equal importance, the description must close, that is, beginning at a known point and following the property description step-by-step, one must come back to the point and place of beginning. Known points termed "monuments" include such durable natural and/or manmade items as a marked wooden stake or post, a marked stone, an iron post having an inscribed cap, a marked tablet set in solid rock or in concrete block, a marked tree, a rock in place marked with a cross (x) at the exact corner point, or other permanent markers properly located and witnessed. This type of description measures the land in relation to its natural and cultural features (figure 2.6). Adjacent landowners, trees, rocks, rivers, arroyos, traveled ways, etc., are used to describe the extent or bounds of an individual ownership. Further, development of the metes-and-bounds description has been augmented by the evolution of surveying technology and equipment. Angles (bearings) and distances, or "metes" of boundary lines, were added to more permanently define the limits of ownership.

Figure 2.6: Metes and Bound Description



Beginning at a point, being the Northwest corner of this parcel, from which point the Northwest corner of section 6, T2lSRIE bears South 15° 32' East a distance of 910.0 feet. This information takes the survey to the point and place of beginning. Thence facing in the direction of Northeast the bearing is North 45° 00', East a distance of 848.6 feet. Thence facing in the direction of Southeast the bearing is South 69° 27' East going a distance of 854.0 feet. Thence facing the direction of Southeast the bearing is South 11°19' East for a distance of 1,019.8 feet. Thence facing Southwest the bearing is South 79° 42' West going a distance of 1,118.0 feet. Thence facing Northwest the bearing given is North 55°16' West for a distance of 608.2 feet. Thence facing due North the bearing is north for a distance of 553.0 feet. This last bearing brings the survey to the point and place of beginning and the parcel contains 40.006 acres more or less.

The advantage of the metes-and-bounds survey system is that it is useful in describing irregularly shaped land-ownership configurations, which cannot be normally described by other generally accepted methods of land description. Many early descriptions referred to monuments that lacked permanency, and surveyors failed to make their survey notes a matter of public record. This situation gave rise to frequent boundary line disputes and litigation. When the lines of an old survey are being relocated, or a discrepancy exists between two tracts, the following precedence (weight of importance) usually applies:

1. monuments (natural and man-made)
2. adjoining owners
3. distance
4. direction
5. size

United States Public Land Survey (USPLS)

The United States Public Land Survey (USPLS) or Rectangular System of Survey is the most widely used method in the United States to describe parcel boundaries. The USPLS begins with principal meridians and base lines. The lines of graticule are the framework upon which the USPLS is built. There are 35 principal meridians and 32 base lines in the United States. Some states, such as Colorado and Nebraska, share meridians and baselines. Below is a detailed description of the USPLS.

In the book ***Map Use***[8], Phillip and Juliana Muehrcke describe the United States Public Land Survey as:

> United States Public Land Survey (USPLS) plan called for regular and systematic partitioning of area into easily discernible parcels prior to settlement and required that all grants be carefully recorded.
>
> The USPLS was implemented in the Northwest Territories and subsequently in the remaining central and western states. The first step was to arbitrarily select an initial point. The parallel and meridian, which intersected at that point, were

[8] Muehrcke, P.C., and J.O. Muehrcke, 1992. "Map Use." 3rd ed., J.P. Publications.

determined by field survey. The parallel was called the baseline. The intersecting meridian was called the principal meridian.

Range lines were then surveyed along meridians at six-mile intervals north and south of the base line and township lines were surveyed along parallels at six-mile intervals east and west of the principal meridian. The 6 x 6 mile squares bounded by these intersecting township and range lines were called survey or congressional townships

Figure 2.7: Typical Township Showing Section Numbers

Typical Township – 36 square miles

6	*5*	*4*	*3*	*2*	*1*
7	*8*	*9*	*10*	*11*	*12*
18	*17*	*16*	*15*	*14*	*13*
19	*20*	*21*	*22*	*23*	*24*
30	*29*	*28*	*27*	*26*	*25*
31	*32*	*33*	*34*	*35*	*36*

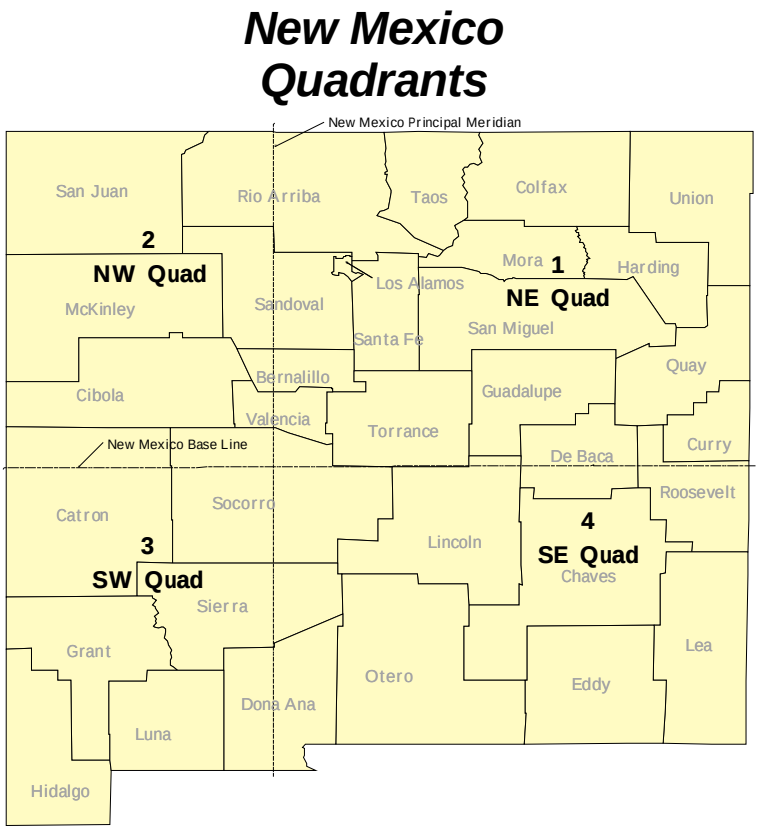
The surveyors encountered a problem, because the earth is round, meridians converge toward the North Pole and the effect of this meridional convergence is additive. Thus, the square township grid could not be extended indefinitely outward from the initial survey point without becoming distorted and the trouble became worse with increasing distance east and west of the principal meridian. In order to reduce the problem of unequal township dimensions to a practical level, standard parallels were established at every fourth range line. These standard parallels and guide meridians formed grid cells approximately 24 miles square. Within each cell, there were 16 idealized townships. Note the words "approximately" and "idealized," for each zone could not be an exact 24 x 24 mile square, nor could each township be truly six miles on a side.

But at least distortion could be limited by modifying each of the zones. The solution was to readjust the guide meridians along the standard parallels so that the southern boundary of each zone was actually 24 miles long. This correction was accomplished by offsetting the guide meridians along the standard parallels; for this reason, the term "correction line" is often used as a synonym for standard parallel. To further reduce the effect of converging meridians, new base lines were established.

New Mexico has one base line running east and west and one principal meridian running north and south which divides the state into quadrants (figure 2.8). To distinguish

New Mexico's meridian and base line from others in the country, they are officially referred to as the New Mexico Principal Meridian and the New Mexico Base Line. The two lines intersect in Socorro County in the vicinity of San Acacio.

Figure 2.8: Map and Table of New Mexico Showing Counties and Quadrants



COUNTY	**Quadrant**(s)	COUNTY	**Quadrant(s)**	COUNTY	**Quadrant(s)**
Bernalillo	1 & 2	Catron	2 & 3	Chaves	4
Cibola	2	Colfax	1	Curry	1
DeBaca	1 & 4	Dona Ana	3 & 4	Eddy	4
Grant	3	Guadalupe	1	Harding	1
Hidalgo	3	Lea	4	Lincoln	1 & 4
Los Alamos	1	Luna	3	McKinley	2
Mora	1	Otero	4	Quay	1
Rio Arriba	1 & 2	Roosevelt	1 & 4	San Juan	2
San Miguel	1	Sandoval	1 & 2	Santa Fe	1
Sierra	3 & 4	Socorro	1,2,3, & 4	Taos	1
Torrance	1	Union	1	Valencia	1 & 2

Philip and Juliana further describe the USPLS as[9]:

> In addition, each township was partitioned into 36 square-mile parcels of 640 acres, called sections. Every section was then given a number from 1 to 36, depending upon its position within the township. A section could be further divided into halves, quarters and similar fractional parts. With this system, the legal description of each land parcel is unique and unambiguous. If full details of the partitioning are given, a parcel can be located with impressive accuracy. (Figure 2.9)

The 60-acre piece of land, for example, would be described in abbreviated form as:

> The SE ¼ of the SE ¼ of the NW 1/4, also the W ½ of the SW ¼ of the NE ¼, also the E ½ of the NE ¼ of the SW ¼, also the SW ¼ of the NW ¼ of the SE ¼ of Section 15, Township 16 N, Range 2 W of the Principal Meridian.

To locate this parcel from its legal description, read the description backwards, beginning with the principal meridian and working back throughout the township and range, the section, and the fractional section.

It is important to note that, due to government surveying methods used in New Mexico before the turn of the century and because meridians converge at the poles, townships are not truly square, nor are all section lines truly north and south or east and west. A perfect section would be one-mile square or 640 acres. Again, the pinching effect of converging meridians on a round earth complicates the surveyor's job of laying out a square grid of townships. To systematize the distribution of shape and area distortions, all errors were put off to the western and northern tiers of sections within each township. The result was fractional lots which may depart radically from the ideal 640-acre sections. (Muehrcke, 1992[10])

[9] Muehrcke, P.C., and J.O. Muehrcke, 1992. "Map Use." 3rd ed., J.P. Publications.
[10] Muehrcke, P.C., and J.O. Muehrcke, 1992. "Map Use." 3rd ed., J.P. Publications.

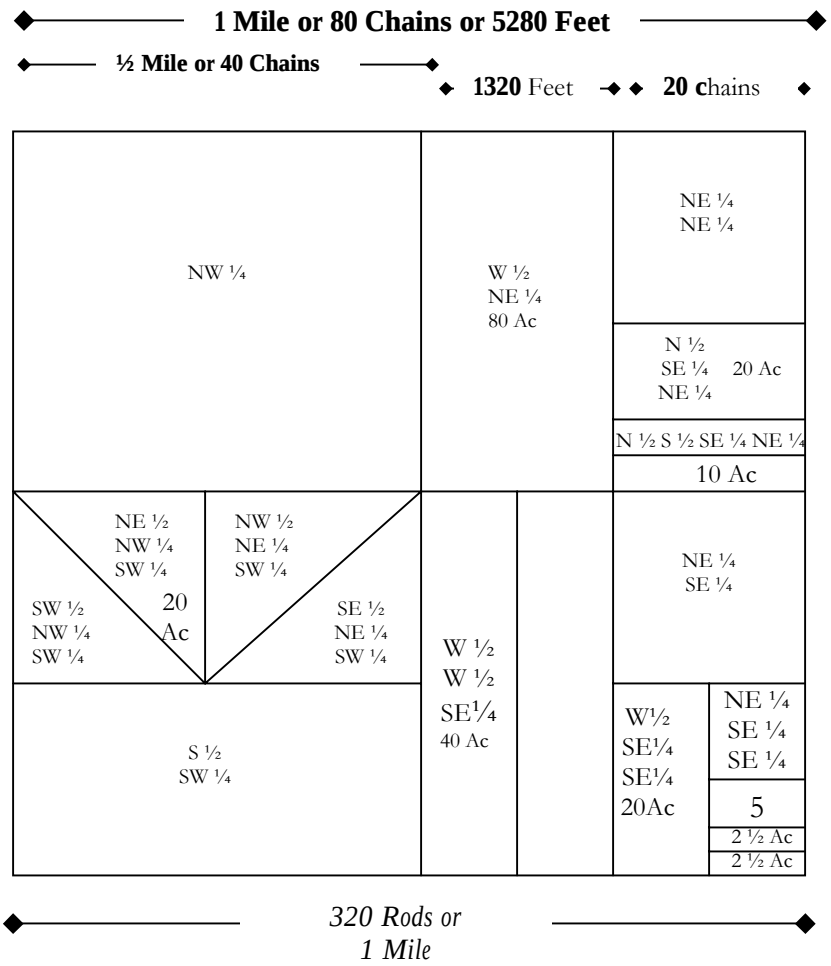
Figure 2.9: Rectangular Survey of a Section of Land

Linear Measure

7.92 inches	1 link
100 links	1 chain
4 poles	1 chain
66 feet	1 chain
80 chains	1 chain
320 rods or poles	1 mile
5,280 feet	1 mile

Square Measure

208.71 * 208.71 feet	1 acre
43,560 square feet	1 acre
16 square rods of poles	1square chain
10 square chains	1 acre
160 square rods or poles	1 acre
640 acres (one section)	1 square mile
36 square miles	1 township



AERIAL PHOTOGRAPHY

A major breakthrough in mapping occurred in the early part of the 20th century with the development of aerial photography. Aerial photography, supplemented with photogrammetry, was the final ingredient necessary to produce highly accurate maps of large areas at low cost. In fact, the most elementary of the possible bases for assessment maps is a simple aerial photograph.

Photography, both terrestrial (ground) and aerial (air), played an important role in the advancement of mapping. More important, however, has been the development of photogrammetry. Photogrammetry, defined as "the science, art and technology of obtaining reliable measurements and qualitative information from photographs," dates back to the 1800's when the first attempts were made to use terrestrial photographs to create topographic maps.

The United States Geological Survey (USGS), the largest producer of maps in the U.S., uses photogrammetry as the primary method of topographic mapping. Advantages of photogrammetric mapping are:

- Speed of coverage of an area;
- Ease of obtaining topographic detail;
- Reduced likelihood of data omission because of photographic detail;

Photographic maps are prepared directly on an aerial photograph base. The information stored varies widely. The base photo may be black and white, color or infrared, and the size and scale variation are virtually limitless. These types of maps are generally used for large-scale (small-area) coverage.

Aerial photography, whether photogrammetrically adjusted (rectified) or unadjusted (not rectified) can be a powerful research tool in the appraisal process. Photography can give validity to the location of structures, fences, orchards, etc., and if accurately prepared, pictures may be used for obtaining reliable land measurements and the subsequent preparation of assessment maps.

The rectified photography base system may be described as a moderate-cost, easily acquired system that is accurate enough to produce acceptable assessment maps. An improved variation of aerial photography is sometimes referred to as a "photomap", although it is more properly called "rectified aerial photograph". A rectified aerial photograph is one in which the distortions caused by tilt displacement have been removed. This type of base map is usually prepared as a series of enlargements (controlled mosaic), and the rectified photograph is used as a medium upon which the assemblage of ownership information and other data are delineated. The combination of the base photograph and additional data produces an assessment map of acceptable accuracy and creditability. New relatively inexpensive photography can be readily acquired from aerial photography engineering offices.

DIGITAL IMAGERY

Digital Imagery takes aerial photographs one step further. The GIS user may lay digital parcel data over an image on a personal computer. The flexibility of the digital product increases the applications of aerial mapping for the tax appraiser. Figure 2.10 shows a digital orthophoto with parcel data overlaid (EarthData, 1996[11]).

[11] http://www.earthdata.com/index2.htm

Figure 2.10: Rio Rancho, NM, a Fast-Growing Community Relying on GIS.

EarthData, 1996[12]

[12] http://www.earthdata.com/

UNIFORM PROPERTY RECORD CARD (UPR)

The U.P.R. card referred to in this text is the Uniform Property Record Card. Refer to Figure 2.11 at the end of this chapter.

The UPR card should contain the following information:

1. Name and address of owner;
2. Date of purchase;
3. All deed numbers connected with the property;
4. A brief description of the property, i.e., NE 1/4 NE 1/4, Sec. 17, T0lN, Rl8E, subdivision, lot and block description;
5. A complete survey description, when available, with distances in feet, and
6. Parcel acreage.

Each parcel shall be accompanied with a separate UPR Card. The UPR card may be filed manually (hard copy), in digital format, or both.

CHAPTER 3: UNIFORM PROPERTY CODE (UPC)

All parcels within a county must be coded with a unique Uniform Property Code (UPC) *of 13 digits with an additional 4 digits to code multi-records that are associated with one land parcel.* This chapter describes the process of coding the first 13 digits of the 17-digit code. Only multi-record parcels may use the additional 4 digits (i.e., condominiums). Coding of the last four digits is described in greater detail in Chapter 4. "Dummy codes" should not exist**.** ***If a county is using dummy codes, the county should go to all measures to properly identify the property***. In land grants the mapper can project the section lines to locate the parcel and properly identify it. Field inspection is strongly recommended to at least determine approximate location of parcels in a land grant where a survey is not available.

At the end of this chapter are some general rules to follow when assigning parcels, contact the Tax Mapping Specialist at (505) 827-0892 for any questions, clarifications, or any problems that may arise regarding these rules.

CODING / UNIFORM PROPERTY CODE (UPC)

As stated above, each parcel within a county must bear a unique UPC, coded to the center of the parcel. The 13-digit code must be expressed as; x-xxx-xxx-xxx-xxx. Below is a detailed description of the UPC:

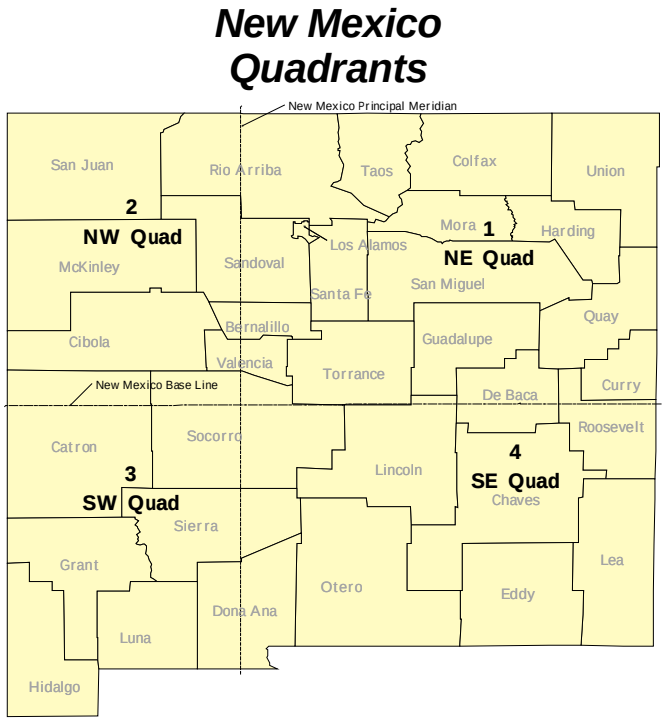
1. The first number denotes in which quadrant the parcel lies.
2. The next three digits denote the number of sections East or West of the NMPM.
3. The following three digits denote the number of sections North or South of NMBL.
4. The next three digits denote the number of feet East or West within the section to the centroid of the property wherein the center of the parcel is located*.
5. The following three digits denote the number of feet North or South within the section to the centroid of the property wherein the center of the parcel is located**.

* Last digit of the East/West distance is dropped (i.e., 1,155ft is coded 115)
** Last digit of the North/South distance is dropped (i.e., 3,450 is coded 345)

Parcels will be coded for the most accurate location using the following steps:

1. To determine the first digit find the quadrant in which the county is located. New Mexico is divided into four quadrants, Figure 3.1 illustrates this division. As illustrated in the figure, some counties will be located in more than one quad. For example, Socorro County is located in all four quadrants; therefore, the county will have parcel codes starting with a 1,2,3 or 4.

Figure 3.1: Map of New Mexico Illustrating the Four Quadrants



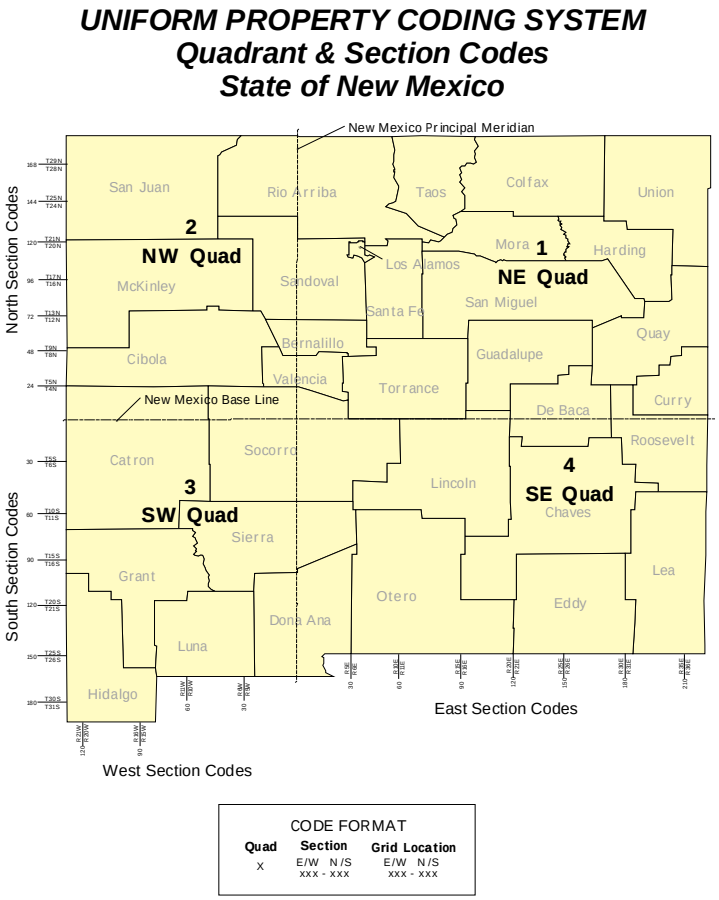
2. To code the next 12 digits, make all measurements from the southwest corner of the section in quadrant #1; the southeast corner of the section in quadrant #2; the northeast corner of the section in quadrant #3; and the northwest corner of the section in quadrant #4.

3. The next six digits are determined…
   In Quadrant #1, the section code number is determined by counting the number of sections East of the Principal Meridian and the number of sections North of the New Mexico Base Line, in that order.
   In Quadrant #2 the sections code number is determined by counting the number of sections West of the Principal Meridian and the number of sections North of the New Mexico Base Line, in that order.
   In Quadrant #3 the section code number is determined by counting the number of sections West of the Principal Meridian and the number of sections South of the New Mexico Base Line, in that order.

In Quadrant #4 the section code number is determined by counting the number of sections East of the Principal Meridian and the number of sections South of the New Mexico Base Line, in that order.

4. To code the last six digits from the respective section corner…
   In Quadrant #1, the section code number is determined by measuring the number of feet East of the SW section corner and then number of feet North, in that order
   In Quadrant #2 the sections code number is determined by measuring the number of feet West of the SE section corner and then number of feet North, in that order.
   In Quadrant #3 the section code number is determined by measuring the number of feet West of the NE section corner and then number of feet South, in that order.
   In Quadrant #4 the section code number is determined by measuring the number of feet East of the NW section corner and then number of feet South, in that order.

Figure 3.2: Uniform Property Coding System – Map of NM with Quadrant and Section Codes

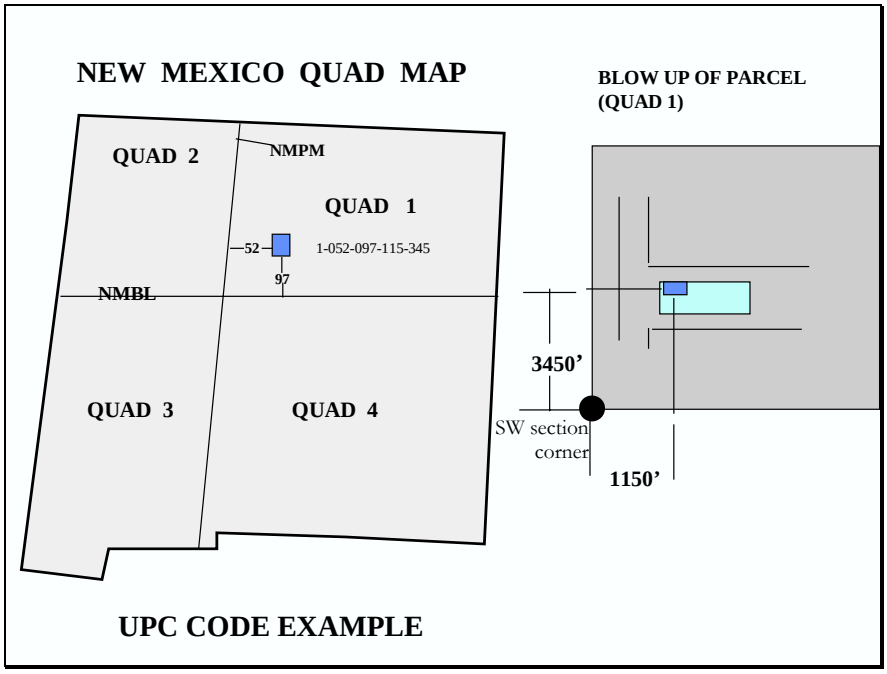


A parcel is coded to the centroid of the property and is recorded (Figure 3.3): 1-052-097-115-345

The parcel is in Santa Fe County, which puts the parcel in quadrant #1. Now begin at the intersection of the New Mexico Principal Meridian and the New Mexico Base Line, then go east along the New Mexico Base Line counting the sections until the corner section where the parcel lies is reached. Thence, go north of the base line 97 sections to locate the corner section wherein the parcel lies. Thus, beginning at the Southwest corner of the section and measuring 1,150 feet to the east, then 3,450 feet north locates the centroid of the parcel. The parcel code is: 1-052-097-115-345.

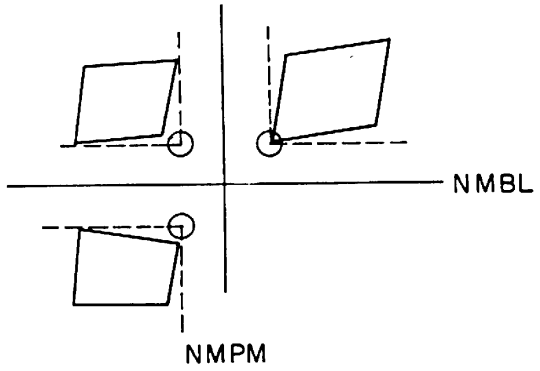
In many cases sections are neither square nor rectangular. In that event measurement begins at the section corner of such an oblique section along imaginary lines that are closest and parallel to the New Mexico Base Line and Principal Meridian. (Figure 3.4)

Figure 3.3: Uniform Property Code (UPC)



If a block or lot extends into more than one quad in a section, the major portion of the parcel shall carry the code. The same applies to parcels lying in more than one section. Be certain to note on which map the code is contained.

Figure 3.4: Oblique Sections with Starting Points, Showing Quadrants 1, 2, and 3.



Not every section is a true square. In this figure showing oblique sections, note the starting points when coding a particular parcel. Always measure from a section corner, which is closest to the New Mexico base line and closest to the New Mexico principal meridian.

Frequently a property owner has land that is divided by a highway, road, river, creek, arroyo, canal, irrigation ditch or railroad. Through the judicious use of tie-bars, extra coding can be significantly reduced. Tie-bars should not be shown crossing city or village streets, county lines, city limit lines, school district lines, grant lines, survey lines or reservation lines. Tie-bars only apply to manual mapping. A GIS has each of the above listed as its own layer.

CODING HALF TOWNSHIPS

Many counties in New Mexico have correction sections as described in Chapter 2 under the United States Public Land Survey section. When the State first started coding the sections, these corrected sections were disregarded. This has become a problem in many of New Mexico's counties. One solution to this problem is to code all parcels located in a corrected section with a unique "corrected-quadrant code" that would be uniform throughout the State. The only number that would be changing is the quadrant number (Figure 3.5). The remaining twelve (12) digits will be coded as stated in the previous section. Below is an example:

Example: ?-xxx-xxx-xxx-xxx
(1) (2) (3)

(1) "Corrected section code" refer to Figure 3.5 to determine your quadrant number.
(2) The next three digits denote the number of sections East or West of the NMPM and the following three digits denote the number of sections North or South of NMBL.
(3) Measurement in feet to the centroid of the parcel

Figure 3.5: Map of New Mexico Illustrating the Four Corrected Quadrants

RULES TO FOLLOW WHEN ASSIGNING UPC'S TO PARCELS

1. Each deed with one or multiple contiguous parcels will have one UPC associated with it.
2. If one deed has multiple non-contiguous parcels, then each parcel shall have a UPC associated with it.
3. Only assign a UPC to the parcel, **do not** assign a UPC to a homestead.
4. Start coding each parcel from the: SW section corner in quadrant 1, SE section corner in quadrant 2, NE section corner in quadrant 3 and NW section corner in quadrant 4.
5. If a contiguous parcel lies in multiple townships or sections, code the first 7 digits from the starting section corner only. Additional UPC's are not necessary for each township or section that is contiguous with the property being coded. Use tie-bars if the county is manual mapping.
6. The UPC should **only** be thirteen (13) numerical digits, unless coding multiple records (example: condominiums) to one land parcel (Refer to Chapter 4).

Definitions:

Multiple Parcels: More than one parcel, may be contiguous or non-contiguous.

Multiple Records: One land parcel with multiple ownerships (records), for example condominiums.

Note: Contact the Tax Mapping Specialist at (505) 827-0892 for any questions, clarifications, additions, or any problems that may arise regarding these rules.

CHAPTER 4: MAPPING MULTIPLE RECORDS TO ONE LAND PARCEL

Mapping multiple ownerships or records of one land parcel either manually or digitally can be difficult. Each parcel shown on the map must be associated with a UPC, which can be linked to the UPR either digitally or manually. ***One UPC must be associated with only one property record card.*** As with digitally linking the parcel with an attribute (UPC) to a database, the attribute must be unique. This would be a straightforward method if each parcel shown on the map had exactly one association linked to it. This is not always the case. For example, multiple condominium or co-op records can be associated with a single land parcel.

When mapping condominiums, the condo is represented by one parcel on the map, but each unit within the complex will have an ownership card associated to it. One parcel on the map will have many associated records. This relationship is called one-to-many relationship between condominium parcels in the GIS.

When coding the condominium parcel manually, first code the parcel itself, and then code each unit consecutively there after. Use the additional digits in the UPC to code the condominium units. For example, if the condominium parcel is coded 1-020-010-346-120, then the first unit is coded 1-020-010-346-120-0001. Label the land parcel's UPC, and then list each unit's UPC on the mylar map. If the codes do not fit the parcel, then refer to the parcel and list the codes on the right-hand side of the map. For example, Dona Ana County has a condominium complex with five units; the codes on the parcel are as Figure 4.1 illustrates.

Coding a condominium parcel digitally can be difficult. As mentioned earlier, the condominium parcel will have a one-to-many relationship. When joining your database to your graphical data or GIS, a common field is used (UPC) to join the two. Through this linkage any

record in the database that matches the value of the parcel will become the associated attributes to the parcel. Based on the design of the database, the condominium issue can either be resolved or its problems magnified through this linkage (Wilkoff and Terner 1999[1]).

For this linkage to work as a one-to-many relationship there must be a common UPC between the "parent" parcel and each condo unit in the database (Wilkoff and Terner 1999). Individual units have a four-digit suffix added to them, the reason why four digits were added to the UPC. This linkage is illustrated in Figure 4.2.

There are many ways of dealing with the one-to-many relationship that occurs with multi-ownership or co-op records. The method described in this chapter will assist the county to perform a query of multi-ownership parcels. With this proper structure, all of the property-related applications that are key to a county GIS can function without ignoring the condo records that exist (Wilkoff and Terner 1999).

[1] The Challenges of Integrating GIS and CAMA: Handling the One-To-Many Relationship by Nick Wilkoff and Michael Terner. Integrating GIS and CAMA 1999 Conference.

Figure 4.1: Condominium Parcel Showing its Relative UPCs.

How a land parcel consisting of a condominium complex should be manually labeled on a mylar map.

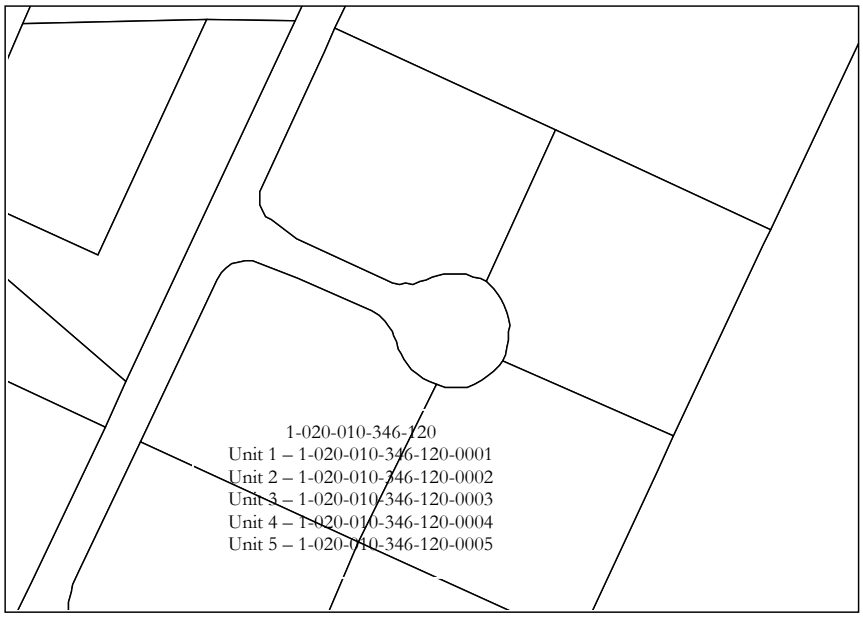
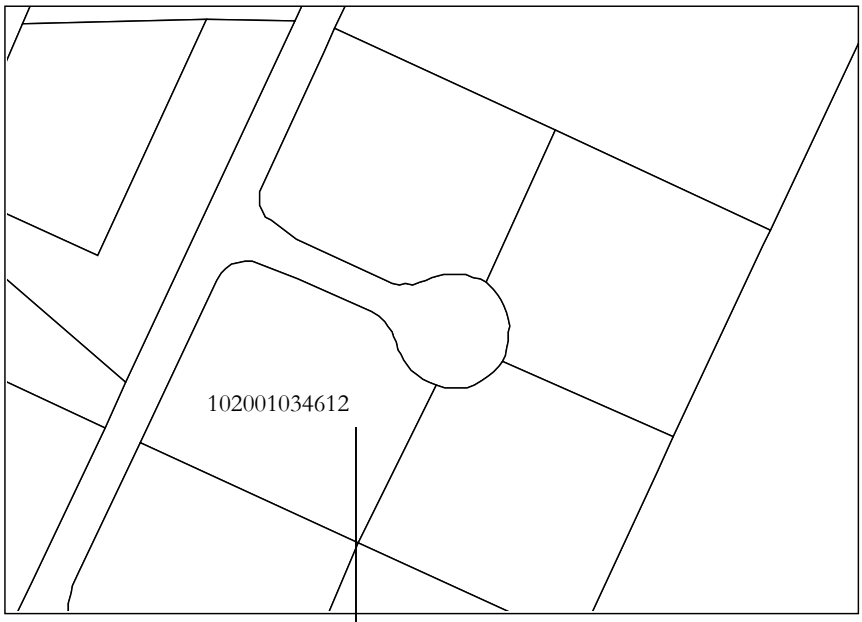


Figure 4.2: Condominium Parcel Showing its Relative UPCs.

How to structure a database to code a condominium parcel.



UPC	OWNER
102001034612101	Ortiz
102001034612102	Smith
102001034612103	Marquez
102001034612104	Martinez
102001034612105	Jones

CHAPTER 5: FUNDAMENTALS OF MANUAL MAPPING

Each county assessor is responsible for locating and describing all properties within a jurisdiction to provide fair and equitable assessment values. The first requirement of a good assessment system is a complete set of tax maps. Using two cartographic methods, manual or digital, the assessor can successfully complete a set of tax maps. While the current industry trend and state statutes favor a digital approach, it is necessary to understand the fundamental concepts of manual mapping. Chapter six (6) discusses the digital approach in greater detail. There are certain concepts, shared by each method that are discussed in the next two chapters.

The fundamental mapping concepts are presented in detail in the International Association of Assessing Officers (IAAO) Course 600, "Fundamentals of Cadastral Mapping." Check with IAAO or call the Property Tax Division, (505) 827-0870, for course scheduling.

OBTAINING SOURCE DATA

Parcel maps are compiled from various sources of data. The source materials should be assembled and placed in folders marked Township, Range, and Section. Set up a separate folder for each section; however, many sections will require more than one folder depending upon the number of parcels within a section. Suggested sources from which to obtain mapping data include:

- Bureau of Land Management
- New Mexico State Highway Department
- U.S. Forest Service
- National Geodetic Survey
- New Mexico State Land Office
- Bureau of Reclamation
- Other Government Agencies
- Oil and Mineral Companies

- Surveyors
- Utility Companies
- Conservation districts
- Title Companies
- Commercial Mapping Agencies
- Field Enumeration
- County Clerk's Office
- Aerial photographers

CREATING A PARCEL MAP FROM A LEGAL DESCRIPTION

After reading Chapter 2, you should be familiar with the concept of metes and bounds or bearings and distances, two phrases that are synonymous. Secondly, we know that either phrase indicates direction and the length of direction. An example would be "North 45 degrees West a distance of 250 feet". "North 45 degrees West" refers to the words "bearing" or "metes" and the figure "250 feet" refers to the words "distance or bounds."

"North 45 degrees West" as indicating direction will require using the following figures:

Figure 5.1 represents a compass face or card. North is indicated at the top, South at the bottom, West to the left and East to the right. North and South are indicated 00º 00' 00" and West and East are indicated 90º 00' 00". The observer always is located at the center of the compass card at point "0."

Figure 5.2 is the same card, except we now have platted the phrase "North 45 degrees West" upon it. The observer faced North and revolved his direction 45 degrees toward West. Thence the direction is North 45 degrees West. If the observer (still facing North) revolved his direction 76 degrees toward West as line OA in Example 1-2 indicates, then his direction is North 76 degrees West. If the observer's direction is North 76 degrees West and he does a complete reverse face as line OB indicates, then his direction is South 76 degrees East.

Figure 5.1: Compass Face

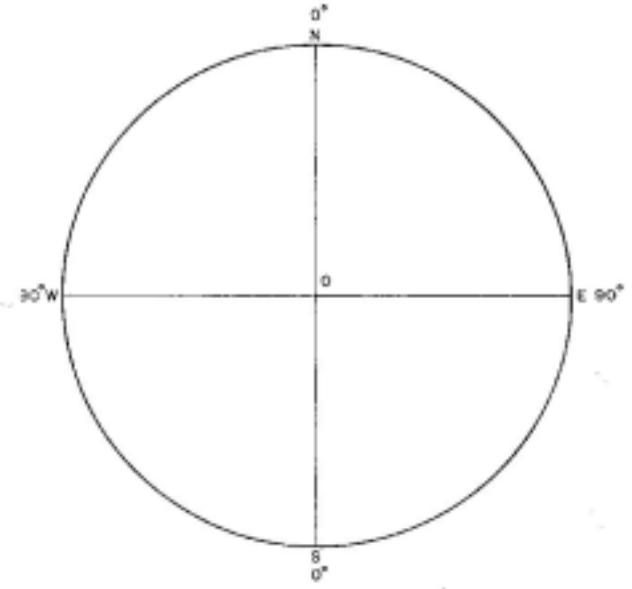
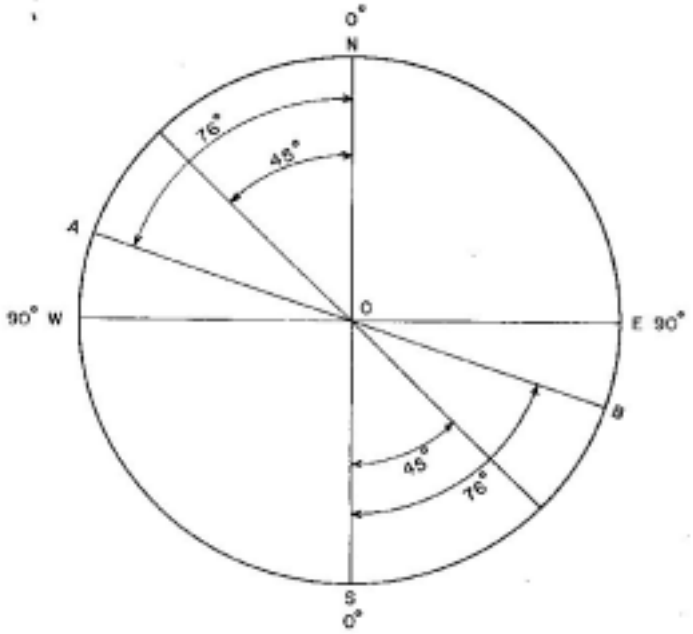


Figure 5.2: Compass Face Showing Direction



Two rules are involved here:

Rule No. 1: The direction is always indicated as North 76 West or South 76 degrees East and never West 76 degrees North or East 76 degrees South.

Rule No. 2: A bearing of North 76 degrees West (N 76º W) may be reversed to South 76 degrees East (S 76º E). When a bearing is reversed, the degree stays the same while both directions are changed.

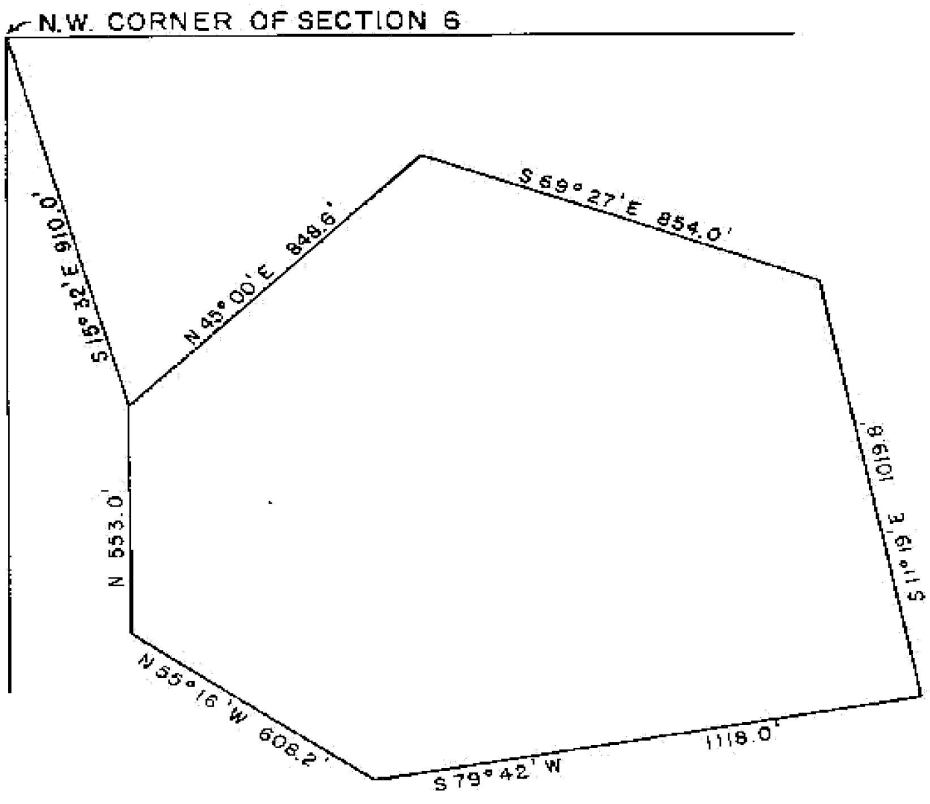
Each degree is divided into 60 minutes and each minute is further divided into 60 seconds. The direction North 45º 30' 00" West means that the direction is halfway between North 45º West and North 46º West, as 30 minutes is equal to one-half a degree. Further, North 45º30' 30" West means that the direction is slightly greater than one-half the distance between North 45º West and North 46º West.

To check a deed or survey description for its correctness (the survey closes), the bearings start at the point of beginning and return to the point of beginning. A rough sketch may be drawn using a protractor and scale.

For example: A deed is received that has the following metes and bounds survey description. Refer to Figure 5.3.

Beginning at a point, being the Northwest corner of this parcel, from which point the Northwest corner of section 6,T21SR1E bears South 15º 32' East a distance of 910.0 feet. This information takes the survey to the point and place of beginning. Thence facing in the direction of Northeast the bearing is North 45º 00', East a distance of 848.6 feet. Thence facing in the direction of Southeast the bearing is South 69º 27' East going a distance of 854.0 feet. Thence facing the direction of Southeast the bearing is South 11º19' East for a distance of 1,019.8 feet. Thence facing Southwest the bearing is South 79º 42' West going a distance of 1,118.0 feet. Thence facing Northwest the bearing given is North 55º16' West for a distance of 608.2 feet. Thence facing due North the bearing is north for a distance of 553.0 feet. This last bearing brings the survey to the point and place of beginning and the parcel contains 40.006 acres more or less.

Figure 5.3: Parcel Description Using the Metes-and-Bounds Survey Method



Note that the tie from the Northwest corner of the property to the section corner locates the property with regard to the section wherein the property lies, which in this case is Section 6. Also note that the bearings are given in a clockwise manner.

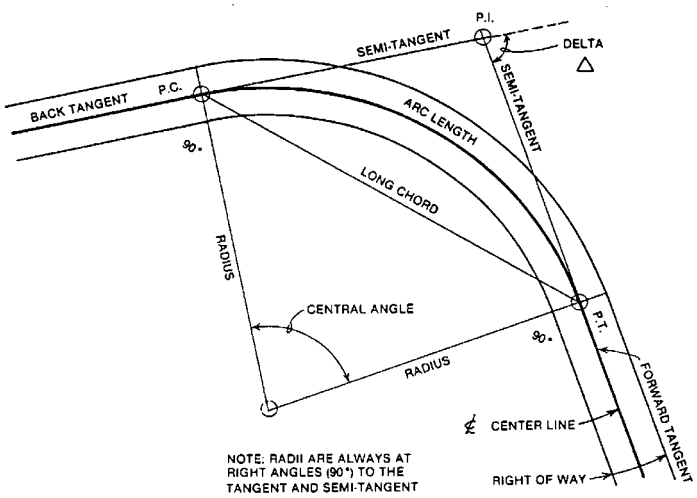
Many survey descriptions, due to such factors as typographical errors, reversed bearings, wrong dimensions, missing bearings, etc., will not close, but with diligent searching, elimination and some deductions, correct descriptions can sometimes be determined. If all else fails, the owner should be contacted. The burden of proof lies with the property owner, not the assessor to resolve an inaccurate deed description.

METHODS FOR PLOTTING CIRCULAR CURVES

The following are some basic instructions on how to plot circular highway curve. (Figure 5.4) There are three basic circular curves used in highway construction known as tangential curves – simple curve, compound curve, and reverse curve (Figure 5.4 and 5.6). There is also a non-tangential curve. (Figure 5.5). Another curve used infrequently in highway construction is the spiral curve which can be either a circular curve in the center with transition (spirals) at both ends, or simply a curve with transitional spirals throughout. The most important point to remember is that all circular curves have a fixed radius and that the radii are **always** at right angles, perpendicular or 90 degrees, to the tangent or semi-tangent. For the purpose of the following illustrations, a tangent is merely a straight line that is usually a bearing in degrees.

Figure 5.4: Circular Curves

EXAMPLE OF A TANGENTIAL OR CIRCULAR CURVE



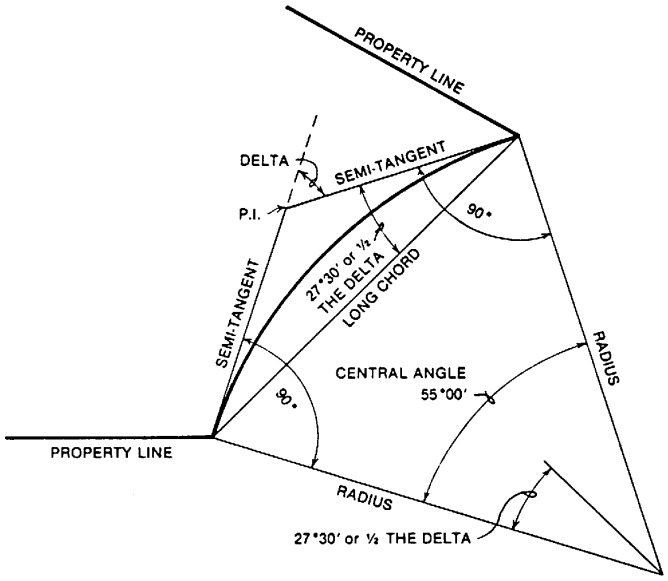
DATA WHICH USUALLY APPEARS ON N.M. STATE HIGHWAY MAPS

- P.I. DENOTES POINT OF INTERSECTION (OF THE TANGENTS)
- Δ DENOTES *DELTA (DELTA IS EQUAL TO CENTRAL ANGLE)
- D DENOTES DEGREE OF CURVE
- R DENOTES RADIUS
- T DENOTES TANGENT DISTANCE
- L DENOTES ARC LENGTH OR LENGTH OF CURVE
- CH DENOTES LONG CHORD
- ℄ DENOTES CENTER LINE OF HIGHWAY (MOST ALL CURVE DATA RELATES TO THE CENTER LINE)
- P.C. DENOTES POINT OF CURVATURE
- P.T. DENOTES POINT OF TANGENCY
- OTHER DATA MAY INCLUDE P.O.S.T. (POINT ON SEMI-TANGENT AND P.O.C. (POINT ON CURVE)

*(DELTA IS THE DEFLECTION ANGLE BETWEEN THE BACK TANGENT AND THE FORWARD TANGENT)

Figure 5.5: Non-Tangential Curve

NON-TANGENTIAL CURVE
(A CURVE THAT IS NOT TANGENT TO A PROPERTY LINE)



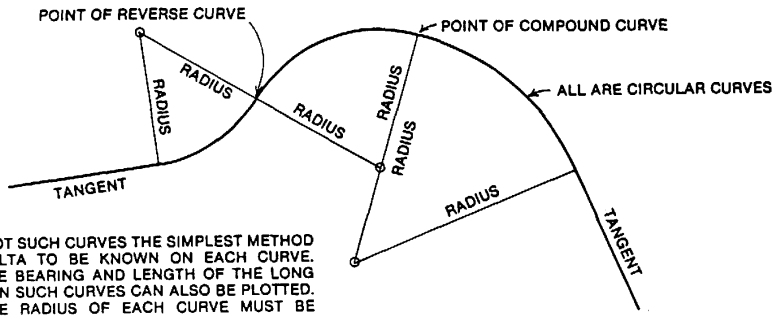
NOTE: THE ANGLE BETWEEN THE LONG CHORD AND THE SEMI-TANGENT IS EQUAL TO ½ THE DELTA OF A CURVE. AS WITH ALL CURVES, THE RADIUS IS PERPENDICULAR TO THE TANGENT.

The condition is true only if the property lines coincide with the ends of the curve, otherwise, and more common, is the condition where the highway curve continues beyond the property lines shown.

The term Semi-Tangent applies only to that portion of a tangent that is a part of the curve geometry. This can be for the total curve or any portion thereof. (SEE EXAMPLE 1)

Figure 5.6: Compound and Reverse Curves

ILLUSTRATION OF COMPOUND AND REVERSE CURVES



IN ORDER TO PLOT SUCH CURVES THE SIMPLEST METHOD IS FOR THE DELTA TO BE KNOWN ON EACH CURVE. HOWEVER IF THE BEARING AND LENGTH OF THE LONG CHORD IS KNOWN SUCH CURVES CAN ALSO BE PLOTTED. OF COURSE THE RADIUS OF EACH CURVE MUST BE KNOWN.

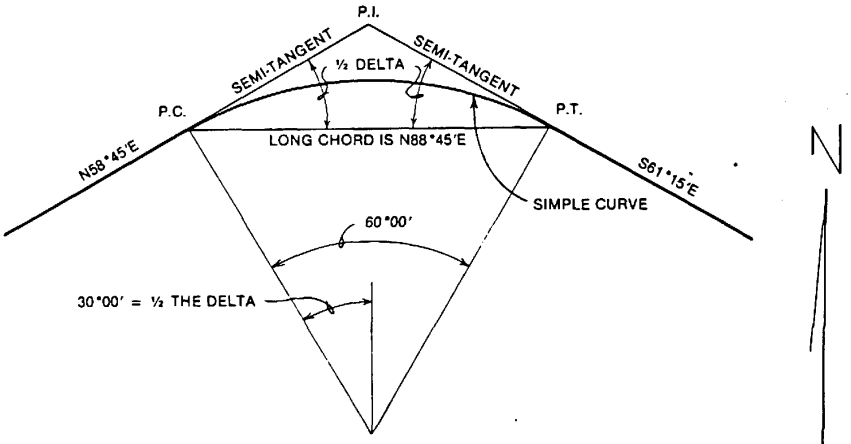


ILLUSTRATION OF THE MANNER IN WHICH TO ARRIVE AT THE PLOTTING OF THE LONG CHORD

NOTE:
IN ORDER TO ARRIVE AT THE BEARING OF THE LONG CHORD, SIMPLY ADD, IN THIS CASE, THE LAST BEARING TO THE DEGREE OF ½ THE DELTA. EXAMPLE: N58°45'E PLUS 30°00' (½ THE DELTA) EQUALS N88°45'E. IF YOU ADD 60°00' (DELTA) TO N58°45'E YOU WOULD ARRIVE AT A BEARING WHICH WOULD BE IN THE DIRECTION OF SOUTHEAST OR 118°45'. IF YOU SUBTRACT 118°45' FROM 179°60' (180°) YOUR BEARING WOULD BE S61°15'E.

Usually a survey contains all the data pertinent to a curve. Such data include:

P.C. -Point of curve
P.T. -Point of tangent
Δ -Delta or Central angle
D -Degree of curve
R -Radius if degree of curve is not given
P.I. -Point of intersection
-Center line of highway (usually all curve data are given off the center line)
R/W -The highway right of way or actual width of right of way owned by the state.
T -Semi-tangent
L -Arc length or length of curve
CH. -The long chord. (See Glossary of Mapping Terms)

Drafting a curve requires the use of a compass and sometimes an extension (termed a "beam,") a straightedge and a right-angle triangle. The beam compass is used for unusually long radii.

Should the curve data include only the "D" or degree of curve and not the radius, the length of the radius can be calculated in the following manner:

> A one-degree curve (1º) is 5,729.58 feet long. In dividing 5,730 (rounded figure) by the degree of curve, the resulting answer will give the length of the radius. For example; a 3-degree curve would give a radius of approximately 1,910 feet; a 10-degree curve would give a radius of approximately 573 feet in length, etc.

There are templates, sometimes referred to as "railroad/highway curves," with the radii and arcs already built-in and scribed. With the templates it is not necessary to use the compass to draw the actual arc of the curve; however, a complete set of railroad/highway curves is quite expensive. The cost to most counties would be prohibitive and unnecessary since a good-quality compass with a beam attachment serves most drafting purposes on the tax maps where highways, streets or roads are involved. Almost, all tax maps are drawn to a scale of 1" equals 200' for section maps and a scale of 1" equals 100' for some quarter-section maps. A beam compass could be used on all curves of 1-degree or more, remembering first that a 1-degree curve at a scale of 1" equals 100' has a radius of about 4.77 feet in length, and then that most beam compasses could not plot a radius of such length. (The higher the degree ("D") of curve, the less the length of the radius.)

There are, of course, curves of 00º15' (0 degrees, 15 minutes) or less. In the case of a 15-minute curve, the length of the radius would be 5,729.58/.25 or 5,729.58 x 4 = 22,918.32 feet in length, or if plotting such a curve at scale 1" equals 100', the radius, using a compass, would be 19.098 feet long. There are no beam compasses to plot a radius of such length, so a railroad/highway curve would be necessary. There are curves in the state with a 0º10' radius or 34,370.61 feet (5,729.58/0.1667) in length, which would be slightly more than 6 ½ miles long. This would produce a curve, that would, depending upon its length, be barely distinguishable from a tangent. However, such gradual curves are fairly rare on highways in New Mexico. In the mountainous areas of the state, some curves are up to 14 degrees and more. (A 14-degree curve would have a radius of 409.26 feet in length, or 5,729.58/14 = 409.22557 feet.) The New Mexico Highway Department prepares highly accurate right-of-way (ROW) maps that are available upon request and that can be adapted to the tax maps as needed. Some ROW maps can be traced directly, depending on the scale used.

With the length and bearing of either the delta, semi-tangent or chord, it is possible to locate the end of a curve from the P.C. to the P.T; however, there is a simpler method that requires no calculation to arrive at the end of a curve, provided the radius is known. (Figure 5.4)

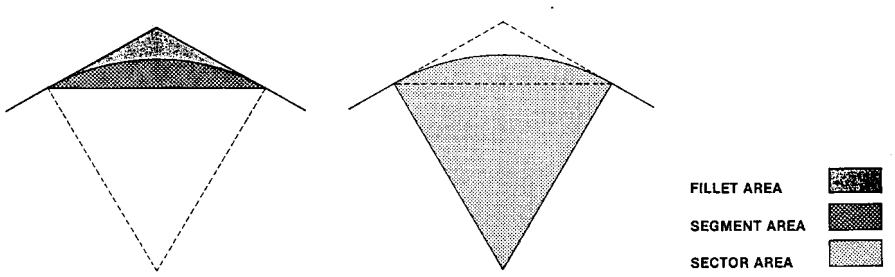
The procedure is as follows: first plot the tangent to the P.C.; next, draw in the radius at right angles to the tangent and measure the radius; then adjust for the next bearing at the P.T. (or end of curve); at that point, using a right-angle triangle, slide it along the straightedge, which has the next bearing, to the radius point for that particular curve. Draw a line at a right angle to the straightedge. The procedure will indicate the end of the curve or arc length without calculations. When this is done, the chord, delta and semi-tangent will be arrived at automatically. If there is doubt, check the radius length, delta or semi-tangent to assure accuracy. In addition, if the bearing and length of the long chord are known, another check can be made for accuracy. In any event, for a common curve, the delta, long chord and semi-tangent from the P.C. to the P.I. and from the P.I.

to the P.T. will be accurate using this simple method. The radius must be properly scaled, and the bearings to the P.C. and from the P.T. must be accurately fixed. The length of the long chord does not really need to be known as long as the bearing is known. Since the curve is plotted, the intersection with the long chord fixes the point where the curve actually ends. The radius will always be at right angles to either the tangent at the P.C. or the tangent from the P.T. (Figures 5.4 and 5.5).

There are several methods to calculate the area of a circular curve. Use a calculator that contains the sin (sine), cos (cosine) and tangent and can convert degrees, minutes and seconds into decimals. The methods are as follows:

- To calculate the length of the long chord, known factors should be the delta and radius;
- To calculate the length of the semi-tangent, known factors should be the delta and radius;
- To calculate the radius, known factors should be the delta and arc length;
- To calculate the delta, known factors should be the arc length and radius;
- To calculate the arc length, known factors should be the delta and radius;
- To find areas involved in a common curve known as the sector, segment and fillet, Figure 5.7, some results can be obtained as follows:
  - To find the area of the sector the arc length and radius should be known;
  - For the area of the segment, known factors should be the delta, long chord, arc length and radius;
  - For the area of the fillet, the semi-tangent, arc length and radius should be known.

Figure 5.7: Areas of a Simple Circular Curve



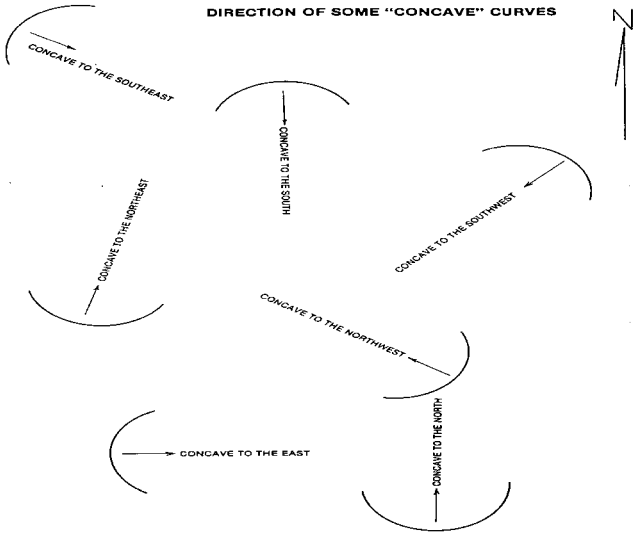
The simplest way to find the length of the hypotenuse (the longest leg) of a right-angle triangle is to measure the two shortest legs of the triangle, square each length separately, add the sum of the two and find the square root of that sum.

Deflecting Angles

There are survey descriptions which occasionally give no actual bearings, e.g., N78º15'W, S44º16'E, etc., but instead call out deflecting angles, e.g., deflecting to the left in a southerly direction 50º15'. The important point in dealing with the plotting of survey descriptions involving deflections is to imagine that you are facing in the direction of the last described line.

Some descriptions also use the term for a curve as being "concave to the north," "northeasterly", "easterly", etc. "Concave" simply means that it is arched or curving inward, much as it would appear when looking into a bowl. (Figure 5.8)

Figure 5.8: Concave Curves



Figures 5.9 and 5.10 are descriptions where no actual bearings are given and only angles or degrees are involved. It is possible to calculate the actual bearing through either adding or subtracting the deflecting degrees depending on the direction given for the deflection. The description does include two curves, one tangential and one non-tangential. Both curves are, however, circular curves. It is of prime importance to know the direction of the chord to plot a non-tangential curve. The distance is not necessary so long as the degree of the delta (or central angle) and the radius are known.

Figure 5.9: Plotting a Curve

That part of the west half of the northwest quarter of Section 14, Township 5 North, Range 14 West of the New Mexico Principal Meridian, described as follows:

Commencing at the northwest corner of said Section 14; thence south, along the west line of said northwest quarter, a distance of 300.00 feet to the point of beginning of the land to be described; thence easterly, deflecting to the left 89 degrees 00 minutes 00 seconds, a distance of 200.00 feet; thence southeasterly a distance of 642.86 feet along a tangential curve concave to the southwest having a radius of 818.51 feet and a central angle of 45 degrees 00 minutes 00 seconds; thence southeasterly, tangent to said curve, a distance of 427.00 feet; thence southerly a distance of 671.95 feet along a non-tangential curve concave to the east having a radius of 700.00 feet and a central angle of 55 degrees 00 minutes and 00 seconds, the chord of said curve deflects 62 degrees 30 minutes 00 seconds to the right from the last described line; thence westerly, deflecting 76 degrees 21 minutes 03 seconds to the right from said chord, a distance of 869.08 feet to the west line of said northwest quarter; thence north along said west line a distance of 1,100.00 feet to the point of beginning, containing 22.02 acres

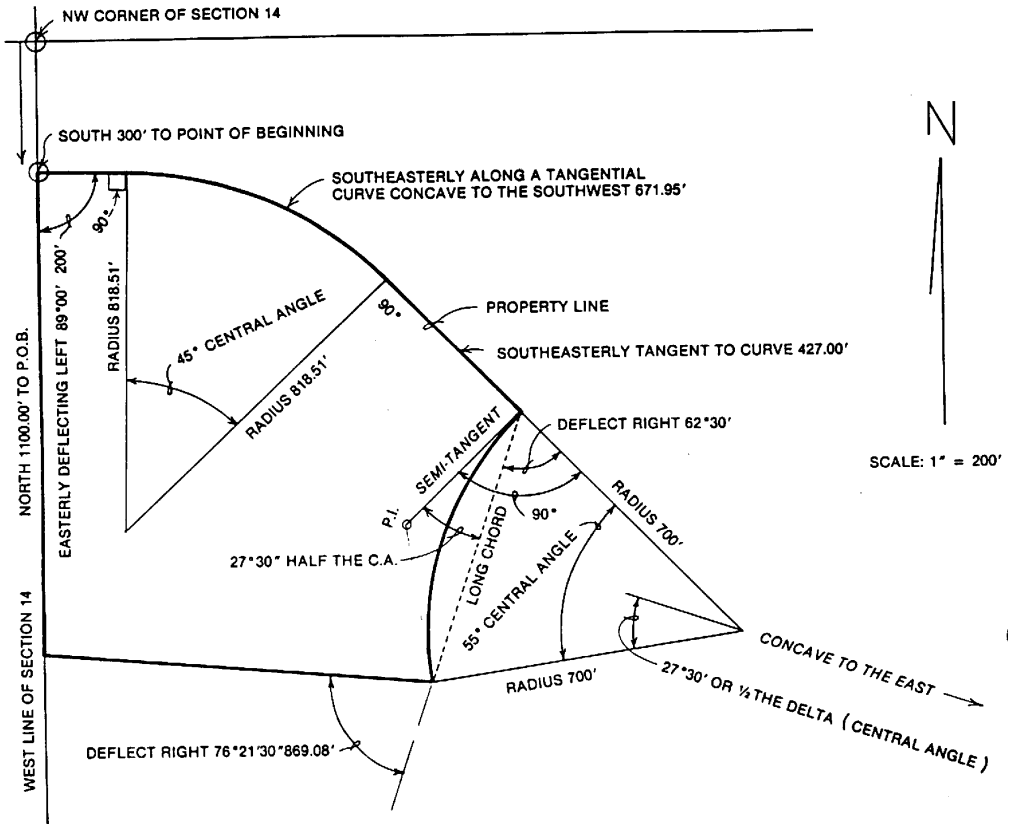
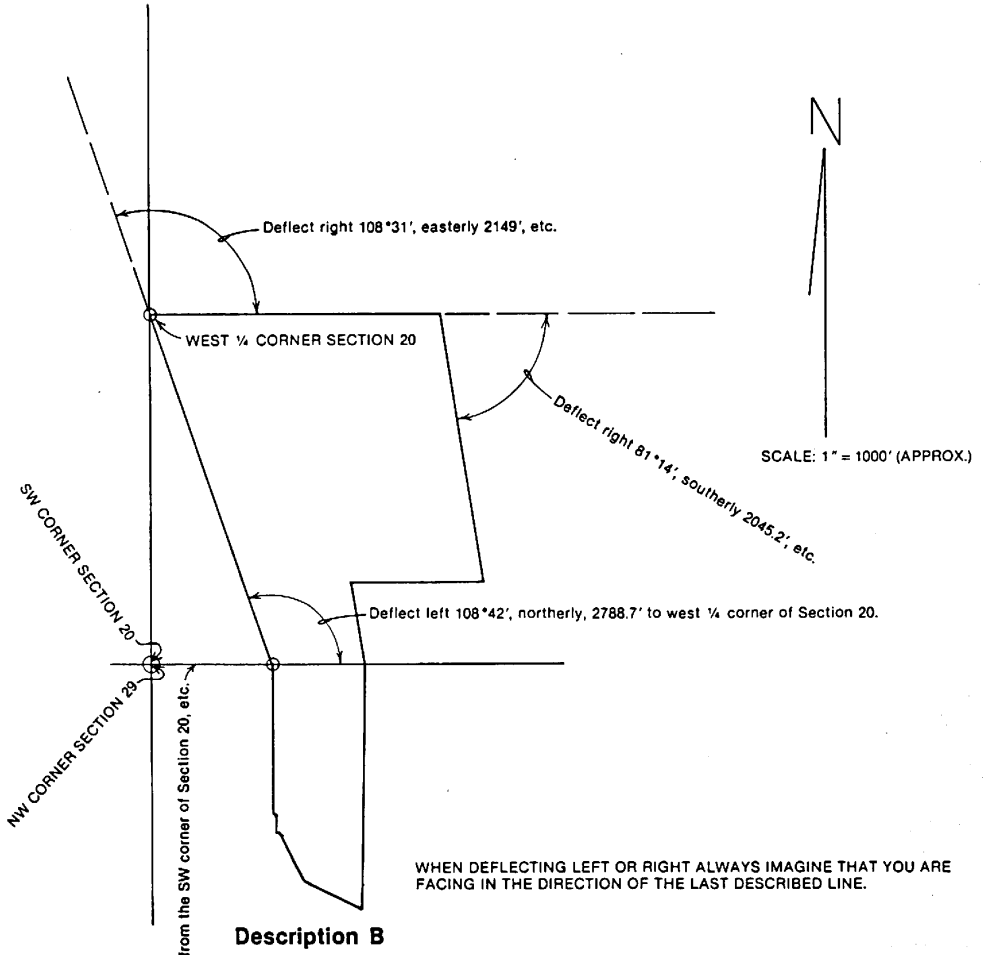


Figure 5.10: Plotting a Curve

Parcel description using deflecting left and right angles.



Description B

A TRACT OF LAND LYING IN THE SOUTH PART OF THE W½ OF SECTION 20, AND THE NORTH PART OF THE NW¼ OF SECTION 29, ALL IN TOWNSHIP 26 SOUTH, RANGE 20 WEST, N.M.P.M., CONTAINING 126.3 ACRES, MORE OR LESS AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SECTION LINE BETWEEN SAID SECTIONS 20 AND 29 WHICH BEARS EASTERLY 889.4 FEET FROM THE SW CORNER OF SAID SECTION 20 AND ALSO THE NW CORNER OF SAID SECTION 29; THENCE DEFLECTING LEFT 108°42' NORTHERLY, 2788.7 FEET TO THE WEST ¼ CORNER OF SAID SECTION 20; THENCE DEFLECTING RIGHT 108°31' EASTERLY 2149 FEET TO THE NE CORNER OF THE TRACT BEING DESCRIBED; THENCE DEFLECTING RIGHT 81°14' SOUTHERLY 2045.2 FEET; THENCE DEFLECTING RIGHT 98°57' WESTERLY AND PARALLEL TO THE SOUTH LINE OF SAID SECTION 20, A DISTANCE OF 990.7 FEET; THENCE DEFLECTING LEFT 98°57' SOUTHERLY, 631.8 FEET TO A POINT ON THE SOUTH LINE OF SAID SECTION 20; THENCE DEFLECTING RIGHT 9°42' SOUTHERLY 1855 FEET TO THE SE CORNER OF THE TRACT; THENCE DEFLECTING RIGHT 109°42' NORTHWESTERLY 441.7 FEET; THENCE DEFLECTING RIGHT 42°18' NORTHERLY 385 FEET; THENCE DEFLECTING LEFT 62°51' WESTERLY 25 FEET; THENCE DEFLECTING RIGHT 90°00' NORTHERLY 135 FEET; THENCE DEFLECTING LEFT 90°00' WESTERLY 19 FEET; THENCE DEFLECTING RIGHT 88°38' NORTHERLY 1225.6 FEET TO THE POINT OF BEGINNING.

AREA CALCULATION

Once the property ownership lines have been plotted, the area of each parcel may be determined. Occasionally the deed acreage and the plotted acreage will not match. When this occurs, "***the deed acreage takes precedence***". Always note inaccuracies of surveys.

If using a planimeter, trace the exterior boundary line of the parcel. A dial readout will then appear giving you the square inches contained inside the parcel's boundary. Square inches can then be converted to acreage by using the following formula:

$$\frac{\text{Scale}^2}{43{,}560} = \text{Factor} \times \text{Reading}$$

Example: A planimeter reading of 1,450 and a scale of 1"=200' will result in an acreage of:

$$\text{Factor} = \frac{200 \times 200}{43{,}560} = \frac{40{,}000}{43{,}560} = .918$$

Reading = 10.5 (square inches)

Therefore, .918(factor) x 10.5(reading) = 9.639 Ac.

To manually calculate the acreage use the following formulas: (Refer to Appendix E for measurement conversions).

Rectangle: length x width = area
Right Triangle: ½ base x height = area
Circle: 3.1416 (π) x R^2 = area

The area is converted to acreage by the following formulas:

Square feet/43,560 = acres
Square chains/10 = acres

NEW MEXICO STANDARDS FOR DRAWING PROPERTY OWNERSHIP MAPS

The parcels are to be inked on 32" by 36" Mylar. The tracing is the finished product from which the prints are made and must be clear, concise and accurate. The tracing must follow a set standard (listed on next page) relative to weight and type of lines, symbols and lettering. Enough ink must be used so that the tracings reproduce exceptionally well.

Roman, Old English, Fancy or Serif lettering **should not** be used. All lettering heights and weights shall conform, insofar as is practicable, to standards set forth below.

The direction of the lettering should be such that it will appear right side up when read from bottom to top of the map, except that along lines forming an angle of 30º or more to the left of the vertical, the lettering shall be from the top downward.

Schedule For Line Weights And Lettering Guide

Using "K & E LeRoy" (or equal, Pens for Line Weights)
#0 - pen for lot lines, splits and railroads
#1 - pen for street lines, roads and highways (either paved or unpaved), rivers, arroyos, ditches, and bridges
#2 - pen for county lines, city limits, school districts and survey lines
#2 - pen for grant lines
#4 - pen for national or state lines and border (section) lines

Using "K & E LeRoy" Lettering Pen and Guide
#000- pen 2/80 CL Template for dimensions
#00 - pen w/l00 CL Template for code numbers, acreage and notes
#0 - pen w/l00 CL Template for lot numbers
#1 - pen w/120 CL Template for tracts
#2 - pen w/140 CL Template for streets, roads, highways, school districts, counties, block numbers, arroyos, rivers, railroads, ditches, canals, section numbers, counties and Indian reservations.
#0 - pen w/175 CL Template for subdivisions and grants
#4 - pen w/240 CL Template for index designation

Use good judgment in the selection of pen size for any special features on the maps not listed in these mapping specifications.

The maps should match adjoining maps so they can be trimmed and combined. There are many factors that oppose this feature: inaccuracy in plotting, errors in record dimensions, shrinkage in tracing cloth, if used, or contraction and expansion of prints in the printing process.

Begin drawing by locating section, section quadrant or township 1½" from the left margin and allow 3" spacing at the bottom of the map. Never assume that the particular section or township is perfectly square. Section dimensions and bearings will be obtained from U.S. Government plats. Section lines extend across a grant to establish sections. This is done only to help facilitate in coding. The sections can be drawn square.

Do not show property lines crossing streets, roads, arroyos, rivers and railroad rights-of-way. Lines that do cross are: section, school district, city limit, grant, Indian reservation, survey, county or state.

TITLE BLOCK AND LEGEND

The margin for title block shall be on the right-hand side of the map and shall contain the following information. Mylar sheets can be pre-printed with border and title block for a nominal cost. Such pre-printing can save a tremendous amount of needless and costly drafting time.

"LeRoy" Pen No.	Template
#2	175 CL Property Identification Map
#4	240 CL Name of County
#4	240 CL New Mexico
#2	175 CL Scale (App)
#2	175 CL Code Number
#2	175 CL 1-000-000-Quad 3, etc.
#2	175 CL Legal Descriptions
#2	175 CL Twp__ Rge__ Sec __
#2	175 CL Drawn by
#2	175 CL Coded by
#2	175 CL Edited by

The borderlines around map sheets are to be constructed thus: measure 3/8" from edge of sheet and construct a continuous line using a No. 2 K & E LeRoy pen (or equal). Measure in from

the No. 2 pen line ½" and draw a continuous line around the sheet using a No. 4 LeRoy pen, (or equal). North arrow and all lettering composing the title block are to be done symmetrically.

Each map shall have a directional North arrow placed at the top of the right-hand margin. The North arrow should always point toward the top of the drawing.

The legend will appear only on the index Map.

Scales to be used for compilation of maps are as follows:

1"= 100'	Quarter (¼) Section
1"= 200'	Section
1"= 400'	4 sections (If necessary)
4"=1 mile	36 sections (township)

The scales 1' = 100', 1" = 200', and 1" = 400' are used for urban areas and any rural or mining areas broken into small parcels.

The scale 4"= 1 mile is used for rural areas where properties are more sparsely settled. This scale will usually show an entire township composed of 36 sections.

QUALITY CONTROL

Upon completion of inking the maps and index, obtain a complete set of direct prints for use in quality control (checking) for all detail. The checking can be most effectively done with a red pencil on the direct prints without causing unnecessary erasing on the tracings. This will make it easier to avoid missing any items when the tracings are corrected.

The maps should be proofread with the completed UPR Cards to assure that all properties are accounted for and properly coded. Every word or group of words, all figures, map numbers, titles, and adjoining map numbers should be carefully checked to assure accuracy and completeness of the maps.

The typed UPR Cards should be checked/marked in pencil at the same time to assure that the ink tracing and the cards agree and are complete.

The reviewer must keep in mind the standards and specifications required for the scale of the map. Mark for correction any unacceptable deviations from the standards.

The reviewer next returns the tracings to the draftsman to make all corrections as indicated in red on the direct prints. Any changes in the U.P.R. cards should be corrected and rechecked.

After all checking and corrections have been made on the maps, two sets of blue-line prints should be bound and marked as follows:

1. "Office" for office counter and public use.
2. "Land and Structures" for the county appraisers for use in the field survey of buildings, land and total property.

The maps are official records and as such are subject to considerable use. In many counties they are also subject to substantial use by field appraisers, other county offices, title companies, real estate brokers, engineers, etc.

Tax maps, which involve considerable expense in production, should not be subject to daily use. They should be used only when being brought up-to-date (maintenance) or for checking by the draftsman. Make less costly prints of the original maps for daily use.

SUMMARY OF REQUIREMENTS FOR MANUAL MAPS

1. Maps must be in sufficient detail to accurately show ownership boundaries.
2. Boundary lines of maps should be street or survey lines that are generally also property lines such as section, fractional section, etc.
3. The maps should be carefully cross-indexed and tied together by showing map number of each adjoining map, street lines, section lines, etc.
4. Lay out section lines according to information on U.S. Geological Survey Maps and Government Surveys.
5. Plot main roads first, i.e., state highways, county roads, etc. Use State Highway Maps to determine ownership adjacent to highway.
6. Outline all plats of surveys on map before drawing in lots. This will insure that all parcels will fit on map and that there are no voids (remember that each parcel must be accounted for).
7. Draw entire map lightly in pencil (No. 6H lead suggested) prior to inking. Again, strive to keep drawings accurate and neat.
8. Use line weight guide when inking map.

The following **should not** be shown on maps:

1. Owner's name. This can be more satisfactorily shown on the Uniform Property Record Card.
2. Assessed values.
3. Utility services.
4. Zoning.
5. Date of property transfer.
6. Topography.
7. Improvements, including fences.
8. Soil data.
9. Utility easements.
10. Mineral claims.
11. Metes-and bounds-data or survey notes, i.e., deltas, tangent points of intersection, radii, highway stations, etc.

MAP MAINTENANCE

Once a mapping system is installed, it is an absolute necessity to carry on with a maintenance program; otherwise the initial effort and expense of installing will be negated in a year or two. The assessment requires the timely collection, assimilation and distribution of ownership-related data to ensure continuity of assessment maps and office records.

An organized maintenance program can be very routine and straightforward. It simply involves making ownership and boundary line changes each year. This can be accomplished on a weekly, monthly, semi-annual or annual basis, whichever is most feasible. To make the changes, you will need a copy of all recorded deeds, wills, plats and surveys that are filed for record in the county courthouse. Periodic inspection of the District Court Clerk's records will be required relative to judgments filed against property(s). Occasionally you will need to contact certain property owners about changes that occur that are not filed for record.

Each assessor's office can organize its maintenance program according to workload and personnel.

EDUCATION

Training for manual mapping can be taken from IAAO, Course 600: "Techniques of Cadastral Mapping". Property Tax Division offers this training every fall. Training can also be acquired from the Mapping staff at PTD upon the assessor's written request to the Director.

EQUIPMENT AND MATERIALS

The types of drafting equipment used range from the common to the sophisticated. The use of more-sophisticated equipment will increase drafting accuracy. The accuracy and aesthetic quality of a well-prepared assessment map may be attributed to a combination of drafting expertise and

availability of the type of drafting equipment. The following should be considered as a minimum equipment requirement for the preparation and maintenance of assessment maps.

Drafting Materials & Equipment Needed For A One Person Drafting Facility

1 - Protractor - 6" Diameter
1 - Erasing Shield
1 - 12" 30º 60º Triangle
1 - 10" 45º Triangle
1 - S. Steel Straightedge (3' long)
1 - French Curve
1 - Roll 3/4" Drafting Tape
1 - Lead Pointer
1 - Box (each) F, 2H, 6H Leads
1 - Bottle Black India Ink
1 - 12" Scissors
3 - Lead Holders (Mechanical Pencils)
1 - Engineer Scale (Triangular)
1 - Architect Scale (Triangular)
1 - Engineer Scale w/4" = 1 Mile Graduation (Flat)
1 - Erasing Machine with soft pink pearl erasers - 7" long
1 - Polar Planimeter with fixed arm (K & E #62-000, or equal)
1 - Proportional Divider (K & E #55-1860, or equal)
1 - #1956 Erasers "Magic Rub" (Box of 12)
1 - Each #80 CL, 100 CL, 120 CL, 140 CL, 175 CL & 240 CL Leroy Lettering Templates
1 - Leroy Scriber
1 - Castell TG Reservoir Pen Set - Set of nine S1169
1 - 6" Compass with Lead & Pen Adapters
1 - Beam Compass
1 - Drafting Lamp
1 - Drafting Stool
1 - Xacto Knife w/#l1 Blades
2 - Shot Bags
2 - Templates (Dietzgen #2300-411 & 2300-422, or equal)
1 - 37 ½" x 72" Drafting Table with vinyl cover1 Drafting Machine (Universal Boardmaster, or equal w/l-18" scale and 1-12" Scale (Plastic)
1 - Ultrasonic Pen Cleaner
1 - Bottle Pen Cleaning Fluid
1 - Horsehair Dusting Brush
1 - Sandpaper Board
1 - Roll 36" x 20 yd vellum (Tracing Paper)

CHAPTER 6: GEOGRAPHIC INFORMATION SYSTEM (GIS)

The initial task of converting your manual maps to a digital format is a difficult and expensive endeavor. The standards and guidelines in this manual are designed to assist the assessor and the mapping staff in the development and maintenance of a Geographic Information System (GIS). They are intended to develop an accurate, current and statewide parcel basemap. It is the intention of the standards to set uniform parcel information for all assessors' offices and develop a reliable and compatible parcel layer within a county's GIS.

Many factors must be considered and understood for the successful implementation of GIS. The first step to a GIS is a "needs analysis." The needs analysis can provide a more in-depth understanding of what can and cannot be accomplished with a GIS. A needs analysis is accomplished by surveying potential users, determine what they do, and how GIS can help improve operations. The second edition of the ***GIS Guidelines for Assessors***, a joint publication of the Urban and Regional Information Systems Association (URISA) and the International Association of Assessing Officers (IAAO)[1], states that a needs analysis can:

- Determine an objective management approach
- Identify the assessor's mapping and geographic information processing activities
- Inventory the assessor's mapping resources, in terms of both maps and associated information
- Evaluate the quality of these resources
- Examine the abilities of current staff members and determine if additional staffing is needed
- Determine what training will be required to provide the needed skill sets for the staff members
- Determine which unfulfilled processing needs that are difficult or impossible under current operations
- Determine which of these processing needs and activities could be met with a GIS

[1] Urban and Regional Information Systems Association (URISA) and the International Association of Assessing Officers (IAAO). 1999. *GIS Guidelines for Assessors.*

- Inventory existing data processing resources in the assessor's office and elsewhere in the jurisdiction
- Identify additional GIS participants
- Identify the form and content of data sharing among participants
- Identify mapping and geographic information processing activities, mapping resources, data, staffing and data quality issues for the additional participants
- Determine the feasibility of GIS development
- Identify recommended steps for GIS development

Specific situations may require either a more general or a more detailed approach. PTD recommends that before starting the "needs analysis," visit other counties that have already started a GIS and obtain suggestions, however, remember that every county is different and different problems may arise.

PTD will provide assistance on your county's needs analysis upon request. Please submit any requests in writing to the Director, Property Tax Division, PO Box 25126, Santa Fe, NM, 87504.

WHAT IS A GEOGRAPHIC INFORMATION SYSTEM (GIS)?

There are many different definitions for GIS in use today. As the technology changes, so will the definition of GIS. The following definition most closely resembles the way an assessor would use a GIS. A computer-based tool that integrates hardware, software, data and people into a powerful analytical system. This system allows for the spatial analysis of the assessors parcel database to create a graphical representation of many temporal events important to the assessment process. Examples of these analyses are: market values, neighborhood updates and value over time. GIS applications enhance the performance of the assessor's office and often provide the foundation for the development of GIS throughout a local government.

A working GIS integrates five (5) key components: hardware, software, data, people and methods (ESRI, 1998[2]).

ESRI 1998

For an assessor's GIS to be successful it should be able to spatially and numerically relate parcel descriptions (parcel maps), aerial photography, satellite imagery, and tax assessment roll data.

The second edition of the ***GIS Guidelines for Assessors***, a joint publication of the Urban and Regional Information Systems Association (URISA) and the International Association of Assessing Officers (IAAO)[3], provides nine (9) principles of GIS. They are:

Principle 1:	A GIS is a data-driven, data-based information system.
Principle 2:	GIS data and maps must be maintained.
Principle 3:	A GIS is most useful when geographic references are registered on a consistent, continuous coordinate system.
Principle 4:	A GIS has topology.
Principle 5:	A GIS has many uses and should be shared by many different functions.
Principle 6:	A GIS contains hardware and software that are constantly undergoing change that improves its functionality over time.
Principle 7:	A GIS grows incrementally in terms of technology, cost and administrative support needed. A long-term commitment is needed to assure success.
Principle 8:	A GIS causes changes in procedures, operations and institutional arrangements among all users.
Principle 9:	A cadre of trained, educated, motivated and dedicated people is crucial to a successful GIS program.

[2] http://www.esri.com/index.html

With the help of the New Mexico Association of Assessing Officers (NMAAO) GIS Subcommittee, PTD has developed the following standards:

COMMUNICATION EFFORTS

When beginning your GIS, PTD strongly encourages the assessor to communicate with all individuals involved in GIS in your county. Avoid duplication of efforts and work closely with GIS professionals in your county. More than likely your county's existing digital data is available to the assessor's office. Depending on the source of the data there may be a cost to acquire it.

When acquiring data from other resources, always consider the costs. It may be less expensive to create the data than to acquire them. Below is a list of data creators that may be in your county:

- Bureau of Land Management
- New Mexico State Highway Department
- U.S. Forest Service
- National Geodetic Survey
- New Mexico State Land Office
- Bureau of Reclamation
- Other Government Agencies
- Oil and Mineral Companies
- Surveyors
- Utility Companies
- Conservation Districts
- Title Companies
- Commercial Mapping Agencies
- Field Enumeration
- County Clerk's Office
- Census Data

Work closely with the above-mentioned sources. Their data will help you build your GIS, and your data will help them.

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[3] Urban and Regional Information Systems Association (URISA) and the International Association of Assessing Officers (IAAO). 1999. *GIS Guidelines for Assessors.*

HARDWARE AND SOFTWARE

As of the revision date, January 21, 2001, of this manual these are the minimum requirements for your GIS. When initiating your GIS, contact your systems administrator and look at your software requirements before purchasing your hardware. The assessor and mapping staff will need to consider and determine which software package that will work best for your office. A list of potential software providers can be obtained from PTD-mapping staff. Your system should always have upgrade capability. The following is a **minimum** hardware requirement:

PIII board that supports single or dual 450 or above CPU
256-512 MB RAM (at least 256)
8.5-15 GB Hard Drive
CD ROM (CDR)
Zip drive (optional)
32MB Video Card
PS2 or USB mouse and keyboard
Sound card
Video card (32MB RAM)
Monitor (17"-21" preferably)
Labtec 1016 Speaker

The above-mentioned requirements are current as of the revision date of this manual. Technology changes quickly. When purchasing your hardware also always obtain the latest technology available at the time of purchase. Existing systems also may need to be upgraded to meet the current needs of technology. Consult your information systems department to keep up to date.

EDUCATION

It is essential to train your staff to use the software that it purchases. The training needs across the state will vary depending on the software purchased. The county must train the mapping staff in basics such as data creation and maintenance as well as sophisticated analysis techniques. PTD suggests using agency-to-agency training: for example, the assessor's office would be trained by the rural addressor's office to minimize training costs. Also suggested are the use of academic or private training sources, and if possible, to centralize the training location. A centralized location will

allow multiple counties and agencies to work together to facilitate lower training costs through shared facilities and the possibility of large-volume discounts.

The next step is to train non-GIS staff to better perform their jobs by using GIS in support of county missions. These individuals need to build awareness of the capabilities of GIS before learning how to use the technology. This awareness can be accomplished with in-house county staffs already familiar with county operations. Available data may best accomplish this objective.

PTD will coordinate GIS training needs upon request. Please submit any requests in writing to the Director, Property Tax Division, PO Box 25126, Santa Fe, NM, 87504.

SPATIAL REFERENCE SYSTEM / GEOREFERENCING (CONTROL)

A spatial reference system or georeference is a fundamental part of the GIS. It is the framework upon which your data will be built. We recommend that the counties use the Bureau of Land Management's Public Land Survey System (National Geographic Coordinate Data Base - NGCB) or the National Spatial Reference System (NSRS), the nations geodetic control network.

The NGCB data can be downloaded from the Bureau of Land Management's website **(www.blm.gov/gcdb).** Questions regarding these data may be directed to Joe Schmitt, BLM-Team Leader of the Cadastral Survey GCDB Section at (505) 438-7474.

The NSRS provided by the National Geodetic Survey can be requested by email at **stone-ngs@cabq.gov** or contact the PTD-Mapping Section at (505) 827-0892 for more information. The NGCB data is partially based on the NSRS. The accuracy level of the NSRS data is higher than that of the NGCB data. However, the coverage can be limited.

DATABASE

In the assessors' GIS, the property ownership is represented by polygons. Within each polygon is a centroid attribute (point). The centroid connects the spatial information to the database, which holds information (attribute) about a given parcel. It is critical that the two, graphics and tabular data, have a unique identifier. This tie requires that each parcel on the map be associated with attributes in the database. ***The Uniform Property Code is the unique identifier*** (discussed in greater detail in Chapter 3). Not every parcel on the map is going to have one record tied to it. For example, multiple condominium or co-op records can be associated with a single land parcel. A condominium complex is represented as one parcel on the map, but a separate record represents each unit within the complex; therefore, one parcel on the map will have many associated records. This relationship is a one-to-many relationship between the condominium parcels and the tabular data. A more detailed discussion is presented in Chapter 4.

Open Database Connectivity, ODBC

Open Database Connectivity or ODBC is a layer of the operating system that allows applications to connect to a database without having to worry about the specifics of the database. These connections allow read-and-write capabilities.

Drivers are available from your database vendor for their specific database, if supported. Typically the ODBC drivers come with any client software provided by the database vendor.

Some limitations of the ODBC are that not all databases are supported, and these are compatibility and performance problems. Switching the drivers may solve these problems.

PTD strongly recommends a relational database to be used by the county. Below is a set of tables that PTD requires each county to submit at the end of each tax roll:

TABLE NAME: ***Parcels***

	FIELD NAME	TYPE	SIZE	DECIMAL POINTS	DESCRIPTION
1	UPC	Number	21		Uniform ID Map Code
2	MapCode	Text	13		PTD Map Code
3	OwnersName	Text	255		Property Owner's Name
4	Attention	Text	255		Representative of or In Care of Name
5	MaddressStreet	Text	255		Mailing Address Street Number and Name
6	MaddressCity	Text	50		Mailing Address City
7	MaddressState	Text	50		Mailing Address State
8	MaddressCountry	Text	50		Mailing Address Country other than USA
9	PaddressNo	Number	8	0	Property Address Number
10	PaddressStreet	Text	50		Property Address Street Name
11	PaddressSuf	Text	50		Property Address Suffix – A,B,C
12	PaddressDir	Text	50		Property Address Direction – N,S,E,W
13	LegalDescription	Text	255		Legal Description as on Notice of Value
14	SchoolDistrict	Text	50		Taxable School District
15	Township	Number	8	Auto	Township that Equals Center Map Code
16	TownshipDir	Text	50		Township Direction – North, South
17	Range	Number	8	Auto	Range that Equals Center Map Code
18	RangeDir	Text	50		East, West
19	Section	Number	8	Auto	Section
20	CountyCode	Number	8	Auto	Provided by PTD
21	Zoning	Text	255		Legal Zoning
22	LandUseCode	Text	50		Land Use Code
23	TotalAcres	Number	25	3	Total Deeded Land
24	TotalLandVal	Currency	25	0	Total Land Value
25	BldgClass	Text	255		Classification of Building – Res, Comm
26	TotalBldgSQFT	Number	25	2	Total Building Sq Ft
27	TotalBldgValue	Currency	25	0	Total Building Value (All Structures)
28	MiscImprValue	Currency	25	0	Total Miscellaneous Value
29	TotalFullValue	Currency	25	0	Sum of Total Bldg, Land & Misc Impr Values
30	VetExemptionNo1	Text	50		Veterans Exemption Number 1
31	VetNo1Amount	Currency	25	0	Veterans Number 1 Amount Applied
32	VetExemptionNo2	Text	50		Veterans Exemption Number 2
33	VetNo2Amount	Currency	25	0	Veterans Number 2 Amount Applied
34	HeadOfHousehold	Currency	25	0	Head of Household Exempt Amount Applied
35	DisabilityExemption	Yes/No	1		Disability Exemption Yes or No
36	TotTaxableVal	Currency	25	0	Total Full Value / 3 less all exemptions

TABLE NAME: ***BldgSegments***

	FIELD NAME	TYPE	SIZE	DECIMAL POINTS	DESCRIPTION
1	UPC	Text	25		Uniform Map Code Link
2	BldgClass	Text	50		Classification of Individual Buildings

3	BldgSqFt	Number	8	0	Sq Ft of Building
4	BldgValue	Currency	25	0	Total Building Value
5	MiscValue	Currency	25	0	Miscellaneous Value – Other Improvements
6	TotalValue	Currency	25	0	Total Value – Sum of BldgValue & MiscValue
7	YearBuilt	Number	8	0	Year Built
8	Quality	Text	50		Quality of Construction

TABLE NAME: ***BookPage***

	FIELD NAME	TYPE	SIZE	DECIMAL POINTS	DESCRIPTION
1	UPC	Text	25		Uniform Map Code Link
2	Book	Text	50		Book & Page Filed in Clerk's Office
3	Page	Text	50		Page Filed
4	Name	Text	50		Name of Grantor or Defin of Type of Doc, Plat

TABLE NAME: ***LandSegments***

	FIELD NAME	TYPE	SIZE	DECIMAL POINTS	DESCRIPTION
1	UPC	Text	25		Uniform Map Code Link
2	LandClass	Text	50		Land Classification
3	FF	Number	8	2	Frontage
4	Dept	Number	8	2	Dept
5	SqFt	Number	8	2	Total SqFt of Land Segment
6	Acreage	Number	8	3	Total Acreage of Land Segment
7	LandValue	Currency	25	0	Land Value of Segment

TABLE NAME: ***SaleData***

	FIELD NAME	TYPE	SIZE	DECIMAL POINTS	DESCRIPTION
1	UPC	Text	25		Uniform Map Code Link
2	Type	Text	50		Residential, Vacant, Commercial
3	SalePrice	Currency	25	0	Sale Price
4	SaleDate	Date/Time	25		Sale Date (00/00/0000 Format)
5	ValidSale	Yes/No	1		Valid Sale or Not
6	Reason	Text	255		If Invalid, Describe Why

SUMMARY OF REQUIREMENTS FOR DIGITAL DATA

All data must comply with the standards presented in this manual.

1. The following reference formats will only be accepted:
   1.1. Datum: North American Datum of 1983
   1.2. Projection: Transverse Mercator, Universal Transverse Mercator, and Geographic Reference System (un-projected)
   1.3. Coordinate System: New Mexico State Plane Coordinate System, Universal Transverse Mercator, or Latitude and Longitude (decimal degrees/un-projected data)
2. The Digital Data Form will be completed and submitted with data.
3. Database and graphical data will be submitted together.

DATA TRANSFER

In accordance with Regulation 3 NMAC 6.7.17.9, every county must submit its digital mapping data annually to PTD commencing in June 2002. This regulation was promulgated on February 14, 2000. All data must comply with the standards presented in this manual. Refer to Chapter 2 for digital data requirements.

Before transferring data, always save previous years data for reference analysis. Data may be transmitted to PTD by FTP (file transfer prototype) after normal business hours; submit completed Digital Data Information Form, located in Appendix E. Contact PTD's Mapping Section to arrange for specific file transfer(s). The county may also mail the data by cd or zip to PTD at the following address:

Taxation and Revenue Department
Property Tax Division
PO Box 25126
Santa Fe, NM, 87504
Attention Mapping Section.

APPENDIX A

NEW MEXICO STATUTES ANNOTATED 1978

47-1-49. New Mexico coordinate system; zones.

The system of plane coordinates which has been established by the national ocean survey and national geodetic survey for defining and stating the positions or locations of points on the surface of the earth within the state of New Mexico shall be known and designated as the "New Mexico coordinate system". As used in Section 47-1-49 through 47-1-56 NMSA 1978, the term "New Mexico coordinate system" includes both the New Mexico coordinate system of 1927 and the New Mexico coordinate system of 1983.

For the purpose of the use of this system the state is divided into an "east zone", "central zone," and a "west zone."

The area now included in the following counties shall constitute the east zone: Chaves, Colfax, Curry, DeBaca, Eddy, Guadalupe, Harding, Lea, Mora, Quay, Roosevelt, San Miguel and Union.

The area now included in the following counties constitute the central zone: Bernalillo, Dona Ana, Lincoln, Otero, Rio Arriba, Sandoval, Santa Fe, Los Alamos, Socorro, Taos, Torrance, and Valencia.

The area now included in the following counties shall constitute the west zone: Catron, Cibola, Grant, Hidalgo, Luna, McKinley, San Juan and Sierra.

47-1-50. Zone designations.

As established for use in the east zone, the New Mexico coordinate system shall be named and in any land description in which it is used it shall be designated the "New Mexico coordinate system of 1927, east zone" or the "New Mexico coordinate system of 1983, east zone".

As established for use in the central zone, the New Mexico coordinate system shall be named and in any land description in which it is used it shall be designated, the "New Mexico coordinate system of 1927, central zone" or the "New Mexico coordinate system of 1983, central zone".

As established for use in the west zone, the New Mexico coordinate system shall be named and in any land description in which it is used it shall be designated, the "New Mexico coordinate system of 1927, west zone [zone]" or the "New Mexico coordinate system of 1983, west zone".

47-1-51. Plane coordinates, x and y; definition.

The plane coordinates of a point on the earth's surface, to be used in expressing the position or location of such point in the appropriate zone of this system, shall consist of two (2) distances, expressed in feet and decimals of a foot when using the New Mexico coordinate system of 1927 and expressed in meters and decimals of a meter when using the New Mexico coordinate system of 1983. One (1) of these distances, to be known as the "x-coordinate", shall give the position in an east-and-west direction; the other, to be known as the "y-coordinate," shall give the position in a north-and-south direction. These coordinates shall be made to depend upon and conform to the coordinates, on the New Mexico coordinate system, of the horizontal control stations of the national ocean survey and national geodetic survey within the state, as those coordinates have been determined by the survey. The length of the one foot expressed in meters is equal to 1,200 divided by 3,937 exactly.

47-1-52. Description of land located in more than one zone.

When any tract of land to be defined by a single description extends from one into another of the coordinate zones as provided in Section 47-1-49 NMSA 1978, the positions of all points on its boundaries may be referred to either of the zones; the zone which is used shall be specifically named in the description.

47-1-53. Definition of coordinate system according to U.S. coast and geodetic survey [national ocean survey and national geodetic survey].

A. For purposes of more precisely defining the New Mexico Coordinate System, the following definition by the national ocean survey and national geodetic survey is adopted:

(1) the New Mexico coordinate system, east zone, is a transverse Mercator projection having a central meridian 104º 20' west of Greenwich, on which meridian the scale is set at one part in 11,000 too small. The origin of coordinates is at the intersection of the meridian 104º 20' west of Greenwich and the parallel 31º 00' north latitude;

(2) the New Mexico coordinate system, central zone, is a transverse Mercator
Projection having a central meridian 106º 15' west of Greenwich, on which meridian the scale is set at one part in 10,000 too small. The origin of coordinates is at the intersection of the meridian 106º 15' west of Greenwich and the parallel 31º 00' north latitude;

(3) the New Mexico coordinate system, west zone, is a transverse Mercator projection having a central meridian 107º 50' west of Greenwich, on which meridian the scale is set at one part in 12,000 too small. The origin of coordinates is at the intersection of the meridian 107 º 50' west of Greenwich and the parallel 31º 00' north latitude; and

(4) the origin for each zone is assigned the coordinates; x = 500,000 feet an y = 0 feet for the New Mexico coordinate system of 1927. The origin for the east zone is assigned to the coordinates; x = 165,000 meters, and y = 0 meters, for the central zone x = 500,000 meters and y = 0 meters and for the west zone x = 830,000 meters and y = 0 meters for the New Mexico coordinate system of 1983.

B. The position of the New Mexico Coordinate System shall be as marked on the ground by horizontal control stations established in conformity with standards adopted by the national ocean survey and national geodetic survey for the first-order, second-order and third-order work, whose geodetic positions have been rigidly adjusted on the North American datum of 1927 or of 1983 and whose coordinates have been computed on the system defined in this section. Any such station may be used for establishing a survey connection with the New Mexico coordinate system.

47-1-54. Recordation of land description based on coordinates system; limitation.

No coordinates based on the New Mexico coordinate system, purporting to define the position of a point on a land boundary, shall be presented to be recorded in any public land records or deed records unless such point is within eight kilometers of a monumented horizontal control station established by and for which coordinate data has been published by an agency of the state of New Mexico or a political subdivision of the state of established in conformity with the standards of accuracy and specifications for first-, second- or third-order geodetic surveying as prepared and published by the federal geodetic control committee of the United States Department of Commerce. Standards and specifications of the federal geodetic control committee or its successor in force on the date of the geodetic survey shall apply. The publication of the existing control stations, or the acceptance with intent to publish the newly established control stations by the national ocean survey and national geodetic survey, shall constitute evidence of adherence to the federal geodetic control committee's specifications. The limitations of this section may be further modified by the Secretary of Highway and Transportation.

47-1-55. [Use on maps, reports of survey or other documents.]

The use of the term "New Mexico Coordinate System" on any map, report of survey, or other document, shall be limited to coordinates based on the New Mexico coordinate system as defined.

47-1-56. Use of coordinate system.

For the purpose of describing the location of any survey station or land boundary corner in the State of New Mexico, it shall be considered a complete, legal and satisfactory description of such location to give the position of said survey state or land boundary corner on the system of coordinates defined in Sections 47-1-49 through 47-1-56 NMSA 1978.

Nothing contained in those sections shall require a purchaser or mortgagee of real property to rely wholly on a land description, any part of which depends exclusively upon the New Mexico coordinate system.

Where conflicts arise in the location of a corner or other boundary element when such corner or element's location is described in both the conventional system and the New Mexico coordinate system, the description providing the most certain location shall be used.

7-38-9. Description of property for property taxation purposes.

A. Property shall be described for property taxation purposes by a description sufficiently adequate and accurate to identify it. Real property shall be described under a uniform system of real property description in accordance with regulations of the department. The department shall promulgate regulations establishing a uniform system of real property description to be used by the department and all assessors. The system shall include requirements for comprehensive mapping or geographic information system; the use of uniform property record documents and uniform coding of real property descriptions.

B. Real property that has been valued for property taxation purposes prior to the effective date of the Property Tax Code [Articles 35 to 38 of Chapter 7 NMSA 1978] by a description consisting of a mere reference to the time and place of filing or recording in the office of the county clerk of any map or other instrument describing the property with sufficient preciseness to permit its identification shall be considered to have been sufficiently described for property taxation purposes. All prior assessments, records and instruments maintained or issued by property taxation officers which describe the property by such a reference are validated and given the same force and effect as if a description of the property had been used that would comply with this section.

REGULATIONS

3 NMAC 6.7.17.1 Description sufficiently adequate and accurate to identify real property - improvements must be described: A description sufficiently adequate and accurate to identify real property is a description such that, if the description were included in a deed, title would pass and which identifies it sufficiently to permit it to be located on the ground and its boundaries determined. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.2 Uniform system of real property description to be used by the department and all county assessors: The Department and all county assessors shall substantially comply with the current "New Mexico Mapping Manual" prepared by the Division pursuant to Section 7-35-4. The system described in that manual replaces the "unit tax system" and any other system now in use in any county for the description, indexing or identification of real property. The Director may permit, however, a reasonable time for replacement of these other systems. The Department may insure substantial compliance with this subsection (3 NMAC 6.7.17.2) by installation of the required system by the Department pursuant to Section 7-38-10. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.3 Real property descriptions recorded with the county clerk: Legal descriptions or plats of real property filed pursuant to Section 14-8-16, for record in the office of the county clerk, certified as correct by a professional engineer or land surveyor licensed in the state and delivered to the county assessor are, in the case of legal descriptions, and in the case of plats, adequate documents for reference in descriptions for property taxation purposes. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.4 Maps prepared by the State Engineer pursuant to the Land Survey Act of 1969: Where the state engineer has prepared maps containing a legal description of tracts of land surveyed pursuant to the Land Survey Act of 1969 and assigned each such tract a number, such lands for taxation shall be described by reference to the tract number and map number that designate the land and the date the map was filed and placed on record in the office of the county clerk. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.5 Descriptions by reference to recorded instructions: Descriptions by reference to instruments fully recorded with the county clerk and containing a description of the property sufficiently adequate and accurate to identify it, unless otherwise ordered by the Secretary, are adequate descriptions for property taxation purposes when the instruments meet the conditions of the subsection (3 NMAC 6.7.17.5). The instrument containing the description referred to, or other similar information, so that the instrument containing the description referred to can be located and identified. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.6 Description by coordinates: Descriptions pursuant to the New Mexico coordinate system established by Sections 47-1-49 through 4-1-56 are adequate descriptions for property taxation purposes, provided they are otherwise adequate pursuant to these regulations. In the event, however, there is a conflict in a legal description where state plane coordinates are used to describe any tract of land which in the same document is also described by reference to any subdivision, line or corner of the United States public land surveys, the description based on the public land survey will prevail. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.7 Subdivision Descriptions by Number and Plat Designation: Description of parcels by number and plat designation are valid for the purpose of taxation for subdivisions approved pursuant to the New Mexico Subdivision Act (Sections 47-6-1 et seq.) provided they are otherwise adequate pursuant to these regulations. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.8 Effect of Section 7-38-9B: The effect of Section 7-38-9B is to validate assessments, records and instruments maintained or issued by tax officers prior to the effective date of the Property Tax Code. This provision in no way authorizes the use of past practices of description, mapping or coding after January 1, 1975. However, certain of these regulations do, authorize the use of past practices of description and coding but only to the extent and subject to the conditions stated in those regulations. [3/23/83, 12/29/94, 8/31/96]

3 NMAC 6.7.17.9 GEOGRAPHIC INFORMATION SYSTEMS:

3 NMAC 6.7.17.9.1 A "geographic information system" is consists of three parts:
1 a digitized map or set of maps for the county in a format conforming to standards set by the Department, with smart points, lines and areas;
2 a computerized database or databases containing required valuation information for each property in the county; and
3 a set of rules relating the map features to each other and to the property valuation database or databases such that every parcel mapped is identified with a property in the database. [2/14/2000]

3 NMAC 6.7.17.9.2 Every county shall have a digitized set of maps for the county in place by June 2002. Every such set shall meet the specifications and standards set by the Department for such sets. The Department shall review each set to ensure conformance with requirements of this regulation and directives of the Director. [2/14/2000]

3 NMAC 6.7.17.9.3 Beginning in 2002, every county shall transmit to the Department in accordance with instructions of the Department but at least annually a copy of the county's digitized county maps and property database. Such copies shall be retained by the Department as back-up for the county system until replaced by a subsequent copy. [2/14/2000]

7-38-10. Department may ensure compliance with mapping and description of real property regulations by departmental installation of required system; reimbursement by county of costs incurred.

Whenever the director determines that it is necessary to insure compliance with departmental regulations relating to comprehensive mapping and real property description, or to correct county deficiencies in this regard, he shall order the installation by the department of the necessary maps and other increments of

the property description for costs incurred by the department in the installation or correction of a property description system.

3 NMAC 6.7.18 Installation of Required System by Department: Tax maps are maps showing the location, shape and size of each parcel of property that the county assessor must value. An identification number is usually applied to each parcel of property to correlate the numbered parcels with the ownership lists. Because tax maps are essential to the appraisal process, the Department may take whatever action is necessary, including having the maps prepared and installed in a county and billing the county for the costs of preparing and installing, to ensure that every county has adequate tax maps. [3/23/83, 12/29/94, 8/31/96]

APPENDIX B

GLOSSARY OF MAPPING TERMS

(A)

ABUT

To reach; to touch. In old law, the ends were said to abut the sides to adjoin. The term "abutting" implies a closer proximity than the term “adjacent."

ACRE

A unit of area measurement. An acre equals 10 square chains or 43,560 square feet. 640 acres equal 1 square mile. See CHAIN.

ADJACENT

Lying near or close to; sometimes contiguous; neighboring. The term "adjacent" implies that the two objects or parcels of land are not widely separated, though they may not actually touch, while "adjoining" implies that they are so joined or united to each other that no third object or parcel of land intervenes. See ABUT.

ADJOINING

Touching or contiguous, as distinguished from lying near to or adjacent. To be in contact with; to abut upon.

AERIAL

Relating to the air or atmosphere, being applicable in a descriptive sense to anything in space above the ground and within the atmosphere.

AERIAL PHOTOGRAPH

A photograph of a part of the earth's surface taken by an aircraft supported camera.

ALIQUOT

Contained an exact number of time in another; a part of a measurement that divides the measurement without a remainder. See ALIQUOT PARTS.

ALIQUOT PARTS

Legal subdivision, except fractional lots. A division of a section into halves or fourths ad infinitum.

ANGLE

The figure formed by two lines extending from the same point in degrees. Angles are either 1, obtuse, where the degree is greater than 90; 2, right, where the degree is exactly 90 and; 3, acute where the degree is less than 90.

ANGLE POINT

A point in a survey where the alignment or boundary deflects from a straight line.

ANGLE BETWEEN THE LONG CHORD AND THE SEMI-TANGENT

On a circular curve, the degree between the semi-tangent and the long chord is equal to the degree of one-half the delta or central angle.

ARC LENGTH

The length of a circular curve usually designated on highway right-of-way maps an "L."

AZIMUTH

The angle measured on the horizon between the meridian and the plain of the vertical circle through a celestial body or other objects. Most government agencies reckon azimuth clockwise from south, 0 degree to 360 degrees.

(B)

BLM (Land Status Records)
: Bureau of Land Management

BM
: Bench Mark

BARK SCRIBE
: To bark scribe a tree monument or bearing tree is to lightly cut the appropriate marks into the bark of the tree without blazing. In the case of certain smooth and thin barked trees, marks thus made will last as long as the tree remains sound. See BLAZE.

BASE LINE
: A line which is extended east and west on a parallel of latitude from an initial point and from which are initiated other lines for the Cadastral Survey of the public lands within the area covered by the principal meridian that runs through the same initial point.

BEARING
: The horizontal angle which a line makes with the meridian of reference adjacent to the quadrant in which the line lies. Bearings are classified according to the meridian of reference as: astronomic, geodetic, magnetic, grid, etc. When no reference is specified on a plat or in a document, astronomic meridian is presumed. A bearing is identified by naming the end of the meridian from which it is reckoned, either north or south and the direction of that reckoning, either east or west. Thus, a line in the northeast quadrant making an angle of 50 degrees from the reference meridian will have a bearing of N. 50 degrees E.

BENCH MARK
: A relatively permanent material object, natural or artificial, bearing a marked point of known elevation above or below an adopted datum.

BEAM COMPASS
: A compass which is equipped with extension rods to be used for the plotting of circular curves involving extra ordinarily long radii of various lengths.

BEARING TREE
: A marked tree used as a corner accessory; its distance and direction from the corner being recorded. Bearing trees are identified by prescribed marks cut into their trunks; the species and sizes of the trees are also recorded.

BLAZE
: A mark made upon a tree trunk usually at about breast height. The bark and a small amount of live wood are removed with an ax or other cutting tool, leaving a flat, smoothed surface which forever brands the tree. On rough-barked tree monuments or bearing trees the appropriate marks are scribed into a smooth, narrow, vertical blaze the lower end of which is about 6 inches above the root crown. The blaze should be just long enough to allow the markings to be made.

BOUNDARY LINE
: A line along which two areas meet. A boundary line between privately owned parcels of land is usually termed a property line. If a boundary is a line of the United States Public Land Surveys, it is given a particular designation, such as section line or township line.

BUREAU OF LAND MANAGEMENT, THE
: An agency of the Department of the Interior, it was created July 16,1946, pursuant to Presidential Reorganization Plan No.3 of 1946, which consolidated the functions and activities of the General Land Office and the Grazing Service.

(C)

CADASTRAL SURVEY
: A survey which creates, marks, defines, retraces or reestablishes the boundaries and subdivisions of the public lands of the United States.

CALL
: A reference to, or statement of an object, course, distance or other matter of description in a survey or grant requiring or calling for a corresponding object, or other matter of description, on the land.

CARDINAL
: The cardinal directions; north, south, east and west.

CENTROID
: In Geographic Information System (GIS), the center of gravity of an entity, often used to reference polygons.

CARTOGRAPHY
: The art, science and technology of expressing graphically, by maps, charts, three dimensional models and globes, the known physical features of the earth or any heavenly body at any scale. In particular, cartography is concerned with all phases of map finishing, including the designing of format and symbolization; drafting, editing and proofing a map content; and specifying requirements for reproduction.

CENTRAL ANGLE
: The angle in degrees between the radii of a circular curve. The central angle is equal to the delta of a circular curve.

CENTERLINE
: The line connecting opposite corresponding quarter corners or opposite subdivision-of-section corners or their theoretical positions. Applied to a street, right-of-way or any strip of land of uniform width "centerline" defines the line midway between the side lines of said strip.

CHAIN
: The unit of length prescribed by law for the survey of the public lands of the United States. The chain is equivalent to 66 feet or 4 rods, poles or perches. 10 square chains equal one acre.

CHAINING
: The operation of measuring a distance on the earth, using a chain or tape. The corresponding operation, in private surveys, is taping.

CHORD
: In surveying and geometry, a straight line joining any two points on an arc, curve, circumference, or surface.

COMPASS
: A drafting instrument that can be adjusted to different radii lengths used for the plotting of circles or curves.

COMPOUND CURVE
: The union of two or more curves which traverse in the same directions off of a common radius although each does vary in length.

CONFORMALITY
: The characteristic of true shape, wherein a projection preserves the shape of any small geographical area. This is accomplished by exact transformation of angles around points.

CONTIGUOUS LAND
: Generally speaking, two parcels of land having a common boundary line.

CONTOUR
: An imaginary line on the ground all points of which are at the same elevation above or below a specified datum surface.

CONTOUR MAP
: See TOPOGRAPHIC MAP.

COORDINATES

A set of numbers used in specifying the location of a point.

CORNER

A point on the surface of the earth, determined by the surveying process which defines an extremity on a boundary of the public lands.

COURSE

In surveying, the direction of a line with reference to a meridian.

CURVES

Curved rulers, termed irregular curves, or French curves, used for drawing curved lines. The patterns for these curves are laid out in parts of ellipses and spirals or other mathematical curves in various combinations. Curves for drawing circular curves are highway curves.

(D)

D/C

An abbreviation appearing on the Bureau of Land Management plats signifying "Ditches and Canals".

DATUM

In ordinary survey usage, a defined reference for survey measurements. Two principal types of datum are used - horizontal and vertical.

DECLINATION

The variations given in degrees on maps generally applied to the angles between true, magnetic or grid north.

DELINEATE

As applied to mapping, it is the act of representing, portraying or describing graphically features to be shown on a map.

DELTA

On circular curves, it is the angle between the intersection at the point of intersection of the forward and back tangents.

DRAFTING MACHINE

A drawing instrument equipped with a protractor that can be adjusted for laying down and measuring angles in drawing or plotting survey descriptions.

(E)

EASEMENT

An interest or right in land owned by another that entities its holder to a specific limited use; such as laying a sewer, crossing over property or putting up power lines.

EQUIVALENCE

The characteristic of equal area. Preservation of equivalence involves an inexact transformation of angles around points and thus, is mutually exclusive with Conformality except along one or two selected lines. The property of equivalence is important in maps which are used for comparing density and distribution data, as in populations.

(F)

FIELD NOTES

The official written record of the survey, certified by the field surveyor and approved by proper authority.

FOUND CORNER

A term adopted by the U.S. Geological Survey for an existent corner of the Public Lands Surveys which has been recovered by field investigation. See CORNER.

FRACTIONAL SECTION

A section, which in its original form, contained one or more subdivisions of less than forty (40) acres due to irregular exterior boundaries, or due to the encroachment of a meandered body of water or other land which could not be properly surveyed or disposed of as an aliquot part of that section.

FRACTIONAL TOWNSHIP

A township containing less than 36 sections, usually because invasion by a segregated body of water by other land which cannot be properly surveyed as part of that township such as a land grant. Half ranges and half townships are fractional townships by definition.

(G)

GEOMETRY

A branch of mathematics that deals with the measurement, properties and relationships of points, lines, angles, surfaces and solids.

GEODETIC SURVEY

A precise survey of considerable extent which takes into account the shape of the earth.

GRANT

Lands, title to which has been confirmed or conferred to the United States for a particular reason or purpose.

GUIDE MERIDIAN

An auxiliary governing line projected north along an astronomical meridian, from points established on the base line or a standard parallel, usually at intervals of 24 miles east or west of the principal meridian, on which township, section, and quarter-section corners are established.

(H)

HACHURES

A short line used for shading and denoting surfaces in relief in map drawing and drawn in the direction of the slope. (See RELIEF & TOPOGRAPHIC).

HES (Land Status Records)

Homestead entry survey.

HOMESTEAD ENTRY

An entry under the United States land laws for the purpose of acquiring title to a portion of the public domain under the homestead laws. Consisting of an affidavit of the claimant's right to enter, a formal application for the land and payment of the money required.

HORTALIZA

A Spanish term meaning "garden"'. Hortalizas are still a matter of record in Tularosa, New Mexico consisting of gardens or tracts of farm land on the outskirts of that city. A Hortaliza measured from between 285 to 300 feet square. There were 104 Hortalizas in Tularosa, many of which are now subdivided.

(I)

INDEPENDENT RESURVEY

An official rerunning and remarking intended to supersede the records of the original survey and establish new section lines and subdivisions on public lands only. Any patented lands involved must be identified and segregated according to the original survey. Only remaining areas of the public lands may be resurveyed without regard to the original survey.

INITIAL MONUMENT

A physical structure which marks the location of an initial point in the rectangular system of surveys. See INITIAL POINT.

INITIAL POINT

A point which is established under the rectangular system of surveys and from which is initiated the cadastral survey of the principal meridian and the base line that controls the cadastral survey of the public lands within a given area. See MERIDIAN, BASE LINE, RECTANGULAR SYSTEM OF SURVEYS And MONUMENT.

INITIAL POINT OF A METES AND BOUNDS SURVEY

Also a "beginning point." In a survey, such as the survey of the boundaries of an Indian reservation, each angle point is monumented and assigned a number. The numbers are in a series with number 1 at the initial point.

IRREGULAR SECTION

A section having two or more adjacent boundaries, as returned on the original survey, that are not within 0 degrees 21' of cardinal or exceed 25 links from 40 chains in measurement. See CARDINAL.

(K)

KILOMETER

Abbreviated km, having a length of 1,000 meters. a kilometer has an approximate U.S. equivalent of 0.62 of a mile or 3,273.6 feet.

(L)

LAND STATUS MAP

The Bureau of Land Management publishes a color coded New Mexico Land Status map that includes Public, State, Indian, Reservation, National Parks and Monuments, Military, Private, National Forest, National Wildlife Refuge, Private Land Grants, etc. It also includes other features such as major highways, county boundaries, townships, etc. Topography is generally not shown owing to the use of so small a scale. The New Mexico State Land Status maps, at present, shows State Surface and Minerals, State Minerals (only) and State Surface (only) plus a number of other types of roads and more detailed features not shown on the BLM maps. The state map is published in the form of Quadrangles drawn at the scale of one inch equals two miles and is published by the State Land Office.

LAND STATUS RECORDS

Those records maintained by the Bureau of Land Management, showing ownership of the public lands and the availability of the lands for use under land laws. The land status records include the Master Title Plat, Supplemental Master Title Plat, Use Plat, Historical Index, Control Document Index, Miscellaneous Document Index, Serial Register, Mineral Location and Contest Index, Tract Books, Plat Books, Patents, Deeds Name Index Card File and the Working and Reference Records.

LAND SURVEYING

The practice of land surveying includes surveying of areas for their correct determination and description and for conveyance, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions, thereof.

LATITUDE

1. The distance on the earth's surface, north or south of the Equator, expressed in either linear or angular measurements.
2. The north-south component of a traverse course.

LEAGUE

Any of various units of distance from about 2.4 to 4.6 statue miles

LEGAL DESCRIPTION

A written statement recognized by law as to the definite location of a tract of land by reference to a survey, recorded map or adjoining property.

LEGEND

A description, explanation or table of symbols printed on a map or chart to permit a better understanding or interpretation of it.

LINK

A unit of linear measure, one hundredth of a chain and equivalent to 7.92 inches (0.66 foot). See CHAIN.

LONGITUDE

The distance on the earth's surface east or west of a defined meridian, usually the meridian of Greenwich (0 degrees Longitude), expressed in either angular measure, such as 90 degrees West Longitude, or in time, such as 6 hours West of Greenwich.

LOST CORNER

A corner whose position cannot be determined, beyond reasonable doubt either from traces of the original marks or from acceptable evidence or testimony that bears on the original position, and whose location can be restored only by reference to one or more interdependent corners.

LOT

A subdivision of a section which is not described as an aliquot part of a section, but which is designated by number, e.g., LOT 2. A lot may be regular or irregular in shape and its acreage varies that of regular subdivisions.
The term "Government Lot" is commonly used by persons outside the Bureau of Land Management in referring to such a subdivision of a section. "Lot" is also the name given individual parcels of recorded subdivisions of private tracts.

(M)

MAP

A representation on a plane surface, at an established scale, of the physical features (natural, artificial, or both) of a part or the whole of the earth's surface, by means of signs and symbols and with the means of orientation indicated.

MERIDIAN

A north-south line from which longitudes (or departures) and azimuths are reckoned.

METES AND BOUNDS

A method of describing a parcel of land by citing the owners of abutting lands and describing the length of each course of a boundary as "along" some apparent line, such as, "along a stream" or "along the road." In modern usage, a metes and bounds description includes the bearings and distances of each course.

METES-AND-BOUNDS SURVEY

A survey of an irregularly shaped tract of land, not conforming to the rectangular system of surveys.

MINUTE

In the use of the protractor for plotting angles or bearings a minute is one sixtieth part of a degree. There are sixty seconds in a minute.

MISCLOSURE

The amount by which a series of survey measurements fail to yield a theoretical or previously determined value for a survey quantity; hence, a measure of the accumulated errors and blunders in the work. Also termed "closing error" or "error of closure."

MONUMENT

A physical structure, such as an iron post, marked stone, or tree in place, which marks the location of a corner point established by a Cadastral survey. Objects, to be ranked as monuments, should have certain physical properties such as visibility, durability and stability and they must define location without resorting to measurements. "Monument" and "corner" are not synonymous, although the two terms are often used largely in the same sense. See CORNER.

MORE OR LESS

When used in connection with quantity or distance in a conveyance of land are considered words of safety or precaution intended to cover some slight or unimportant inaccuracy. The same applies to the use of the word "about."

MTP

Land Status maps on record with the Bureau of Land Management known as a "Master Title Plat". The Master Title Plats are drawn at scale 1" = ½ mile and show patent land with only the name of original owner given, public domain (BLM), State, Indian, Land Grants and other Federal Lands. Each plat usually covers one township and is a black line print approximately 20" x 25" in size.

MYLAR

A durable transparent plastic drafting film of various thickness with, at least, one side having a matte or coated surface for drawing with ease using either pencil or ink.

(N)

NEARLY AS MAY BE

As applied to legislation and establishment of the Bureau of Land Management, the basic provisions require that the public lands "shall be divided by north and south lines run according to the true meridian and by others crossing them at right angles, so as to form township six miles square;" that the townships shall be subdivided into sections, containing as nearly as may be, six hundred and forty acres each;" and that "the excess or deficiency shall be noted and added to or deducted from the western and northern ranges of sections or half-sections in such townships, according as the error may be in running the lines from east to west or from south to north."

NINETY DEGREES

Two lines extending from the same point that are at a right angle or perpendicular to one another as in a right angle triangle, square or rectangle.

(0)

OBLIQUE SECTION

A section whose sides may neither be parallel nor perpendicular or having the axis not perpendicular to the base.

ORTHOGRAPHIC AERIAL PROJECTION

An aerial photo of a single view of objects on the ground in which the view is projected along 1ines perpendicular to the surface. In a perfect Orthophotograph, there are no displacements of images because of tilt or relief.

OVERLAP

Lands surveyed in conflict. A common area included in a separate survey as is shown by the evidence on the ground.

(P)

P.C. - Point of Curvature
P.I. - Point of Intersection
P.O.C. - Point on Curvature
P.O.S.T. - Point on Semi-Tangent
P.T. - Point of Tangency

PARALLELOGRAM

For purposes of the definition in this glossary of terms, a parallelogram is a quadrilateral with opposite sides parallel and equal but containing no right angles. In a strict sense parallelograms do also include squares and rectangles, both quadrilaterals of which contain opposite sides parallel and equal but also having all four corners at right angles

PATENT

A document by which the United States conveys, to those entitled thereto, legal title to some portion of the Public lands.

PERCH

A unit of linear measure equal to 25 links or 16 ½ feet. Also termed a "pole" or "rod." In the land area, a square rod; 272.25 square feet or .00625 acre.

PERPENDICULAR

Being at right angles to a given line.
(See NINETY DEGREES and RIGHT ANGLE).

PHOTOGRAMMETRY

The science or art of obtaining reliable measurements by means of photographs.

PLANE COORDINATES

In general, coordinates specifying the location of points on a plane. In surveying, use the "plane" is usually a projection of the earth's surface such as a developed cone or cylinder.

PLANIMETER

A device for measuring small areas by mechanical integration.

PLANIMETRIC MAP

A map which presents only the horizontal positions for the features represented, distinguished from a topographic map by the omission of relief in measurable form.

PLAT

As used technically by the BLM, the drawing which represents the particular area included in a survey, such as a township, private land claim or mineral claim and the lines surveyed, established, retraced or resurveyed, showing the direction and length of each such line; the relation to the adjoining official surveys; the boundaries, descriptions, and as nearly as may be practicable, a representation of the relief and improvements within the limits of the survey.

POLE

Also termed "perch" or "rod"; a unit of length in land measurement, equal to 25 links or 16 ½ feet.

POLYGON

For purposes of the definition in this glossary, a polygon is a closed plane containing more than four sides and can either be concave or convex.

PROPORTIONAL DIVIDER

A measuring instrument with calibrations that can be adjusted and used in the plotting of an existing drawing through means of either enlargement or reduction of the existing drawing's original size.

PROTRACTOR

An instrument that is used for laying down and measuring angles in the drawing or plotting of a metes and bounds survey description. It is calibrated in the degrees contained within a circle.

PROTRACTION

The word means extension; prolongation. An example of its use would be the representation on paper of the fractional lots in the north and west tiers of sections within a township. These lines are not monumented on the ground. They are shown on the plat as a protraction (dashed line) indicating that they were not run in the field. The distances given are parenthetical until they are actually surveyed.

(Q)

QUADRANT

Any of the four quarters into which something is divided by two real or imaginary lines that intersect each other at right angles. An arc of 90º that is one quarter of a circle

QUARTER-SECTION CORNER

A corner at an extremity of a boundary of a quarter section. Written as ¼ section corner, not as one fourth section corner.

QUARTER SECTION

One-fourth of a section, containing 160 acres more or less.

(R)

R/W

The abbreviation used by the Highway Department meaning "right- of- way".

RADII

Plural of radius

RADIUS

A line segment extending from the center of a circle to the surface of the curve. One-half the diameter of a circle.

RECTANGLE

Having four sides lying, crossing or meeting at right angles and having opposite sides parallel but not equal as opposed to a square.

RECTANGULAR SYSTEM OF SURVEYS

A system inaugurated by the Continental Congress on May 20,1785, for the survey of the public lands of the United States. Its distinguishing characteristic is that in the main and in all case where practicable, its units are in rectangular form.

RECTIFIED PHOTOGRAPH

A photograph in which tilt displacements have been removed by transformation. See TRANSFORMATION.

REGULAR SECTION

A section whose boundaries as returned on the original survey, are within 25 links from each 40 chains in measurement.

REGULAR TOWNSHIP

A township which is surveyed with four complete boundaries every part of which is within allowable limits and is subdivided into 36 sections according to the regular method of subdivision.

RELIEF

Variation in the elevation of the ground surface, also features of height above a plain or reference datum. On topographic maps, relief is depicted by Hachures or shading, or more accurately by contours or by spot elevations or both.

REPRESENTATIVE FRACTION

A fraction expressing scale in which the numerator is unity and the denominator is the number that the unit distance must be multiplied by in order to obtain its distance on the ground in the same units. For example, 1/12,000. Also seen as 1:12,000 and 1-12,000.

RESURVEY

A term applied to the reestablishment or restoration of land boundaries and subdivisions by the rerunning and remarking of the lines that were represented in the field note record and on the plat of the previous official survey.

REVERSE CURVE

The union of two curves both of which traverse in opposite directions and having one common radii, although not necessarily of the same length

RIGHT ANGLE

A figure that is formed by two lines extending from the same point which are perpendicular or at 90 degrees from one another.

RIGHT OF WAY

The legal right to cross the lands of another. Also used to indicate the strip of land for a road, railroad or power line. In BLM, a permit or an easement which authorizes the use of public lands for certain specified purposes, commonly for pipe lines, roads, telephone lines or power lines. Also the lands covered by such an easement or permit.

ROD

One rod equals 16.5 feet or 25 links. Also termed "perch" or "pole" in older surveys.

ROOD

A square measure equal to ¼ acre or 40 sq. rods. The term rood is sometimes used also for a linear measure varying locally from 5 ½ yd. to 8 yd.

(S)

SCALE

An instrument consisting of a strip (as of wood, plastic or metal) with one or more sets of spaces graduated and numbered on its surface for measuring or laying off distances or dimensions.

SCALE (ADJ.) TO SCALE

According to the proportions of an established scale of measurement (cadastral maps drawn to scale.)

SECOND

The sixtieth part of a minute of angular measure, i.e. north forty-four degrees 26 minutes 36 seconds west or abbreviated thus; N44º 26' 36"W.

SECTION

The unit of subdivision of a township with boundaries conforming to the rectangular system of surveys, nominally one mile square, containing 640 acres.

SECTION CORNER

A corner at the extremity of a section boundary.

SECTION, HALF

Any two quarter sections within a section which have a common boundary; usually identified as the north half, south half, east half or west half of a particular section.

SECTION, QUARTER

One of the aliquot parts of a section. Normally it is a quadrangle measuring approximately ½ mile on each side and containing approximately 160 acres.

SECTION, QUARTER-QUARTER

One of the aliquot parts of a quarter section. Normally it is a quadrangle measuring approximately ¼ mile on each side and containing approximately 40 acres.

SEMI TANGENT

A straight line involved in a circular curve bearing from the point of curvature (P.C.) to the point of intersection (P.I.)

SITE

A parcel of ground set apart for a specific use. The word itself does not necessarily imply definite boundaries.

SIXTEENTH-SECTION CORNER

Also termed "quarter-quarter section corner." A corner at an extremity of a boundary of a quarter-quarter section, mid-point between or 20 chains from the controlling corners of a section or township boundaries. Written as 1/16 section corner.

SMALL-HOLDING CLAIM ENTRY

An entry in connection with which the entry man and his predecessors-in-interest maintained continuous, adverse, actual, bona fide possession of public lands in the Southwest for at least 20 years prior to cadastral survey of the lands involved (Acts of March 3, 1891, 26 Stat. 861; and June 15,1922 Stat. 650).

SPIRAL CURVE

A curve that winds around a center or central point which gradually recedes from or approaches it. As opposed to a circular curve, a spiral curve has no fixed radius as it recedes or approaches the central point.

SQUARE

Having four sides lying, crossing or meeting at right angles (90º) with opposite sides parallel and all sides equal in length.

STANDARD PARALLEL

Also called “correction line." A line extended east or west from the principal meridian, usually at intervals of 24 miles north and south of the base line, along a parallel of latitude. Standard parallels are established to correct for the convergence of range lines and to maintain a workable adherence to the requirement that each township be 6 miles square. They are surveyed in the manner prescribed for the survey of the base line. The exception in New Mexico is that standard parallels are set at intervals of 30 miles south of the base line and at the standard intervals of 24 miles north of the base line.

STATE PLANE COORDINATE SYSTEMS

The plane-rectangular coordinate systems, established by the United States Coast and Geodetic Survey, one or more for each state in the United States, is used for defining positions in terms of plane-rectangular (x and y) coordinates. Also called State Plane Coordinate Systems.

STATION

A point shown on Highway Right-of-Way maps indicating, in feet, a particular position along the R/W centerline and usually abbreviated "Sta.". Example Sta. 60 + 64.7 which indicates a station located 6,064.7 feet along the R/W centerline from where a particular highway construction project began.

STATUTE MILE

A unit equal to 5,280 feet, as opposed to a NAUTICAL MILE which is an international unit equal to 6,076.115 feet.

SUBDIVISION (verb)

1. Subdivision of a township into sections.
2. Subdivision of a section into half sections, quarter-sections, sixteenth-sections, or sixty-fourth-sections, or into lots, according to the Manual of Surveying Instructions.
3. The process of surveying such subdivisions.
4. In the private practice of land survey, subdivision is the division of an area into lots, streets, rights-of-way, easements and accessories, usually according to State law and local regulations.

SURVEYING LAND

The determination of boundaries and areas of tracts of land. Land boundaries are usually defined by ownership, commencing with the earliest owners through successive ownership and partitions. Land surveying includes the re-establishment of original boundaries and the establishment of such new boundaries as may be required in the partition of the land. See CADASTRAL SURVEY.

SYMBOL

Visible signs shown on a map to indicate and distinguish particular features such as roads, arroyos, rivers, lakes, lot lines, railroads, etc. Symbols to be used are usually shown in the Legend.

(T)

TANGENT

1. A straight line that touches a given curve at only one point and does not intersect it.
2. In the public land surveys, a straight line, tangent to a parallel of latitude, usually at a township corner.
3. That part of a traverse or alignment included between the point of curvature (P.C.) of one curve and the point of curvature (P.C.) of the next curve.

THENCE

In surveying and in metes and bounds descriptions, the term designates that the course and distance given thereafter is a continuation from the course and distance given before.

THEODOLITE

A precision surveying instrument for measuring horizontal and vertical angles. The graduated circles are usually read by means of optical microscopes and are more precisely graduated than are the circles on a transit. See TRANSIT.

TIE

A survey connection to an existing station or corner of the Public Lands from a point whose position is desired to be referenced.

TOWNSHIP

The unit of survey of the public lands; normally a quadrangle approximately 6 miles on a side with boundaries conforming to meridians and parallels within established limits, containing thirty-six sections, some of which are designed to correct for convergence of meridians or range lines. See FRACTIONAL SECTIONS.

TOPOGRAPHIC MAPS (USGS)

A map, which presents the horizontal and vertical positions of the features, represented; distinguished from a planimetric map by the addition of relief in measurable form. A topographic map generally shows the same features as a planimetric map, but contour lines or comparable symbols are used to show mountains, valleys and plains; and depth curves are used to show depth in bodies of water.

TOWNSHIP LINES

The township boundaries that run north and south are termed "range lines," with few exceptions the range lines are run on cardinal and have been intended to be on cardinal. The boundaries running east and west are termed "township lines." By law, they are intended to be on true parallels of latitude.

TRANSFORMATION

The process of projecting (mathematically, graphically or photographically) a photograph, or points on it, from its plane onto another plane by translation, notation, and/or scale change.

TRANSIT

A repeating surveying instrument for measuring horizontal and vertical angles. The graduated circles are usually not graduated as precisely as are those on a theodolite. See THEODOLITE.

TRAPEZIUM

A polygon having four sides, none of which are parallel

TRAPEZOID

A four sided polygon with two sides parallel

TRAVERSE

In surveying, a sequence of lengths and directions of lines between points on the earth, obtained by field measurements and are used to determine the positions of the points through use of trigonometric computations.

TRIANGLE

A polygon having three sides. There are five types of triangles which are: equilateral, isosceles, scalene, right-angled and obtuse. An equilateral triangle has all sides equal and all angles equal. An isosceles triangle has two sides equal and two angles equal. A scalene triangle has no sides equal nor any angle equal or greater than ninety degrees. An obtuse triangle has one angle greater than ninety degrees but less than one hundred eighty degrees. A right angled triangle has one ninety degree angle.

TRUE DIRECTION

Characterized by a direction line between two points, which crosses reference lines, e.g. meridians, at a constant angle or azimuth.

TWENTY-FOUR-MILE TRACTS

The largest unit in the rectangular system of surveys. Each area controlled by a principal meridian and a base line is divided into tracts by means of standard parallels or correction lines (true parallels of latitude) located at intervals of 24 miles to the north and south of the base line and by means of guide meridians (true meridians) spaced at intervals of 24 miles east and west of the principal meridian. (In New Mexico, however, standard parallels occur every 30 miles south of the base line). Because of the convergence of the meridians, the distance between the guide meridians is 24 miles only at the starting points; at all other points, the distance is less by the amount of convergence. Twenty-four mile tracts were first specified in the 1881 Manual of Surveying Instructions.

(U)

U.S.G.S.
: United States Geological Survey

U.S.C.& G.S.
: United States Coast and Geodetic Survey.

(V)

VARA
: Any of various Spanish, Portuguese and Latin American units of length from between 31 and 34 inches. In New Mexico, although there are exceptions, there are predominately 1,901.0 varas to a mile, each vara amounting to approximately 33.33 inches.

VELLUM
: A term for transparent, clear or translucent paper used by architects, engineers, etc. for the preparation of drawings, in either pencil or ink, which can then be readily reproduced on a diazo or other type of white or blue print machine.

VERNIER
: A short scale made to slide along divisions of a graduated instrument such as a drafting machine or Planimeter for indicating parts of divisions.

(W)

WC
: Witness Corner

WARRANTY
: A promise that a statement is true. In conveyance, a warranty deed conveys fee title (to the land described) to the grantee and in addition guarantees the grantor will make good the title if it is found wanting.

WITNESS CORNER
: A monumented survey point usually on the line of survey near a corner established as a reference when the corner is so situated as to render its monument or ready use impracticable.

WHENCE
: From what place or source. In a metes and bounds survey the use of the term "whence" usually means to reverse the bearing given in order to return to its source of beginning.

(X/Y)

(X,Y) Coordinates
: Where (X) = the departure or distance along the east-west axis in a coordinate system.
Where (Y) = the latitude or distance along the north-south axis on a coordinate

APPENDIX C

NEW MEXICO'S COUNTY ASSESSORS MAPPING STAFF

Please notify Property Tax Division of any changes

COUNTY	STAFF	TITLE	PHONE NO.
Bernalillo	Mike Valencia	Base Map Customer Service Coord.	222-3720
	Jeff Lucero	GIS/Mapper	222-3720
	Richard Sanchez	GIS/Mapper	222-3720
	Andy Segovia	GIS/Mapper	222-3720
	Jeff Epler	GIS/Mapper	222-3720
Catron	David Estrada	Mapper/Appraiser	533-6577
Chaves	Glenda Allen	GIS Parcel Mapper	624-6635
Cibola	Desi Montano	Mapper	285-2532
	Sam Blea	Mapper	285-2533
Colfax	Marilyn VanMatre	Draftsman	445-2314
	Karen Walton	Part-time draftsman	445-2314
Curry	Barbara Miller	Deputy Assessor	763-5731
De Baca	Mary Felty	Mapper	355-7448
Dona Ana	Jeff Wright	Head Mapper	647-7404
	Mike Lorimer	Subdivision Mapper	647-7404
Eddy	Rick Coy	Mapper	885-3813
Grant	Violet Villegas	Mapper	3881525
Guadalupe	John Serrano	Assessor	472-3738
	Antonio Velasquez	Mapper	472-3738
Harding	Pete Callahan	Assessor	673-2926
	Levon Sink	Rural Addresser	
Hidalgo	Tonya Lowery	Chief Deputy	542-3433
	Karen Lightfoot	Mapper/Appraiser	542-3433

Lea	Shannon Capps	Mapper	396-8527
Lincoln	David LaFave	Mapper	648-2306
Los Alamos	Contracted to Bob Clay		
Luna	Phil Butz	GIS Coordinator	546-0494
	Frank Almanza	GIS Tech	546-0404
	Ben Maynes	GIS Tech	546-0404
	James Hoskins	County Mapper	546-0404
	Carole Smith		546-0404
McKinley	Jerome Smith	Drafting Tech	863-3032 /133
Mora	Angela Romero	Deputy Assessor	387-5289
	Frances Torres	Clerk	387-5289
	Paul Duran	Appraiser Assistant	387-5289
Otero	Dale Paklli	GIS Supervisor	437-5310
	Phil Meadows	Mapper	437-5310
Quay	Janie L. Moore	Mapper	461-1260
Rio Arriba	Levi Valdez	Mapping Supervisor	753-3382
	Silviano Atencio	Mapper	588-7726
	Kevin Vigil	Mapper	753-3382
Roosevelt	Royene Tivis	Assessor	356-6971
San Juan	Janice Coen	Chief Mapper	334-4304
	Lora Lee	Mapper	334-4205
	Ronnie Reimers	Mapper	334-4219
	Contracted to Powers Engineers -- Boise, Idaho		
San Miguel	Elaine Estrada	Chief Mapper	454-1439
	Patricia Gallegos	Mapper	
	Maryanne Fisher	Mapper	
Sandoval	Louise Parra	Mapper	867-7565
	Julie Ann Quintana	Mapper	867-7618

Santa Fe	Joel Pearson Shawn Thornton Ed Wright Paul Casause Jay Marlin	GIS Tech ADT1 ADT1 ADT1 ADT1	986-6300
Sierra	Wesley V. Whitney	Senior Appraiser/Draftsman	894-2589
Socorro	Michael Stephens	Mapper	835-0714
Taos	Joe Gonzales Don Rael	Draftsman GIS Tech	751-8559
Torrance		Chief Mapper	384-2331
Union	Victor Sanchez	Mapper	374-9441
Valencia	Dennis Storey	Chief Draftsman	866-2071

APPENDIX D

UNITS OF MEASURE USED BY SURVEYORS

7.92 inches……..1 Link
1 Chain……4 Rods
1 Chain……66 Feet
1 Chain……100 Links
1 Link……..…… .66 Feet
25 Links……..1 Rod
1 Rod……...16.5 Feet
1 Pole……..1 Rod/16.5 Feet
4 Rods…….1 Chain/66 Feet
10 Square Chains/160 Sq Rods……...1 Acre
1 Acre……..43,560 Sq Feet
640 Acres…….1 Sq. Mile
1 Sq Mile…….640 Acres
1 Mile……..5,280 Feet
1 Circle……360°
1°…….60'Called Minutes
1'…….60" Called Seconds
1 Meter……3.2808333 Feet (US Survey Foot)
1 Foot……..0.304801 Meters
1 Kilometer…….0.62137 Mile
1 Mile……..1.609 Kilometers

APPENDIX E

DIGITAL DATA FORM

TO BE RELEASED IN THE NEAR FUTURE