THE INS AND OUTS (AND ZIGS AND ZAGS) OF LEGAL DESCRIPTIONS

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Paper 11

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By: Alan C. Morganfield and Charles Carpenter

I. INTRODUCTION

The term "right of way" can mean several different things. Generally, a right of way is an easement but the term may also apply to a fee simple strip of land or a public right of way for roads, drainage or utilities. No matter what form of ownership or property rights are intended, the exact location of rights of way must be described in some manner. This paper will focus on the different methods commonly used to describe the location of rights of way -- the so called "legal description" or "land description" -- and the basic principles involved in reading, writing, retracing and interpreting legal descriptions.

First, this paper identifies several methods for writing legal descriptions. The following sections discuss those methods in more detail and give the historical and statutory bases for their use in writing sufficient legal descriptions. Then, the general principles for using each method to read and write legal descriptions are reviewed. Finally, several variations and combinations of the basic methods that are commonly used to describe rights of way are addressed, and a list of ten terms that are often used or misused in legal descriptions is presented.

II. COMMON TYPES OF LEGAL DESCRIPTIONS

A sufficient legal description is one that either identifies the location of the land on the ground to the exclusion of all other land, or furnishes some means by which such location can be obtained from other sources. A legal description is insufficient if it does not, even with the aid of extrinsic evidence, identify the subject land to the exclusion of all other land. Unfortunately, there is no standard rule which uniformly defines the sufficiency of a legal description. Rather, courts tend to apply general rules of construction which favor certain possible interpretations of a description over others to determine the true intent of the parties.[1]

To the general public the best reference to the location of land may be by a street address or by simply referring to the owner of the land, i.e., the "Walker Farm" or the "Old Baylor Place." Although this may be adequate for general conversations, it is preferable to use a more precise description for instruments affecting title to or the uses of real estate.[2]

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[1] 10 David A. Thomas, Thompson on Real Property § 90.02 (b) (1997 Cum. Supp.); 1 Patton on Titles §111 (2nd ed. 1957).

[2] General descriptions such as these have been held to be legally sufficient, especially when there is other information in the instrument or extrinsic evidence establishing the location intended. E.g., Hildebrandt v. Hildebrandt , 683 P.2d. 1288 (Kan. App. 1984)

A legally sufficient land description can be written in several different ways, and can include combinations several different methods. If the description is not written in a proper manner, the subject land may be described in an unintended location. If the description is erroneous or insufficiently vague, it may locate the land on another person's property, it may describe the property in more than one location, it may fail describe a defined parcel because it does not close, or it may not describe any land at all. In such instances, the insufficient description may render a conveyance void, cloud or slander the title of another, or negate the value of the property rights intended to be established or conveyed.

Four types of legal descriptions which have been developed to achieve greater accuracy and precision in identifying land and land rights are addressed in this paper: (1) descriptions referring to the United States Public Land Survey System ("**USPLSS**"), sometimes referred to as the "rectangular" or "quadrangular" survey system; (2) descriptions referring to recorded subdivision plats; (3) metes and bounds descriptions; and (4) descriptions based on State Plane Coordinate Systems. General descriptions which require reference to extrinsic evidence to be sufficient or which incorporate descriptions from other instruments are not addressed herein.

There is no single preferred method for writing legal descriptions. Any types of descriptions discussed herein, or different combinations thereof, may be the most appropriate means for describing the location of a right of way, depending on the factual, contractual and physical circumstances. Rather, the preferred method of writing descriptions is simply to use the best type or combination of types and parts that will give the clearest and shortest description possible.[3]

III. THE UNITED STATES PUBLIC LAND SURVEY SYSTEM ("USPLSS")

The most common method for describing large parcels of land is by reference to the USPLSS. This is a grid system that is unique to North America.[4] Any parcel of land in a public land state can be precisely identified, to the exclusion of all other land, by stating the Section (or a fractional subdivision thereof), Township and Range numbers in relation to a specific Principal Meridian. The rectangular survey system that is the foundation of the USPLSS was implemented to locate and describe the first sales of public lands in the United States, and substantially all federal disposals of the public domain since 1800. Since the first governmental surveys in Ohio pursuant to the Land Ordinance of 1785, the USPLSS has been extended westward across the United States,

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(reference to the "Hildebrandt Island" in a deed, together with a point of commencement in correct section was sufficient to identify the location of land erroneously stated to be located in a different section).

[3] Gurdon H. Wattles, Writing Legal Descriptions, § 3.3 (3rd printing 1979).

[4] A similar rectangular system of surveyed land grids covers most of the land in Canada. John S. Grimes, Clark on Surveying and Boundaries, §§ 710-731 (4th ed. 1976).

including Alaska, and now covers 30 of the 50 states. This system does not cover the New England or Atlantic coast states (except Florida), West Virginia, Kentucky, Tennessee, Texas and Hawaii.[5]

A. Historical Development of the USPLSS

Soon after the Revolutionary War ended it was decided by the first Continental Congress that a plan must be worked out for locating and selling public lands in the western territories not included in the original states to help pay off the national debt. Thomas Jefferson chaired a committee that recommended a survey plan based on the New England town system.[6] It was adopted by the Continental Congress, in a modified form, on May 20, 1785.[7]

The first surveys under this newly enacted law, were performed in the State of Ohio. Though only seven ranges were actually survey pursuant to the Land Ordinance of 1785, this testing ground for the rectangular survey system proved that it was well conceived. By the time extensive surveys were started in Indiana in 1805, the system had been further refined and most of the basic survey rules were well established.[8] The General Land Office ("**GLO**") was established in 1812 to administer all public land sales.[9] Although the GLO Commissioners circulated written survey instructions to the

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[5] Detailed presentations of the historical development of the USPLSS and the public land laws affecting the extension thereof to all 30 public land states can be found in Albert C. White, History of the Rectangular Survey System, (2nd printing 1991) and Paul W. Gates, History of Public Land Law Development, (photo. reprint 1979) (1968).

[6] The New England town system adopted in Connecticut, Massachusetts and Rhode Island allowed a group of 30 men with families to apply for a town site land grant. If approved, they were required to survey the town into lots and divide the land among themselves. The exterior boundaries were usually six or ten mile square rectangles. Lots were then established within the town site with common boundaries so there would be no gaps between them. Each lot was carefully surveyed and marked on the ground, the results of the survey were platted and recorded in the town's records, and the boundaries were walked each year to preserve the boundary marks. Albert C. White, History of the Rectangular Survey System, 8 (2nd printing 1991); Paul W. Gates, History of Public Land Law Development, 44 (photo. reprint 1979) (1968).

[7] "An Ordinance for Ascertaining the Mode of Locating and Disposing of Lands in the Western Territory and for Other Purposes Therein Mentioned" passed by the Continental Congress on May 20, 1785. Paul W. Gates, History of Public Land Law Development, 11-13 (photo. reprint 1979) (1968) sets forth the full text of the Land Ordinance of 1785.

[8] Curtis M. Brown, Boundary Control and Legal Principles, 31-46 (2nd ed. 1969); Paul W. Gates, History of Public Land Law Development, 55 (photo. reprint 1979) (1968).

[9] Act of April 25, 1812, 2 Stat. 716.

Surveyors General before 1836, it was not until then that Congress expressly centralized the control over all government survey activities in the GLO.[10]

The first official manual of surveying instructions was issued by the GLO on March 3, 1851. It was written by John M. Moore, Principal Clerk of Surveys, to the newly appointed Surveyor General for certain public lands in the Oregon Territory and the new state of California. Copies of these instructions, the so-called 1851 Oregon Manual, were subsequently distributed to the Surveyors General in several other States and Territories.[11] The 1851 Oregon Manual was further expanded by Mr. Moore in an 1855 Manual of Surveying Instructions. Although the technical details of monumentation, rectangular and closing limits, location and restoration of obliterated corners, etc. have evolved since 1855, the basic system of rectangular surveys at the core of the USPLSS has remained essentially the same,[12]

The 1855 Manual has been periodically updated and supplemented. New editions were published in 1881, 1890, 1896, 1902, 1930, 1947, and 1973 ("**BLM Manual**").[13] Since 1862, the BLM Manual has been incorporated into and made a part of every surveying contract let by the federal government.[14] The BLM Manual and certain circulars issued by the federal government, such as the instructions for reestablishing lost or obliterated corner monuments, have also been adopted by statute as the official source for surveying standards in many states.[15]

Since all major legislation authorizing the disposal of public lands, except for mining claims, has required that the land be included in the USPLSS prior to disposal, the political decision to convert the public domain to private ownership required the extension of the USPLSS to cover all of the new territories and states. Until 1910, all public land surveys were conducted by private surveyors pursuant to contracts executed by the Surveyors General, who were under the supervision of the Secretary of Treasury

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[10] Act of July 4, 1836, 5 Stat. 107. Before 1836, an independent Surveyor General appointed pursuant to the Act of May 18, 1796, was authorized to retain deputy surveyors and clerks to perform surveys and prepare the official plats thereof.

[11] Paul W. Gates, History of Public Land Law Development, 115-119 (photo. reprint 1979) (1968).

[12] Albert C. White, History of the Rectangular Survey System, 119 (2nd printing 1991).

[13] Bureau of Land Management, Manual of Instructions for the Survey of the Public Lands of the United States, 3 (1973). Hereafter, this 1973 edition will be cited as "**BLM Manual __**."The 1973 BLM Manual and various supplements thereto are available in most major libraries and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402.

[14] Act of May 30, 1862, 12 Stat. 409.

[15] E.g., C.R.S. § 38-51-103; M.C.A. § 76-3-402; U.C.A § 17-23-16; W.S. § 18-3-704.

from 1797 to 1812 and the Commissioner of the GLO from 1812 to 1910.[16] This contract system ended with the Civil Appropriations Act of 1910 which provided for the direct employment of competent surveyors by the Secretary of Interior.[17] Today substantially all official surveying by the federal government is performed by the Cadastral Survey branches of the Bureau of Land Management ("**BLM**"), whose service center is located in Lakewood, Colorado.

B. USPLSS Grid System

The object of the United States Public Land Survey System ("**USPLSS**") is to create a checkerboard of identical squares covering a given area. The largest squares measure 24 miles on each side and are called "quadrangles." Each quadrangle is further divided into 16 squares called "townships," the boundaries of which measure six miles and run north-south and east-west. Each township is then divided into 36 one mile square "sections." Sections can then be further subdivided into quarter sections, quarter-quarter sections or smaller aliquot fractions.

The next portion of this paper will present a general summary of the how the USPLSS was systematically extended across the United States, and identify some of the methods used by surveyors to address certain topographical features that did not fit "squarely" within the rectangular grid created by the USPSS.

i. Initial Points

First, an initial point would be established from which all subsequent survey lines were oriented. The initial point for the first official government survey was expressly designated in the Land Ordinance of 1785 as the point that was "due north from the western terminus of the southern boundary of the State of Pennsylvania."[18] Subsequent legislation left the designation of initial points to the Surveyors General, GLO or BLM. Many of the initial points were selected to be very prominent and visible landmarks on which an official monument would be erected. For example, the initial point for the Mount Diablo Meridian, to which all surveys in Nevada and most of northern California refer, was established at the summit of Mount Diablo in 1851.[19]

ii. Principal Meridians and Baselines

Principal Meridians (i.e., north-south lines) and Baselines (i.e., east-west lines) originating at the initial points were marked on the ground by deputy surveyors. Each

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[16] Albert C. White, History of the Rectangular Survey System, 229 (2nd printing 1991).

[17] 43 U.S.C. § 52, 36 Stat. 703.

[18] "An Ordinance for Ascertaining the Mode of Locating and Disposing of Lands in the Western Territory and for Other Purposes Therein Mentioned" passed by the Continental Congress on May 20, 1785.

[19] BLM Manual 115.

Principal Meridian was intended to conform to the true meridian extending north and/or south from the initial point.[20] Regular quarter-section and section corners were established alternately at intervals of 40 chains (2640 feet or ½ mile) and regular township corners were established at intervals of 480 chains (31,680 feet or 6 miles) along each Principal Meridian and Baseline.[21]

There are now 36 Principal Meridians located throughout the United States, the first of which were numbered one through six.[22] Most of Colorado and Wyoming, all of Kansas, Nebraska and parts of South Dakota were surveyed using the 6th Principal Meridian. However, there is a large section of Southwestern Colorado, which was surveyed using the New Mexico Principal Meridian. Also, a portion of Mesa and Delta Counties in western Colorado are tied to the Ute Meridian, which is located just east of Grand Junction near the airport, and a small portion of Wyoming has descriptions referenced to the Wind River Meridian. The Ute and Wind River Principal Meridians were established when the plan was to settle Native American Indians in and around those areas and no surveys had been extended west of the Continental Divide.

iii. Standard Parallels and Guide Meridians

Standard Parallels were extended east and west from the Principal Meridians at intervals of 24 miles north and south of the corresponding Baselines on a true parallel of latitude.[23] Guide Meridians were then extended north from the Baselines and Standard Parallels at intervals of 24 miles east and west from the Principal Meridians.[24] These Guide Meridians were terminated at the points of their intersection with the Standard Parallels. At the true point of intersection of each Guide Meridian with a Standard Parallel, a closing township corner was established.[25] The resulting 24 mile squares are commonly referred to as "quadrangles."

Whenever practicable, the exterior lines of each township were surveyed successively through the quadrangle in ranges of townships beginning from the south. Each quadrangle was then divided into sixteen townships which, ideally, should each be

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[20] BLM Manual 61.

[21] A "Table of Measurements" in the Appendix contains conversion charts for equating various distance measures.

[22] Figure 3 in the Appendix is a U.S.G.S. map that identifies all of the Principal Meridians and Baselines in the United States and the dates when they were established.

[23] BLM Manual 62; John S. Grimes, Clark on Surveying and Boundaries, §§ 151 (4th ed. 1976).

[24] BLM Manual 62; John S. Grimes, Clark on Surveying and Boundaries, §§ 152 (4th ed. 1976).

[25] BLM Manual 63; John S. Grimes, Clark on Surveying and Boundaries, §§ 161 (4th ed. 1976).

exactly six miles square. The townships are numbered ordinally from north to south and east to west according to their distance from the Baselines and Principal Meridians to which they relate. Rows of townships running east and west are referred to as "township" numbers and columns of townships running north and south are referred to as "range" numbers.[26]

Because of the curvature of the earth, the north-south range lines converge, or come closer together, as they extend toward the north pole. To keep the range lines as nearly parallel as possible and six miles apart, the lines are laid out for approximately 24 miles. Then, there is a jog, referred to as a correction line, so the lines are again six miles apart, to preserve, as close as possible, the square shape of the township.[27] These and other errors or irregularities causing quadrangles to be more or less than 24 miles square or townships to be more or less than six miles square, are accommodated in the further subdivision of the townships.[28]

C. Documentation for Official Surveys

Public lands are not considered to be surveyed until the survey is approved by the responsible official and all field notes, plats and supplemental plats are filed with the administering land office.[29] The physical evidence of a governmental survey consists of the monuments established on the ground, and the duly approved field notes and plats which are available to the public in various offices of the BLM.[30]

The original township, section, quarter-section, and other monuments physically evidencing the survey will be considered to represent the true corners and control over conflicts with the course, distance and area calls set forth in the field notes and plats.[31]

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[26] Figure 1 in the Appendix is a sample plat which depicts the numbering of townships and ranges.

[27] Without the correction jogs, range lines would tend to converge as they approached the north pole due to the natural curvature of the Earth. Figure 4 in the Appendix is a sample plat depicting the jogs of correction lines accounting for the curvature of the earth.

[28] John S. Grimes, Clark on Surveying and Boundaries, §§ 151-154 (4th ed. 1976).

[29] BLM Manual 191.

[30] Whenever all of the public land surveys were completed in any state, the Act of June 12, 1840, 43 U.S.C. § 54, 5 Stat. 384, provided for the transfer of all original survey records to that State, and closure of the Surveyor General's office in that State. This Act was subsequently amended by the Act of January 22, 1853, 43 U.S.C. § 56, 10 Stat.152, which retained the requirement that survey records be transferred to the State, but further provided that the State must designate an office to receive the survey records and make them available, without charge, to the public. Albert C. White, History of the Rectangular Survey System, 116-7 (2nd printing 1991).

[31] There are detailed instructions and procedures for locating and restoring lost and obliterated corners of approved surveys in the BLM Manual at 129-143.

Once approved and filed, the official survey and plat becomes the final source for resolving all disputes regarding the location of and area within land disposed of by the federal government.[32] USPLSS surveys are conclusive once title to the land passes from the United States to private ownership. If evidence of the survey in the field is lost or obliterated, the field notes and plats will be used as the basis for reestablishing the corners or for a dependent resurvey. However, any discrepancies between the official record and the evidence of corners found in the field will be resolved by reference to the markings in the field. Though private lands may be subject to resurvey, the purpose of any such resurvey is to reestablish the original boundaries and subdivisions established in the initial survey.[33] As such, most of the land for which title originates from the federal government can be identified by an official survey which locates it within the USPLSS.

i. Monuments

The initial surveys of the Seven Ranges in Ohio marked only the township boundaries and a section was the smallest subdivision of the land platted. Later surveys subdivided alternating townships into half sections and eventually quarter sections. Government surveyors are now required to monument the corners of each quarter section in all townships on the ground and to return a formal record thereof in the form of field notes.[34] Further subdivisions into parcels of less than 160 acres can be made by county or private surveyors.[35]

Each section and quarter section corner has an established point known as a corner monument, or "survey monument." Initially these survey monuments were made of natural materials such as stones, pits and mounds, or charred stakes. The legal monument used today is a 3-1/2 inch cap made of brass or aluminum on a 2-1/2 inch pipe, 30 inches long.[36] Until recently, land surveyors could use other materials, such as rebar, axles, or pipes, in addition to the standard BLM monuments for marking land corners. Most states now have statutes and rules regulating the establishment and rehabilitation of monuments which conform them to the BLM requirements.[37]

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[32] 43 U.S.C. § 752.

[33] For a complete reprise of the law of resurveys see James M. Piccone, "Resurveys of Public Lands" 30 Rocky Mountain Mineral Law Institute, Paper 20 (1984).

[34] 43 U.S.C. §§ 2396-7.

[35] 43 U.S.C. § 766.

[36] Curtis M. Brown, Boundary Control and Legal Principles, 72 (2nd ed. 1969).

[37] E.g., C.R.S. §§ 38-51-104 and 38-53-101 *et seq.*, Colorado State Board of Registration for Engineers and Professional Land Surveyors Rule XIII-Physical Standards for Public Land Survey Systems; I.C.A. §§ 31-2709 and 55-1603; M.C.A. §§ 76-3-402 and 70-22-101 *et seq.*; N.R.S. § 329.010 *et seq.*; U.C.A. §§ 17-23-16 and 17-23-17.5; W.S. §§ 18-3-704 and 33-29-140 *et seq.*

ii. Field Notes

Each surveyor keeps notes in the field which identify and describe the lines and corners of the survey and significant topographic features of the subject land. These initial notes are transcribed into official, typewritten field notes conforming to the arrangement and phraseology prescribed by the BLM Manual. These transcribed field notes and the township plats prepared from them are considered to be the primary record of the survey upon official approval, acceptance and filing. The initial survey notes prepared in the field are then destroyed.[38]

The introductory statement to the field notes should include: (1) the history of any prior surveys; (2) a list of the surveys included in the subject field notes; (3) a description of any unusual survey situations and any special method used to address them; (4) a statement that the survey was conducted according to the specifications set forth in the BLM Manual; (5) a description of how the directions of lines were determined and that they refer to the true meridian; (6) a statement that the original survey lines were retraced in the case of a dependent resurvey; (7) identification of the geographical position of the corner of the survey and how it was determined; and (8) the observed magnetic declination.[39]

The field notes should then proceed with a full description of the monuments established by the survey on the ground, the directions and distances of the lines measured, and additional notes reflecting the surveyor's observation of topographical, cultural and other significant features of the subject land, including the character of the land, soil, and forest cover. The surveyed lines should be summarized at the conclusion of the field notes for each mile. A general description of the topography, soil, forest cover, water supply, drainage, mineralization, settlement, improvements, etc. should be provided for the township as a whole at the conclusion of the subdivisional notes for each township. The field notes should also include a record of the names of the surveyors, their assistants, and the authorized officials approving the survey.[40]

iii. Township Plats

The township plat is a drawing which depicts the survey lines marked on the ground. The plats are constructed from the field notes to depict the subdivision of each regular section into quarter-quarter sections. They also show the direction and length of each line, the relation to adjoining surveys, the boundaries of each subdivision and a description of the area of each parcel of land. Acreages for irregular sections, and any significant topographical features or categorical information may also be noted on a township plat.[41]

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[38] BLM Manual 184-189.

[39] BLM Manual 184.

[40] BLM Manual 189.

[41] BLM Manual 193.

Each regular township contains 36 sections which, ideally, should each be exactly one mile square. They are numbered sequentially starting with Section 1 in the northeast corner and proceeding in an alternating serpentine pattern, "as the oxen plow," from east to west and then west to east, ending with Section 36 in the southeast corner.[42] In the case of fractional townships, the sections bear the same number they would have if the township was complete.[43] Each regular section will show center section lines only and indicate that the area is 640 acres. For irregular sections, or other circumstances requiring lotting, each subdivision must be distinctly shown.

a. Lots

The north and west rows or tiers of sections in the township are known as closing sections. These areas are where discrepancies of measurements, known as closure, between the interior section lines and exterior boundary line surveys are adjusted. These sections usually contain more or less than the 640 acres in a "regular" section. The portions of the section where the discrepancies are places are referred to as "Lots."

Generally, irregular sections will be platted to subdivide as many regular quarter-quarter and half-quarter and quarter sections as possible. Then, lots will be established across the northern and/or western boundaries, setting forth the number and acreage, with area computed to the nearest 1/100th of an acre, for each lot.[44] Because the underlying object of the quadrangular survey system is to achieve the maximum number of perfect one-mile square sections containing exactly 640 acres, all distance and acreage corrections required are accounted for in one or more irregular sections along the north (i.e., Sections 1-6) and/or west (i.e., Sections 6, 7, 18, 19, 30 and 31) boundaries of each township.[45] The remaining 24 sections are usually regular one-mile square sections.

For irregular sections on the north and west of a regular township, protracted quarter-quarter section lines are utilized to designate lots, which are numbered

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[42] Figure 5 in the Appendix is a sample plat depicting the numbering of sections.

[43] BLM Manual 89. Fractional townships (i.e., townships for which the official survey does not cover a full six square mile area) may result from many different circumstances. Among the most common reasons are (1) topographical features, such as cliffs, shorelines, river banks and lakes, which preclude survey and monumentation of the entire township; (2) Indian reservation boundaries; (3) boundaries between surveys tied to different Principal Meridians and Baselines; and (4) incomplete deposit surveys.

[44] The BLM Manual, at 192-217, has detailed specifications for the drawing of township plats and the calculation of acreage areas from the field notes.

[45] 43 U.S.C. § 751. Area discrepancies resulting from the convergence of meridians are normally adjusted in the lots established along the western boundary. Area discrepancies resulting from the measurements between the exterior boundaries and the subdivisional lines are normally adjusted in the lots established along the northern boundary. BLM Manual 195.

sequentially from east to west starting with Lot 1 in the northeast corner for sections along the northern border or sequentially from north to south starting with Lot 1 in the northwest corner for sections along the western border. In Section 6, in the northwest corner of each township, lots are numbered from east to west starting with Lot 1 in the northeast corner and then continuing from north to south from Lot 4 in the northwest corner to Lot 7 in the southwest corner.[46] Lots may also be established and numbered in other parts of the section when irregularities, such as water bodies, mining claims, or defective alignments, are incurred. The remainder of the section will, to the maximum extent practicable, be platted in aliquot quarter, half-quarter and quarter-quarter sections.

b. Tracts

Another common exception to the goal of establishing perfectly square quadrangles, townships and sections, was the need to accommodate vested property rights that did not conform to the linear concept inherent in the USPLSS. Whenever a resurvey is deemed necessary, or an original survey was subject to prior vested property rights, the prior ownership established on the ground must be preserved. This is accomplished by first surveying the land subject to the prior vested property right and monumenting the corners of each tract. The surveyed "Tracts" are then numbered sequentially in the plat for each township, starting with Tract 37 so that the tract numbers do not overlap the section numbers.[47] Then, the township lines are surveyed just like an original survey, with closing corners set at the intersection of any tract boundary with a section line, and lots are established for the fractional quarter-quarter sections adjoining the Tracts.[48]

c. Supplemental plats

In areas covered by mining claims and other property rights that were vested prior to the initial survey, the township plats often include supplemental plats of those portions of the township. Supplemental plats are also prepared to depict the irregular boundaries created by bodies of water and prior vested rights identified in resurveys. Generally, supplemental plats are drafted on a larger scale to facilitate the inclusion of additional detail. All supplemental plats should show a reference to the base plat and the purpose and authority for its preparation.[49]

d. Meander Lines

The presence of rivers, lakes and other bodies of water present a special challenge to the implementation of the quadrangular system, because, among other reasons, permanent monuments cannot be established therein. Moreover, since the Land

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[46] Figure 8 in the Appendix is a sample plat which depicts the numbering of lots.

[47] The same tract numbers were used only once in each township. BLM Manual 153.

[48] BLM Manual 155.

[49] BLM Manual 205.

Ordinance of 1785, the navigable rivers, lakes, and streams have been declared public highways which were never subject to disposal by the federal government.[50]

The survey line demarcating the bank of any natural body of water, whether or not navigable, is referred to as a "meander line." Meander lines do not constitute boundaries defining the area of ownership of the lands adjacent to a water body. The actual course of the stream or lake defines the boundary and the ownership of adjoining land changes with the changing water course.[51] Meander corners are established at every point where standard township or section lines intersect with the bank of a navigable stream or other meanderable body of water. However, the actual monument for a meander corner should be established on a line at a secure point near the true location of the meander corner.[52]

IV. SUBDIVISION PLATS

All states have statutes providing for the platting of subdivisions.[53] Once a plat has been approved and recorded in the county records, legal descriptions in instruments affecting title to or uses of land which refer to the designations given in the plat are generally sufficient.[54] Even after vacation of a plat, a legal description that refers to the vacated plat may still be sufficient if no new subdivision with the same name has been platted.[55]

It is well established that a reference to a plat in an instrument affecting title to land as part of the property description, the plat becomes incorporated into the instrument.[56] As such, the plat should be considered as giving the true description.[57] However, in the event of a conflict between the recorded plat and an actual survey with respect to the courses, distances, measurements, or acreage quantities, the actual survey

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[50] Islands within a meandered body of water, navigable or non-navigable, in continuous existence since the date of the admission of a State to the Union and omitted from the original survey present an additional problem. They remained public land of the United States after statehood, subject to survey and disposal by the federal government, because they were not a part of the bed of a stream. BLM Manual 97.

[51] 1973 BLM Manual at 93-4; Michelsen v. Harvey, 822 P.2d 660 (Nev. 1991) (property boundary described by reference to the meander line for Lake Tahoe conveyed to the shore of the lake and included the beach area created when the shoreline receded).

[52] BLM Manual 96.

[53] John S. Grimes, Clark on Surveying and Boundaries, § 501 (4th ed. 1976).

[54] E.g., C.R.S. §31-1-409.

[55] Colorado Real Estate Title Standards § 8.2.1.

[56] 10 David A. Thomas, Thompson on Real Property § 90.02 (d)(2) (1997 Cum. Supp.).

[57] LaBarge v. City of Concordia, 927 P.2d 487 (Kan. App. 1996).

will control.[58] Likewise, the survey from which the plat was drawn controls over any conflict between the survey calls and the depiction thereof in the plat.[59]

For example, if an easement purports to convey rights to use a specific amount of acreage, but describes the right-of-way by reference to a recorded subdivision plat, the actual acreage identified in the plat should control even if it differs from the acreage in the easement instrument. Likewise, the true acreage established by the survey should control over an erroneous acreage set forth in the plat.[60]

While reference must be made to the subdivision statutes of the state in which the subject land is located for the specifics,[61] the basic process for the preparation, approval and recording of a subdivision plat is essentially as follows:

1. A detailed survey of the boundaries of the land to be subdivided, and all streets, alleys, utility easements, interior subdivisions (i.e., blocks and lots) and other designations, must be prepared by a registered professional land surveyor.
2. A plat, which reflects all of the boundary and subdivision lines established by the survey, and such other information as may be necessary, convenient or appropriate for the given circumstances, must be prepared in accordance with the specifications set forth in the applicable statutes.[62]
3. The plat must be executed and acknowledged by the owner of the subdivided land and a certificate of the surveyor stating that it is a proper survey and plat must be included therein or appended thereto.
4. The subdivision and plat must be approved by the governmental official or commission with jurisdiction over subdivisions, usually a zoning or planning board and/or a county, municipal or other local official or commission.
5. The plat, surveyors certificate and governmental approval must be filed in the office of the county recorder or registrar of deeds where the land is located.

When an instrument describes land by reference to a recorded plat, and the reference is solely for the purpose of describing the land affected thereby, any technical defect in the subdivision approval process should not affect the validity of the land description. Likewise, the loss or destruction of a plat referred to in a instrument

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[58] Roberts v. Osborn, 589 P.2d 985 (Kan. 1979); James v. Hitchcock, 309 S.W.2d 909 (Tex. Civ. App. 1958).

[59] John S. Grimes, Clark on Surveying and Boundaries, § (4th ed. 1976). at 661.

[60] Askins v. British American Oil Producing Co., 203 P.2d 877 (Okla. 1949).

[61] E.g., C.R.S. § 38-53-101 *et seq.*; K.S.A. §58-2601 *et seq.*; I.C.A. § 50-1301 *et seq.*; M.C.A. §§ 76-3-101 *et seq.*; N.R.S. § 278.320 *et seq.*; N.M.C.A. § 47-6-1 *et seq.*; U.C.A. § 10-9-801 *et seq.*; W.S. § 34-12-101 *et seq.*

[62] E.g., C.R.S. § 38-53-106.; K.S.A. §58-2001 *et seq.*; M.C.A. §§ 76-3-402; N.R.S. § 278.468; N.M.C.A. § 47-6-3; U.C.A. § 10-9-804; W.S. § 33-29-139.

conveying real estate should not, generally, void the conveyance if the land can be identified on the ground from the description provided. Even if an instrument does not expressly refer to a recorded plat and make it part of the description, the plat may be resorted to for identification of the lands the parties intended to describe.[63]

On the other hand, where a plat is clearly erroneous, it may not provide an adequate description of the land. Still, parole evidence may be admitted to establish the location of the land the parties intended to describe on the ground, even though portions of the actual survey or plat are inaccurate.[64] Moreover, the fact that a plat referred to in a legal description is invalid because it was not duly approved or properly filed and recorded in accordance with applicable statutory requirements, should not affect the validity of the legal description if the survey and plat are correct, the description provided reflects the intent of the parties as to the location of the subject land, and the plat referred to is accessible.[65]

Likewise, a property description that refers to an unrecorded plat may be sufficient between the parties if the plat can be identified by parole evidence, even though it may not provide constructive notice to bona fide purchasers.[66] This is really nothing more than an extension of the general rule that allows parole evidence to be admitted if it helps to explain the intent of the parties to an ambiguous instrument. Producing the unrecorded plat referred to in an instrument may clarify a property description that appears to be ambiguous on its face. This result is similar to the result when a legal description is given by reference to another recorded instrument.[67] In both instances, the parties have in mind a specific parcel of land and are merely using the reference as a convenience.

Ordinarily, a description by tract or lot and block (or some other designation) in a recorded subdivision plat will prevail over courses, distances, measurements and other calls for monuments provided in the description, unless there is evidence indicating that the parties specifically intended otherwise.[68] Similarly, a description of property by its designation in a subdivision plat will generally be construed as intending the metes and

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[63] 1 Patton on Titles §120 (2nd ed. 1957).

[64] 10 David A. Thomas, Thompson on Real Property § 90.02 (c)(11) (1997 Cum. Supp.).

[65] 10 David A. Thomas, Thompson on Real Property § 90.02 (d)(2) (1997 Cum. Supp.).

[66] 1 Patton on Titles § 122 (2nd ed. 1957); 10 David A. Thomas, Thompson on Real Property § 90.02 (c)(11) (1997 Cum. Supp.). In City of Lakewood v. Mavromatis, 817 P.2d 90 (Colo. 1991) and Ellingsen v. Franklin County, 810 P.2d 910 (Wash. 1991), it was held that road petitions recorded in accordance with the applicable statute, but not indexed in the real estate records, did not provide constructive notice.

[67] But see, C.R.S. § 38-35-108 which provides that a reference to an unrecorded instrument does not provide constructive notice of the contents thereof.

[68] LaBarge v. City of Concordia, 927 P.2d 487 (Kan. App. 1996).

bounds depicted in the plat and may incorporate other information or restrictions identified therein.[69]

V. METES AND BOUNDS

The United States and Canada are the only countries in the world using the rectangular system. In all of the rest of the world, tracts of land are surveyed and described by "metes and bounds." The term "metes" means measures of length and "bounds" are the boundaries. The term "metes and bounds" comes from the method used to describe land in the original thirteen states. This method would use natural features, such as a tree, a pile of stones or a creek, as monuments to describe the lengths and directions of the lines. Adjacent landowner names were also included in the description.

Example of historical metes and bounds description:

Beginning at the 24 inch oak tree at the northeast corner of Jake Miller's property; thence north along the east line of Jake Miller's property and along Rock Creek, a distance 400 feet to the 6 inch Cedar tree . . . .

When writing metes and bounds descriptions it is necessary to precisely indicate the length and directions of all lines comprising the boundary of the subject land. The following sections discuss the more common methods for accomplishing that task. Examples of the various methods described are provided to facilitate the presentation.

A. Survey Calls

When an appropriate description cannot be accomplished by reference to the USPLSS or a recorded subdivision plat, usually due to the non-rectangular shape of the parcel and/or the lack of any USPLSS or subdivision plat to reference, the land may be described by "metes and bounds." Today, descriptions following the perimeter of a parcel are still commonly referred to as a metes and bounds description even though the "bounds" are usually omitted.

Metes and bounds descriptions, as well as most other descriptions, should be established or verified by a survey for accuracy and reliability. Most, if not all, states now license and regulate professional land surveyors.[70] Likewise, most states now have statutes with specific requirement for the preparation and filing of land survey plats.[71]

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[69] Haugh v. Smelick, 887 P.2d 26 (Idaho 1993) (purchaser of undeveloped subdivision was subject to density restrictions in Master Plan identified in the subdivision plat).

[70] E.g., C.R.S. § 38-53-101 *et seq.*; K.S.A. §74-7001 *et seq.*; I.C.A. § 55-1901 *et seq.*; M.C.A. §§ 37-67-101 *et seq.*; N.R.S. § 625.070 *et seq.*; N.M.C.A. § 61-23-1 *et seq.*; U.C.A. § 58-22-101 *et seq.*; W.S. § 33-29-114 *et seq.*

[71] E.g., C.R.S. § 38-53-106.; K.S.A. §58-2004; I.C.A. § 50-1304; M.C.A. §§ 76-3-402; N.R.S. § 278.468; N.M.C.A. § 47-6-3; U.C.A. § 10-9-804; W.S. § 33-29-139.

Many also have requirements for legal descriptions that must be satisfied to record instruments affecting title to or the use of land, such as the acquisition of easements, fee property or other land rights.[72]

i. Course

The direction of a line, known as the bearing, is stated in terms of the angle it makes with the meridian, or a straight line, through the beginning point of the line. The angles are always measured from a line, not from a point. Bearings are described in degrees, minutes and seconds from the cardinal directions of North or South; never from the cardinal directions of East or West.

Examples of bearings:
North 70°19' East; or
South 24°10' 22" West.

A tip to remember is to imagine yourself walking down the survey line, using the appropriate directions to describe your course. Any cardinal direction of North, South, East or West is expressed as such. All other measurements are described in degrees from these four cardinal positions. Four quadrants, each being 90° of the 360° circumference of a circle can be delineated. The degrees, minutes and seconds from cardinal North or South, starting from 0°00'00" are called out to the east or west until 90°00'00" is reached at cardinal East or West. [73]

Another method to denote the direction of a survey line is the azimuth. It differs from a bearing in that it expresses all directions in terms of the angle from one direction only, from 0 through 360°, instead of being broken into four quadrants. Azimuths are usually referenced from cardinal North, but military azimuths are usually referenced from cardinal South. In order to indicate the direction, a surveyor would merely write for example, "290°," moving clockwise using cardinal north as the starting point, instead of "North 70° West." Surveyors who use azimuths in their work and in computations generally convert them to the usual bearing format in their final work. Azimuths are seldom used in legal descriptions.

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[72] E.g., C.R.S. § 38-35-106.5 (name and address of author of new legal descriptions required); N.R.S. § 111.312 (assessor's parcel no. required); U.C.A. § 57-3-10 (legal description required to record); W.S. § 34-12-113 (plat may be required if description is unclear) and W.S. § 34-12-114 (warranty that legal description in recorded instruments are correct).

[73] Figure 9 in the Appendix shows how a course bearing are established in four 90 degree quadrants of a 360 degree circle.

ii. Distance

In colonial times, survey distances were actually measured with chains and/rods as the distance measurements imply. Today, the BLM still records measurements noted on plats in chains while distances measured by non government surveyor are in feet, to the hundredth decimal. Many rights of way, usually in the oil and gas industry, are still measured and paid for by the rod, which is equal to 16 1/2 feet. The difficulty in paying for right of way by the rod is the lack of a defined or standard width.

One thing that has not been mentioned so far, and needs to be, is the use of metrics in legal descriptions. For years there have been discussions, plans and rumors about the U.S. going to the metric system. These rumors may be coming closer to reality. The federal government is mandating transportation departments such as the Colorado Department of Transportation (CDOT) to use the metric system in plans and specifications for highways. On the surface this may seem to effect only the highway department. However, there are many other groups of professionals that this use of metrics will affect. Appraisers, title companies and surveyors, to name a few, will all need to know how to use and convert their work to and from the metric system. However, it may be still be a some time before metric measurements are used extensively in legal descriptions.

iii. Basis of Bearing

When necessary, the meridian or cardinal direction can be established by using astronomical observations and calculations or by the use of a compass. There are many be instances, however, where bearings can be determined from a monumented survey line that has already been established, such as a section line, quarter section line, or a lot or block line in subdivision plat. The bearing of a line can also be assumed or related to the grid of a map.

Colorado requires that land survey plats using bearings include a statement identifying the source or otherwise explaining how the bearings were determined so that future surveys of the parcel can be retraced accurately.[74] Presumably, other states have similar requirements. Basis of bearing statements can be incorporated into the description or added as an additional statement before or after the description.

Example of stand alone basis of bearing statement:

Bearings are based on the north line of the Northwest 1/4 of Section 30 to bear North 89°42' East with all bearings contained herein relative thereto.

[74] C.R.S. § 38-51-106(e)

Example of basis of bearing statement incorporated in description:

Commencing at the Northeast corner of Section 23, Township 6 North, Range 95 West of the 6th Principal Meridian, Rio Blanco County, Colorado;
Thence North 89° 53' 45" West, along the North line of said Section 23, a distance of 1326.89 feet to the point of beginning;
Thence South 0° 06' 15" West, a distance of 300.00 feet;
Thence South 89° 53' 45" East, a distance of 250.98 feet; . . . .

Whether or not a basis of bearing statement is specifically required by state law, it is always a good practice to expressly state the basis for the bearings rather than assuming that it will be correctly implied from the calls in the description. This is because a land surveyor who is requested to retrace or survey a legal description without any express point of reference or basis of bearing may be required to obtain bearings by astronomic observation. This could cause problems with the location "on the ground" of the description being surveyed if the bearing used at the time the description was written and the astronomic bearing are not exactly the same. At worst, the two lines could be in considerably different locations and might require legal action to correct. At best, the surveyor must spend additional time (usually at the client's expense) to determine and/or confirm the basis for the original bearings.

iv. Curves

Legal descriptions may not always have the luxury of using all straight lines to locate the boundary of a parcel of land. Many times curves are required for part of the description and must be described along with linear courses.

There are several kinds of curves that may be encountered, such as circular, compound, reverse, spiral or vertical curves. When describing a curve there are a number of the parts of the curve that may be included in the description to properly describe the curve. The most commonly used terms for describing parts of curves and their abbreviations include the following:

Curve Element	Abbreviation
Radius	R
Point of Curve	PC
Tangent	T
Central Angle or Delta	Δ
Point of Tangent	PT
Arc Length	L
Point of Intersection	PI
Chord	Ch
Degree of Curvature	D

In most cases where curved lines are necessary, such as curved roadways, easement descriptions and property boundaries, a simple curve is used. When describing

a simple curve at least two of the foregoing elements of the curve must be given, but usually three or more are provided. Survey drawings and plats prepared by professional land surveyors may provide additional detail for the curves described.

Example of curve description:

Commencing at the Southwest corner of Lot 7, Ridge Subdivision;
Thence North 00°00'31" East, . . .
Thence North 89°59'29" West, a distance of 26.17 feet to a point of curve;
Thence on a curve to the left having a central angel of 53° 36'35", a radius of 15.00 feet, an arc length of 14.04 feet and whose long chord bears South 63°12'14" West, a distance of 13.53 feet to a point of tangent.....

When describing a line with a curve, the distance and direction of the curve must be provided. This can be stated such as " thence on a curve to left having a radius of 205.76 feet...." In some cases the bearing of the long chord can be included to provide more clarity. As was mentioned earlier with respect to bearings, it is often helpful to imagine yourself walking down the line as you describe a curve. If the line curves to the left or right, it is a curve to the left or right. Figure 10 in the Appendix sets forth various formulas that are used to compute the elements of circular curves. Figure 11 in the Appendix is a sketch of various types of curves showing the relation to their respective elements.

Spiral curves are often encountered in highway work. This type of curve will have a changing radius and can be found, for example, on entry and exit ramps to and from a freeway. A vertical curve is also used in highways. An example of where a vertical curve is used would be a portion of a highway crossing a depression or valley. This type of curve not only incorporates the elements of a circular curve but also uses vertical elevations along the line.

At times, it may, be necessary to compute an element of a curve that is not provided in the description. In order to compute this curve information, some knowledge of trigonometry is required. It may be best to request the assistance of someone knowledgeable in this area if you are not comfortable with the computations. The use of curves can be confusing even to professionals with a surveying or engineering background.

More information about the curves noted above and the technical aspects of land surveying and writing legal descriptions can be found in the following references:

Bureau of Land Management, Manual of Instructions for the Survey of the Public Lands of the United States (1973).

International Right of Way Association, Principles of Right of Way (Publishers Press, Inc. 1990).

Curtis M. Brown, Boundary Control and Legal Principles, (J. Wiley & Sons, Inc 1969).

Russell C. Brinker & Roy Minnick, The Surveying Handbook, (Van Norstand Reinhold 1987).

Paul Cuomo & Roy Minnick, Advanced Legal Descriptions (Data Reproductions 1993).

Gurdon H. Wattles, Writing Legal Descriptions, (Gurdon H. Wattles Publications 1979).

For more information and other books and materials addressing the technical aspects of land surveying can be obtained from most college and university bookstores, technical bookstores or by mail from:[75]

Landmark Enterprises
2640 Cordova Lane, Suite 103
Rancho Cordova, CA 95670
(916) 852-6859, Fax 1-800—497-2665
E Mail: Landmkep@pacbll.net

VI. State Plane Coordinate Descriptions

Reference to a State Plane Coordinate System is another legally sufficient method that can be used to describe property. Although not very common in the past, this method is becoming more popular with land surveyors due to the use of computers and the Global Positioning System ("**GPS**"). The primary advantage of this method of land description is that a survey can be retraced even if the corner monuments are lost or destroyed because the exact points of all corners are fixed by their location within the GPS. Also, this method can facilitate the location of a long distance utility line when it will be developed in independent sections.[76]

Most, if not all, states have enacted State Coordinate Systems.[77] These statutes generally provide for the state to be divided into two or more zones. A grid is then imposed upon a map projection of each zone. X and Y coordinates (north and east) are assigned to each point on the grid based on a mathematical relationship between the grid

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[75] A title index and price list for surveying references available from Landmark Enterprises, as of September 30, 1997 is included in "Resource Materials" in the Appendix. The authors have no interest, financial or otherwise, in Landmark Enterprises or the other vendors identified herein.

[76] International Right of Way Association, Principles of Right of Way, 77-8 (1990).

[77] E.g., C.R.S. § 38-52-101 *et seq.*; K.S.A. §58-20a01 *et seq.*; I.C.A. § 17-5501 *et seq.*; M.C.A. §§ 70-22-201 *et seq.*; N.R.S. § 327.005 *et seq.*; N.M.C.A. § 47-1-50 *et seq.*; U.C.A. § 57-10-1 *et seq.*; W.S. § 34-25-101 *et seq.*

and the map projection. As such, legal descriptions can be written by calls from point to point on the grid without any corresponding bearing and distance calls. However, descriptions that refer to state plane coordinates are construed as supplemental to references in the same instrument to subdivision lines or USPLSS corners under most, if not all, state acts. In the event of a conflict, the USPLSS or subdivision description will prevail, unless the coordinates have been upheld by an adjudication.

Example of State Plane Coordinate description:

Beginning at a point on the easterly line of Colerain Avenue being 426,465.73 North and 1,421,156.26 East;
Thence along the easterly line of Colerain Avenue to a point being 426,640.19 North and 1,421,049.77 East . . . .

The system has not been used much in the past due to the many mathematical adjustments and computations required. Today the computer and GPS make it much more practical and cost effective to use for land surveyors, but it is still not widely used due to its complexities.

VII. READING AND WRITING LEGAL DESCRIPTIONS

Now that the basic background of land descriptions has been discussed, the guiding principles for reading and writing USPLSS, subdivision plat and metes and bounds legal descriptions will be addressed. Then, some of the more common methods and terms used to describe easements and other rights of way will be covered, including strip and centerline descriptions, description by fractional or aliquot parts, description by bounds or perimeter (i.e., metes and bounds), and blanket descriptions. Finally, ten of the most frequently used (and abused) terms in legal descriptions will be reviewed.

A. USPLSS Descriptions

Usually, the preferred method for describing large parcels of land in public land states will be by reference to the USPLSS. If the boundary of the property conforms to a subdivision of the USPLSS, a legal description can easily be composed for it by identifying the section (or some fraction thereof), township, range and principal meridian for the subject land.

Examples of USPLSS descriptions:

The Northeast 1/4 of the Northeast 1/4 of Section 10, Township 3 South, Range 68 West of the 6th Principal Meridian, Arapahoe County, Colorado; or

NE/4NE/4 of Section 10, T3S, R68W, 6th P.M., Arapahoe County, Colorado.

For purposes of land descriptions, regular sections and regular subdivisions of irregular sections are commonly divided into half sections (e.g., South ½ of Section 36) containing 320 acres; quarter sections (e.g., Northwest ¼ of Section 36) containing 160 acres; quarter-quarter sections (e.g., Northwest ¼ Northwest 1/4 of Section 36) containing

40 acres, etc.[78] Land descriptions are then written by referring to a particular fraction of a specific section located within a township either north or south of the Baseline, and either east or west of the Principal Meridian.

Ranges running east and west are numbered according to their rank from a Principal Meridian.[79] Townships are numbered north and south from the corresponding Baseline. For example, the 6th Principal Meridian, to which legal descriptions for Kansas, Nebraska, most of Colorado and Wyoming, and parts of South Dakota are tied, is approximately 402 miles east of Colorado Boulevard in Denver. Its Baseline, which follows the 40th degree line of latitude and marks the boundary between Kansas and Nebraska, runs just north of Brighton, Colorado and on Baseline Road in Boulder, Colorado.[80] As such, most USPLSS legal descriptions for land in Colorado reference ranges east of the 6th P.M. and townships north and south of its Baseline. Still, it is always the better practice to include the Principal Meridian, County and State in USPLSS descriptions, even though it may seem redundant when all land in a county is east or west of the same Principal Meridian or is north or south of the same Baseline.[81]

The simplest way to read a USPLSS legal description is to proceed backwards from the end the description to locate the appropriate State, County and Principal Meridian and get to the general vicinity. The specific township and range can be identified by counting north, south, east, or west from the Principal Meridian and its Baseline. Then, the section can be located within that township. The fractional subdivision(s) within the section are also identified by reading the designations backward. For example, the W/2SE/4SE/4 is located in Figure 6 in the Appendix by first finding the southeast quarter; then the southeast quarter thereof; and, finally, the west half of the southeast quarter of the southeast quarter. The acreage, assuming it is a regular 640 acre section, can be readily calculated by dividing 640 by the product of the fractional denominators (i.e., 640 ÷ (2 x 4 x 4) = 20 acres).

B. Subdivision Descriptions

Probably the most common method for writing legal description today in urban and suburban areas is to describe the property by reference to a recorded subdivision plat. A subdivision plat will divide a tract of land into blocks, lots, tracts and/or parcels, delineate public and/or private streets, alleys, utility, drainage, open space and other types

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[78] Figures 5, 6 and 7 in the Appendix are sample plats which depict the numbering of USPLSS sections and the nomenclature for aliquot fractions thereof and their corners. As shown in Figure 7, it is possible to divide a section down to 2 1/2-acre or smaller aliquot fractions, but this is more likely to be confusing than beneficial.

[79] See Figure 1 in the Appendix.

[80] See Figure 2 in the Appendix.

[81] This is required in Colorado for legal descriptions in land survey plats. C.R.S. § 38-51-106(i).

of dedications, and provide other information, such as the location of building envelopes or references to Master Plans or restrictive covenants.

To comply with the specifications and requirements of the governing jurisdiction, a subdivision plat will identifying each lot by a number or letter within a block and show its boundaries, measurements and areas. When a subdivision plat is recorded in the office of the county clerk and recorder or register of deeds where the property is located, it is readily accessible to surveyors, lawyers and the general public who made need to refer to the information contained therein. As such, a lot in platted subdivision (or a portion or fraction thereof) can be described by referring to the plat.

Example of subdivision descriptions:

Lot 5, Block 2, Capitol Hill Subdivision Addition to the City and County of Denver, State of Colorado, according to the official plat thereof recorded . . . .

When referring to a recorded plat in a land description, it is generally preferable to set forth the tract or lot and block (or other designation) followed by " . . . according to the official plat thereof . . . ." The description should also provide appropriate recording or filing information, including the government office in which the official plat can be found. This reference to the plat relieves the scrivener of the burden of reciting all of the other details contained in the plat which add certainty to the location of the parcel on the ground.[82]

Whenever, additional information is provided in the instrument, such as an acreage quantity, a metes and bounds description or the identification of prior conveyances, the scrivener should be careful to confirm the accuracy of all such information and that it does not conflict with the corresponding information set forth in the official plat. Better yet, the scrivener should consider not including such additional information unless it is necessary to reflect the intent of the parties. Too often, the inclusion of additional information confuses rather than clarifies the description.

C. Metes and Bounds Descriptions

A metes and bounds description uses calls to adjoining property lines together with bearings and distances to describe the boundary of the parcel of land. Metes and bounds description are used when ever it is necessary or desirable to describe a tract with irregular boundaries not conforming to the USPLSS or the lots and blocks laid out in a subdivision plat. Usually, a metes and bounds description will describe the perimeter of the parcel moving in a clockwise direction. The description can be made much easier to read by beginning each line starting with "Thence" as a new line, as shown in the example below. This may take up more space on the page for the description, but it is much easier to read and to check for errors.

[82] 1 Patton on Titles § 121 (2nd ed. 1957).

These descriptions rarely or never rely solely on natural features only for location. When a metes and bounds description is used for irregular parts of a section or some fraction of a section, it should always tie to some established corner monument. Likewise, metes and bounds within approved subdivisions should tie to a corner or other monumented point described in the recorded subdivision plat, though they may also be tied to the USPLSS. Though actually a misnomer, "metes and bounds" is often used to refer to the calls for the perimeter description of a right of way.

A perimeter metes and bounds description should include (1) a preamble that provides a general description of the land to be described, such as the township, range, Principal Meridian, County and State, a common local name, an approximate acreage, the shape of the parcel, or other general information to orient the reader; (2) a call identifying the point of commencement, which should be a corner monument from the USPLSS, recorded subdivision plat, or some other readily recognizable and unique location; (3) calls reciting courses and distances to a point of beginning; (4) calls reciting courses and distances around the perimeter of the subject land, which may also include references to adjoining boundaries and other natural or artificial monuments parallel to or intersecting the perimeter, and back to the point of beginning; (5) an area call setting forth the approximate acreage in the parcel; (6) a basis of bearing statement for the courses called out.

Example of metes and bounds perimeter description:

A tract of land in the Northwest one-quarter of the Northwest one-quarter (NW ¼ NW ¼) of Section 30, Township 1 South, Range 66 West of the 6th Principal Meridian, County of Adams, State of Colorado described as follows:

Commencing at the Northwest corner of said Section 30;
thence South 20°30' East, a distance of 140.60 feet to the Point of Beginning;
Thence North 88°55' East, a distance of 200.00 feet;
Thence South, a distance of 125.00 feet;
Thence South 88°55' West, a distance of 200.00 feet;
Thence North, a distance of 125.00 feet to the Point of Beginning;
Containing 0.57 acres, more or less.

(Bearings are based on the north line of the Northwest 1/4 of Section 30 to bear North 89°42' East with all bearings contained herein relative thereto.)

While there are many exceptions, particularly where the result would be absurd or clearly not the intended result, the general priority given to the calls in a metes and bounds description are as follows: (1) natural and permanent monuments; (2) natural boundaries; (3) artificial monuments or markings; (4) calls to adjoining boundaries; (5) course and distance calls; (6) area calls. [83] Usually courses are given priority over

[83] 10 David A. Thomas, Thompson on Real Property § 90.04 (g) (1997 Cum. Supp.).; 1 Patton on Titles §150 (2nd ed. 1957); John S. Grimes, Clark on Surveying and Boundaries, § 277 (4th ed. 1976).

distances, but their relative priority may depend on the exact language of the instrument and the physical circumstances involved. The call which will best fit the entire description, whether the course or the distance, will generally be given priority.[84]

When reading a lengthy metes and bounds description, it is often helpful to trace the calls in reverse order to see if you reach the same points as you did when you started from the beginning. If a perimeter description does not appear to close, there are several computer programs available to help write and check legal descriptions. Some are very easy to use and require very little surveying expertise. For example, the "In Deed" is a program that checks the accuracy of metes and bounds descriptions, calculates the area, and draws a simple sketch. A more sophisticated program that may require some surveying and trigonometry knowledge is Quick CoGo Software. It is available from Jordan, Utah at 801-280-2965. It is best, however, to check with several software suppliers for programs that may fit your needs.

D. Right of Way Descriptions

Legal descriptions for rights of way should be written and interpreted in accordance with the general methods and principles described above. However, they rarely conform to USPLSS or subdivision lines and often involve complex metes and bounds calls. Moreover, it is common for the need to acquire rights to locate roads or facilities to arise before the exact location thereof is known. Likewise, it is not unusual for topographic features or other variables to require adjustments to the planned right of way route after the necessary property rights (or options for them) have been acquired. The following sections will discuss several common drafting techniques used to accommodate the special needs associated with preparing legal descriptions for rights of way.

i. Strip and Centerline Descriptions

A strip description is used primarily for describing a road, dedicated public utility easement or other type of linear right of way. This type of description will describe a line either by metes and bounds or by reference to a boundary, such as a property, USPLSS or subdivision line. Then the right of way is identified as being a strip of land of a specified width which is oriented to the line. The line described may be either edge or the centerline of the strip. The width is generally fixed, but can be made variable if the need arises, although that may be confusing and is not recommended.[85] Strip descriptions

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[84] E.g., Wallace v. Hirsch, 350 P.2d 560 (Colo. 1960), Jackson v. Woods, 876 P. 2d 116 (Colo. App. 1994) and Gilmor v. Cummings, 913 P,2d 749 (Utah App. 1995) (a call to a monument or point capable of precise and exact location controls over the course and distance call to that point); but see, Mahas v. Rindlisbacher, 808 P.2d 1025 (Utah 1990) (distance call controlled over call to a canal when neither legal description would close if the lines were extended additional 400 feet to only canal in vicinity).

[85] In instances where the width will vary extensively, it is probably advisable to use a perimeter metes and bounds description.

should terminate on a property or boundary line for closure, but may not in certain instances.

Examples of strip and centerline descriptions:

A strip of land 25 feet wide, lying north of the following described line...; or

A strip of land 25 feet wide, being 12.5 feet on each side of the following described centerline...; or

A 10 foot strip of land in Lot 7 along the north border of Lot 7, Block 2 ....

ii. Fractional or Aliquot Part Descriptions

An easement or right of way can also be described by designating a fractional or aliquot part of a parcel. A description by aliquot parts means the designation of a part of a parcel, usually a USPLSS section or a subdivision lot, that divides the parcel evenly and leaves no remainder.

Examples of fractional part description:

The East 10 feet of Lot 6, Blue Lake subdivision; or

That portion of the SW/4 of . . . lying north of County Road 110.

Examples of aliquot fractional part description:

The South ½ of Lot 15, Block 5, Brown's Addition to the Town of Silt;

The NW ¼ of the NW ¼ . . . .

Descriptions of this type are generally used to describe larger parcels. As mentioned above, reading descriptions of this type is simplified by following the description backwards. For example, the E ½ of the SW ¼ of the SE ¼ is located by first visualizing the southeast quarter; then visualizing the southwest quarter of that southeast quarter; and finally locating the east half of the visualized quarter-quarter parcel.

iii. Perimeter Descriptions

Whenever there is an irregularly shaped parcel to describe, it can be accomplished by a perimeter description. This type of description is merely a metes and bounds, or more properly just "metes," description that describes the perimeter of the right of way using bearings and distances.

Example of a Perimeter description:

Commencing at the Northeast ¼ of Section 25, Township 7 South, Range 87 West of the 6th P.M., Garfield County, Colorado;
Thence South 88° 45' 33" East, along the north line of said Section 25, a distance of 300.00 feet to the Point of Beginning;
Thence South 01° 14' 27" West, a distance of 100.00 feet;
Thence North 88° 45' 33" West, a distance of 100.00 feet;
Thence North 01° 14' 27" East, a distance of 100.00 feet;
Thence South 88° 45' 33" East, a distance of 100.00 feet to the Point of Beginning.;

iv. Blanket Descriptions

The last right of way type of description covered herein is the "blanket" description. This type is easily written and can provide the entity obtaining the easement or right of way with coverage for their facilities without the necessity of a land survey. This is a very quick method to obtain land rights but it also can encumber every square inch of the grantor's property. Also, blanket descriptions are susceptible to being found too vague to be sufficient.[86]

Examples of blanket descriptions:

A forty foot easement for road purposes across the Southwest of Section 2 . . . ; or

. . . reserving the right of ingress and egress to the existing well on the premises.

Landowners should probably not agree to this type of description unless there is some means to delineate and limit the scope of the grant in the future. Companies who are tempted to utilize this method of description when acquiring rights of way may "save" money at the time the description is written, but should realize that they will usually end up paying more later to the fix problems inevitably associated with blanket descriptions.

If a blanket description is used, the instrument should provide for the reversion of those portions of the land not necessary to provide sufficient access to and setbacks for the facility after it is constructed. This method may require that an "as built" land survey be performed to delineate the boundaries of the permanent right of way intended. Then, an appropriate instrument, usually a quitclaim deed, can be executed and recorded to remove the encumbrance of the blanket description from the property in question. The same result can be accomplished by first taking an option with a blanket description to acquire the necessary property rights, and providing for the execution of an instrument

[86] E.g., Adelson v. Board of County Commissioners for Pitkin County, 875 P.2d 1387 (Colo. App. 1993) (blanket description of a 40 foot strip across certain subdivision lots to be used for road purposes was too vague to provide constructive notice of an existing road).

with a more specific legal description upon exercise of the option after the facility has been installed.

C. Terminology

The choice of terminology used in writing legal descriptions can cause them to be interpreted in different ways and can cause legal questions to arise regarding the intent of the description. Care should be taken on the choice words used in the description to lessen the chance of misinterpretation for the meaning desired. The following are ten of the most commonly used and misunderstood terms use in legal descriptions:[87]

Adjacent Adjacent means lying near or close to or in the vicinity of, but not necessarily touching. This word is often used incorrectly instead of adjoining. Although thought to mean touching, this term indicates only that a person is in the right neighborhood, not on the right line.

Adjoining This is the preferred term when the intent is to refer to a boundary that is actually in common with another.

Along A call for a boundary to be along a line implies that a person is moving with the call, and the line itself is the route of motion. The term is not interchangeable with "by a line," "on a line" or "with a line." When referring to a strip description or a road, along generally refers to the centerline, unless otherwise called for.

Contiguous The term contiguous is somewhat vague and should be avoided. In close proximity, near though not in contact, and adjoining all fall within the meaning. Other terms that do not carry such ambiguities are preferable.

Due Due north refers to astronomic north, not an assumed north. Geodetic north is not included in this term. The use of "true" instead of "due" does not improve clarity. These terms should be used only when the bearings or azimuths are actually based on astronomic observations. Statements regarding the basis of bearings in a deed should be made in the description. In the absence of a stated basis of bearings, the bearings called for in a legal description are considered to be relative to each other, but not necessarily to the bearings in other deeds.

Either This term is sometimes assumed to mean the same distance on both sides when describing a strip with a centerline. "Thirty-three feet on either side of the following described centerline" is an incorrect use. Either implies that there is a choice of one side or the other of the centerline, but not both sides as was probably intended. Scriveners should employ the word "each" instead.

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[87] Russell C. Brinker & Roy Minnick, The Surveying Handbook, 1075 (1987).

Excepting This terms is not interchangeable with reserving. Some descriptions use them in tandem. However, the word excepting means omitted or cut off, while the term reserving indicates only a portion of something is being withheld. When reserving an easement from a foregoing description, the implication is that fee title to the land has been transferred, but a partial interest in the form of an easement is to be created and held for the grantor. When an "exception" is made, anything described in the exception that was also described in the body may be construed as being entirely removed from the grant.

More or less This term is sometimes misunderstood. This phrase indicates that the reader of a call should be cautious. It indicates uncertainty as to the accuracy of a call. The term should be reserved for situations where the call is questionable. When used at the end of an acreage call, more or less implies that the area is not to be taken as any real influence on the description; that is, the bearings and distances in the body of the description control the area of the land, and the area call is supplementary and for information only.

Parallel to For two lines to be parallel to each other, they must by mathematics be equidistant from each other at any point. Lines or objects cannot be parallel "with" each other, but must be parallel "to" each other. Although parallel implies straight lines, this term is often used with curves. The principle indicates that the curves are concentric, which means they share a common radius point and are also equidistant from each other at any given point.

Tract or Parcel These two terms are the most frequently used in metes and bounds preambles to refer to the land being described. The term parcel is generally preferred because it does not have other meanings with which it can be confused. Tract is a term used within the USPLSS for prior vested rights segregated from the survey or resurvey. Similarly, using "a section of land" can be confused with a 640-acre Section of the USPLSS. The term "lot" also has several official meanings, so the description should clarify which system or designation is intended.

VI. Conclusion

Care should always be taken in the preparation of legal descriptions to avoid the need for legal action to perfect the rights being obtained. A description written incorrectly may cause overlaps or gaps with surrounding properties, title problems or even worse, the construction of improvements on the wrong property. The best advice is to repeat the following statement used earlier for preparation of legal descriptions -- the preferred method for writing legal descriptions is to use the best type or combination of types and parts that will give the clearest and shortest description possible.

DRAWINGS & FIGURES

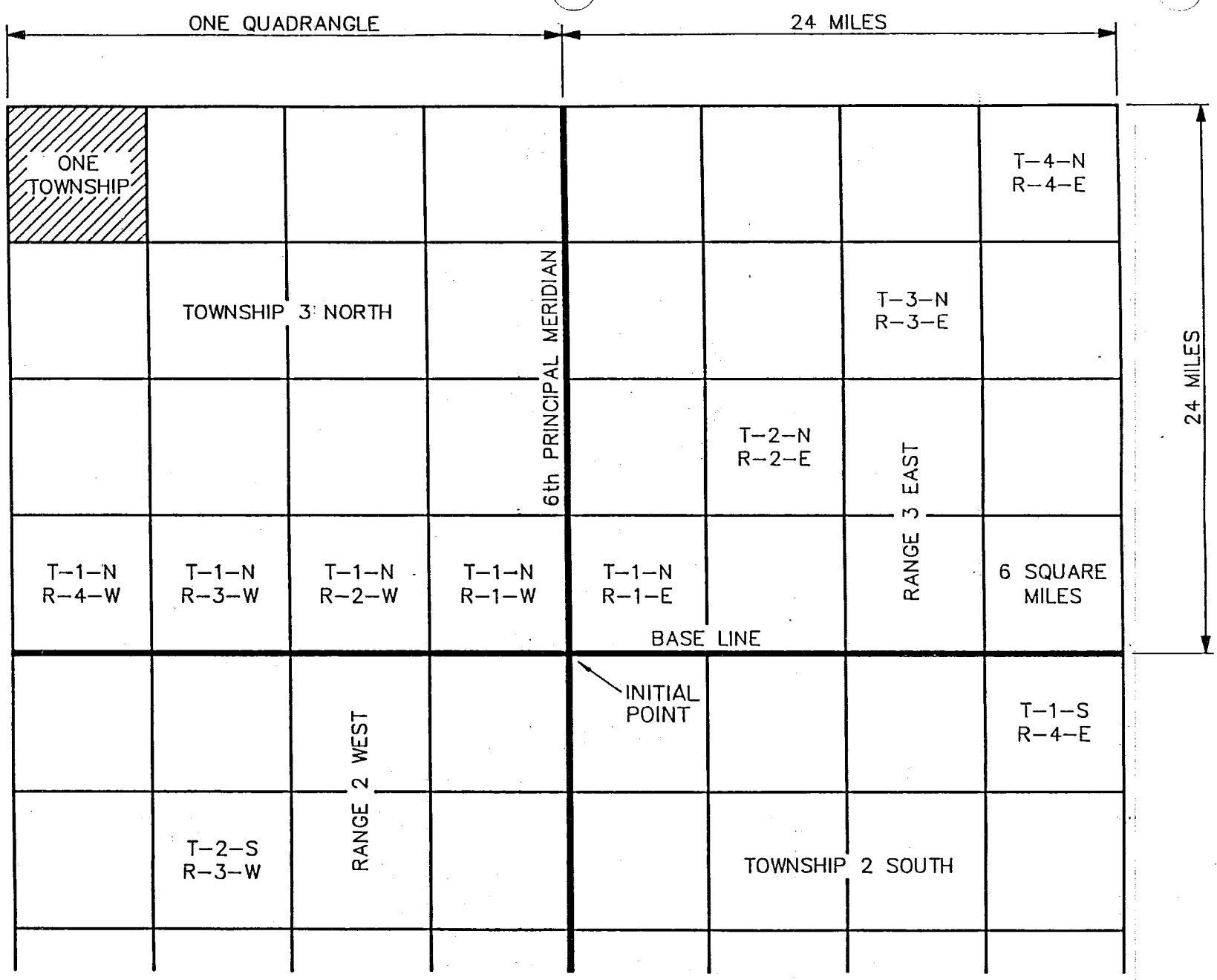
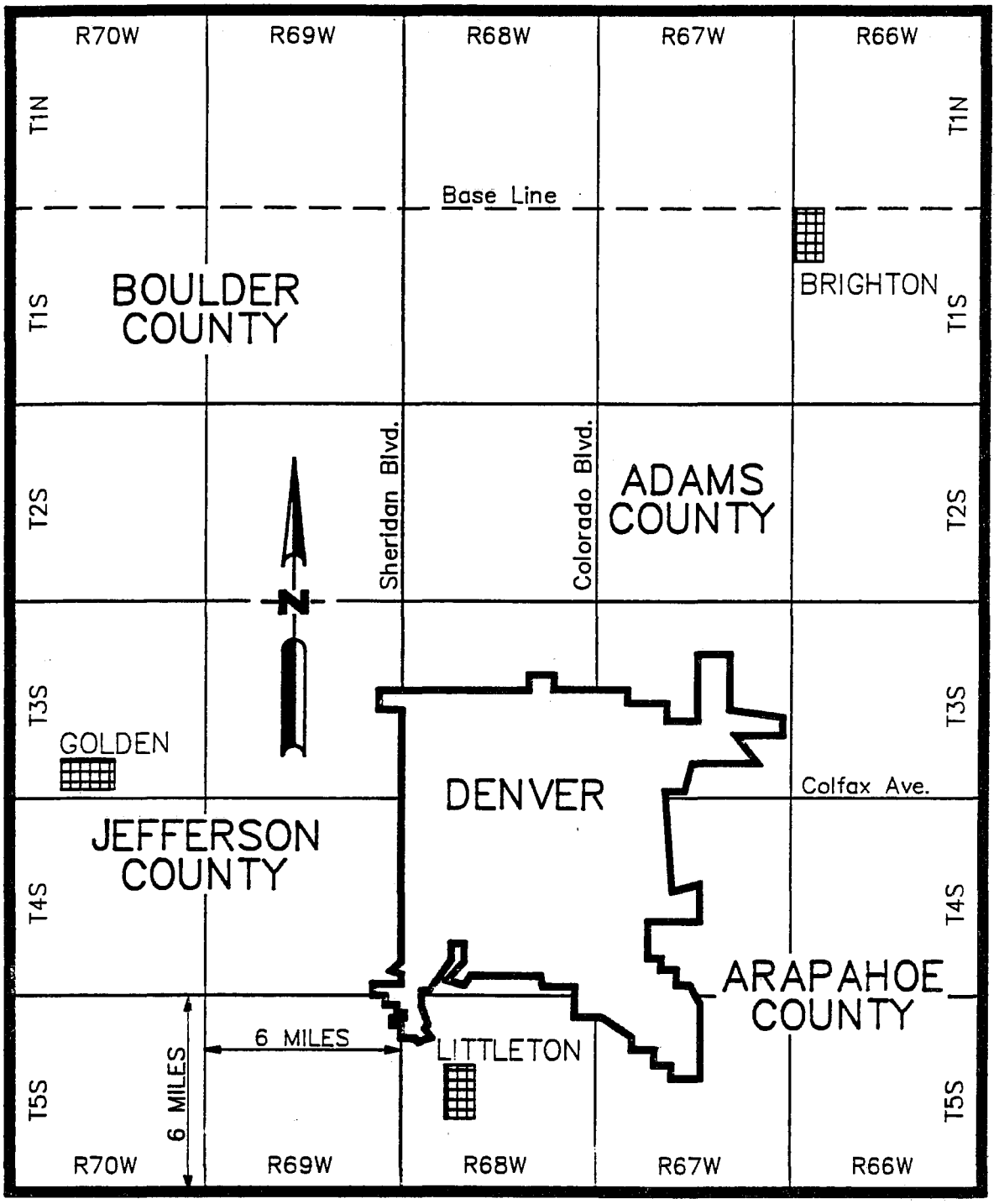


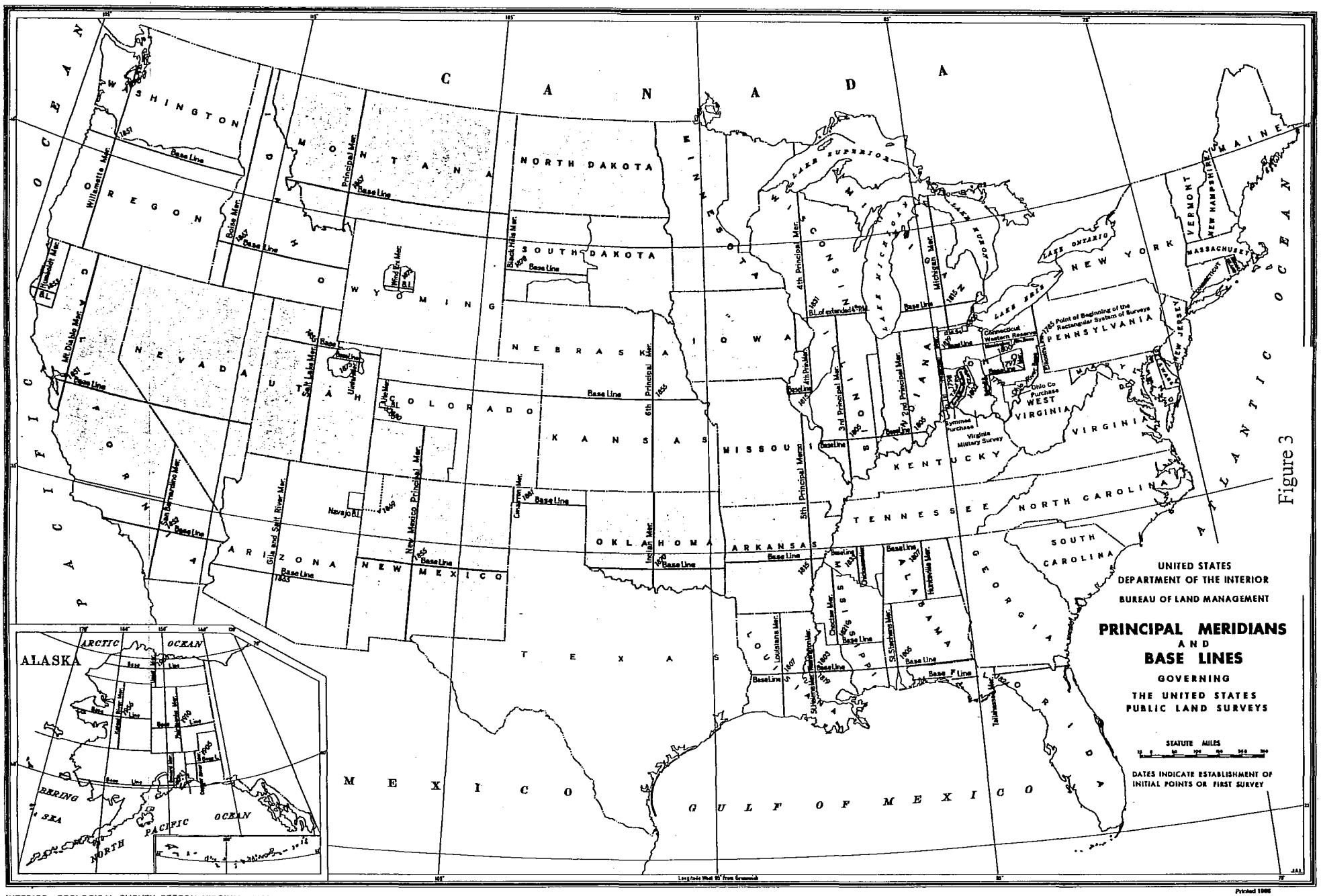
Figure 1

Figure 1

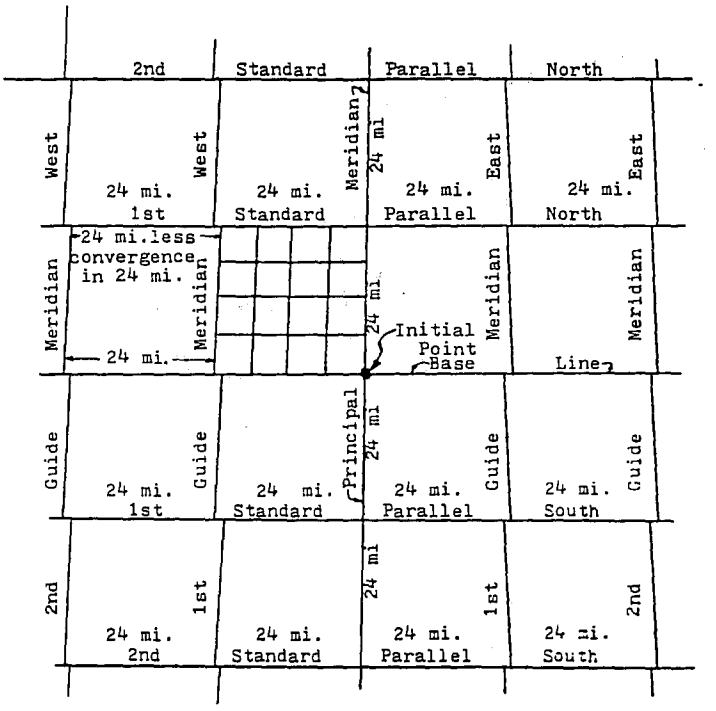


MAP SHOWING DENVER AND VICINITY IN TERMS OF THE ACTUAL TOWNSHIPS AND RANGES.

Figure 2



INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988



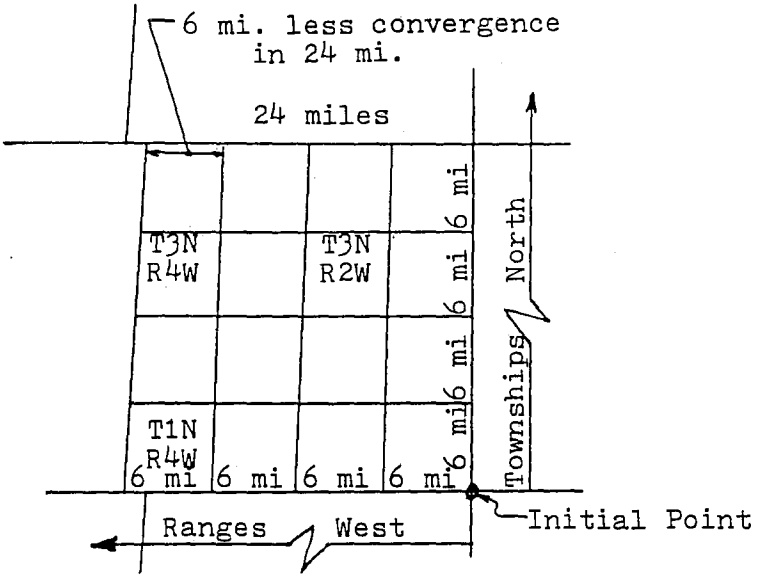
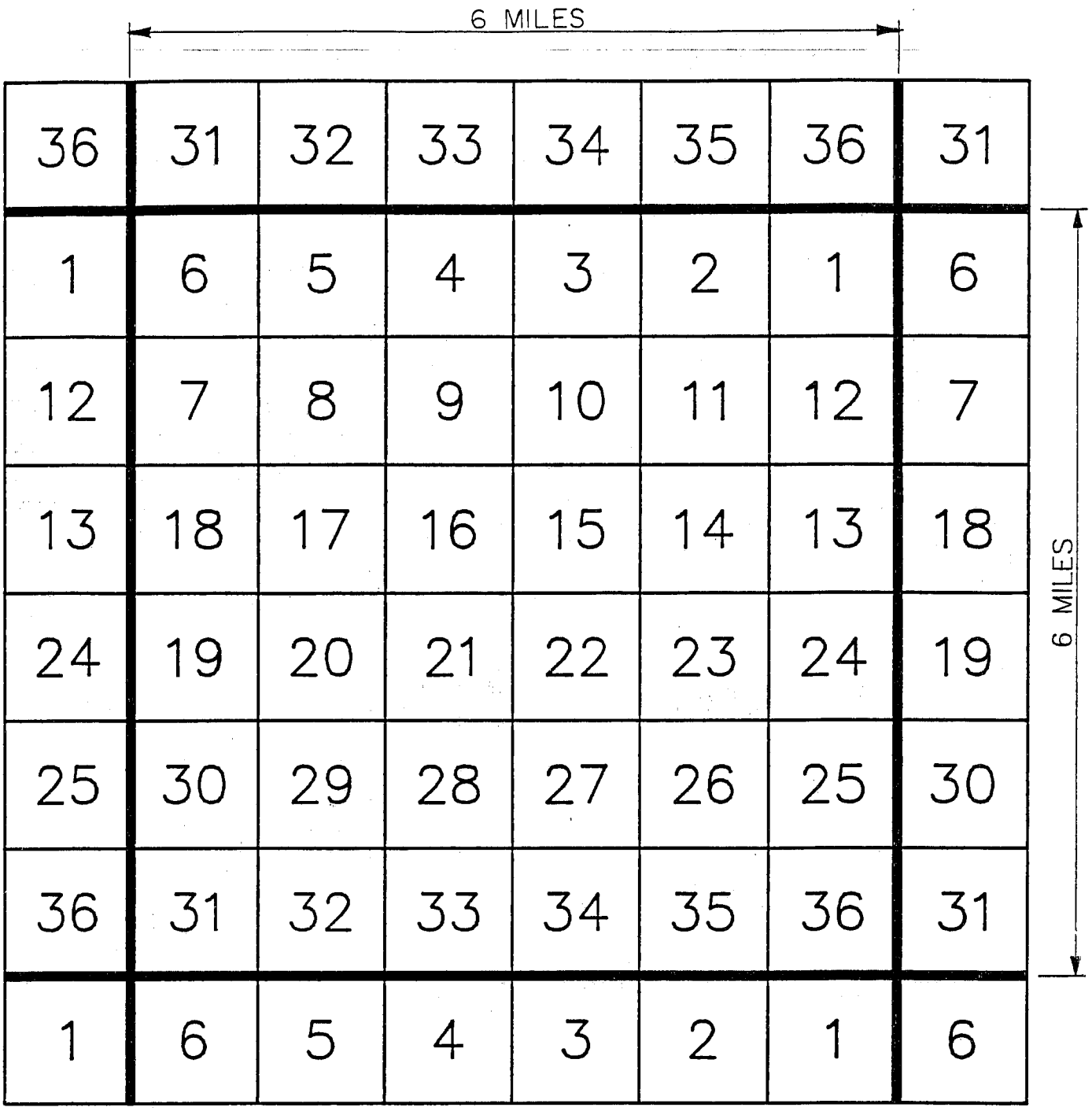


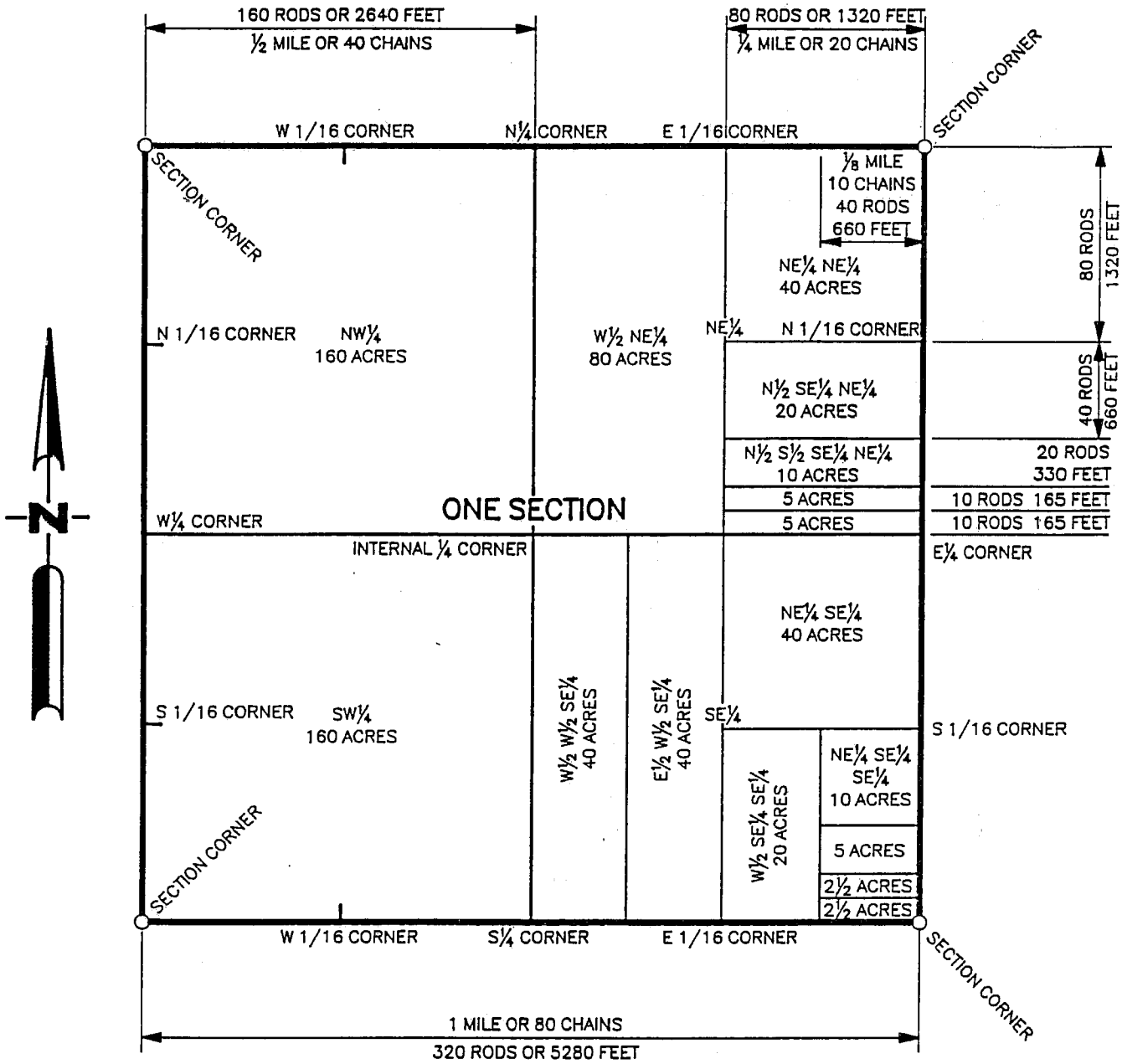
Figure 4

(From Principles of Right of Way, International Right of Way Association, Page 75



SECTIONAL MAP OF TOWNSHIP SHOWING
ADJOINING SECTIONS

Figure 5



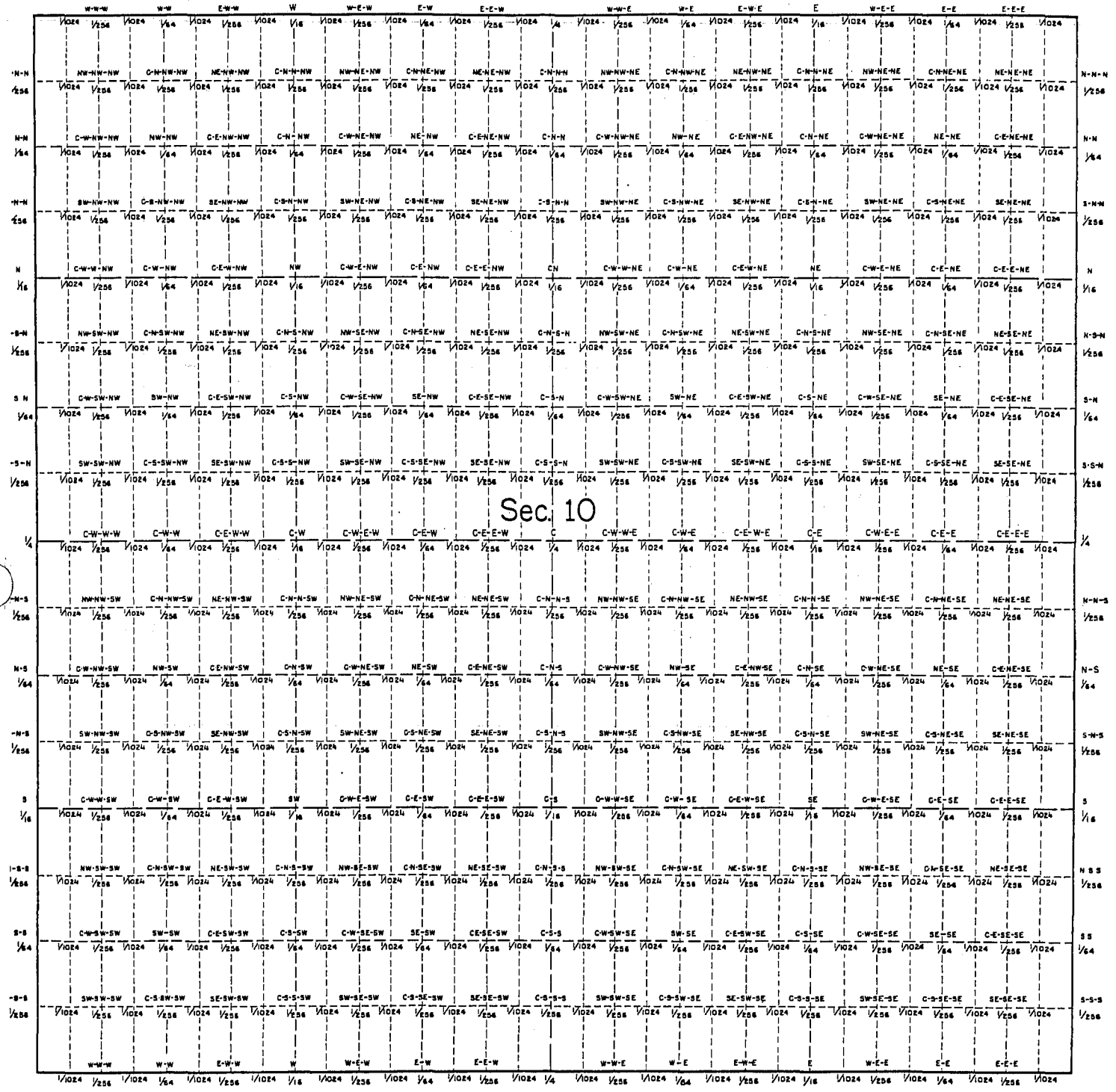
RECTANGULAR SURVEY OF A SECTION OF LAND

Figure 6

Form 9600-14
August 1979)
(formerly 9180-12)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

IDENTIFICATION OF CORNERS ON SUBDIVISION OF SECTION LINES

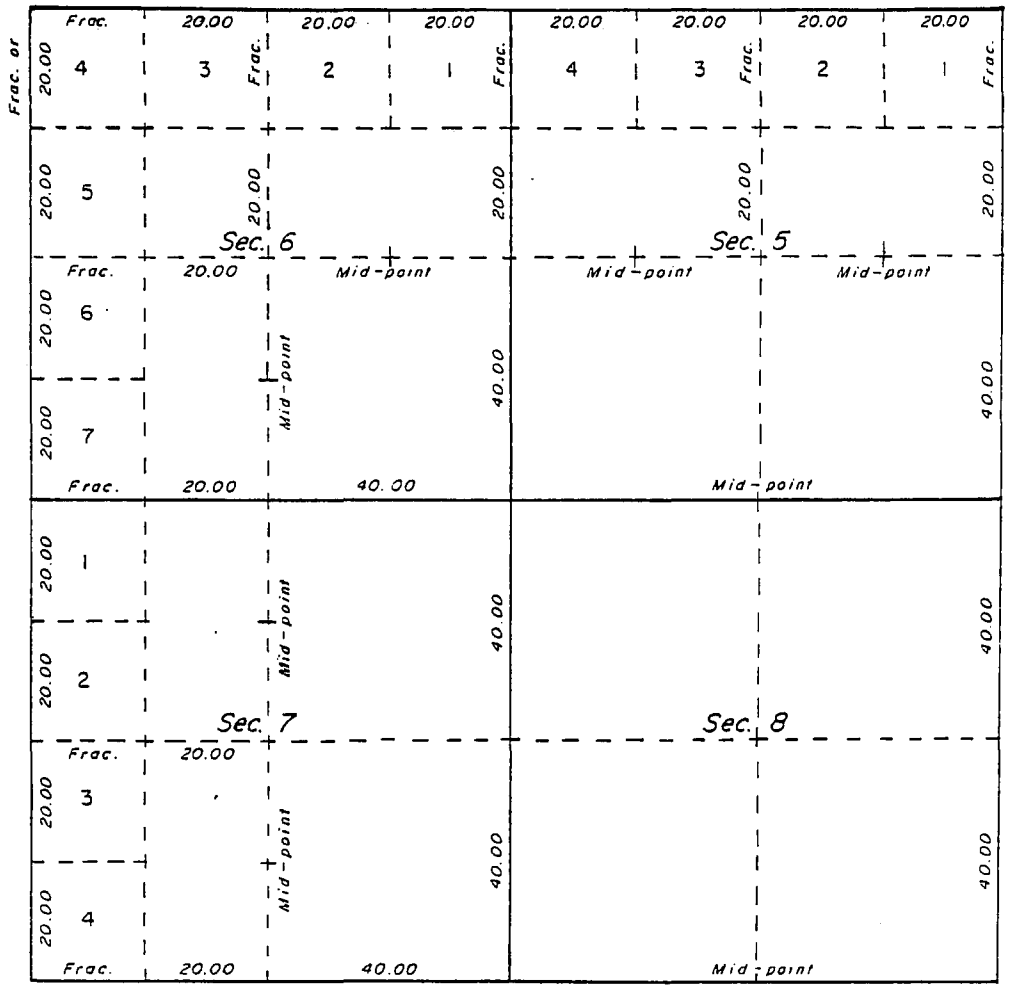


If 1/1024 corners are established they will be marked 1/1024 only

See figs. 65 & 66 MANUAL OF SURVEYING INSTRUCTIONS, 1973, for marks on the monuments

GPO 852-823

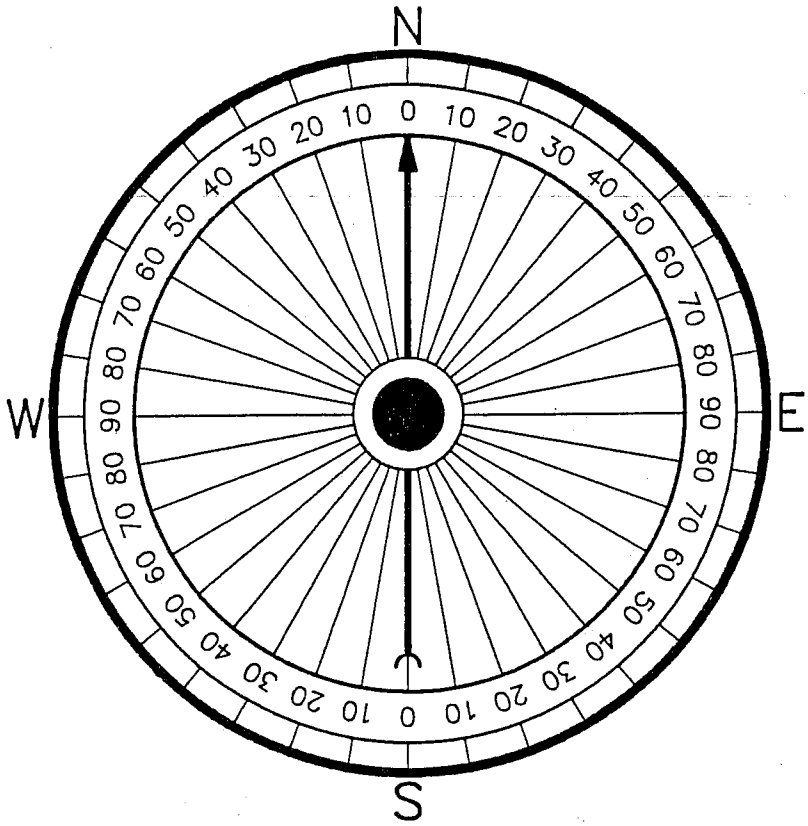
Figure 7



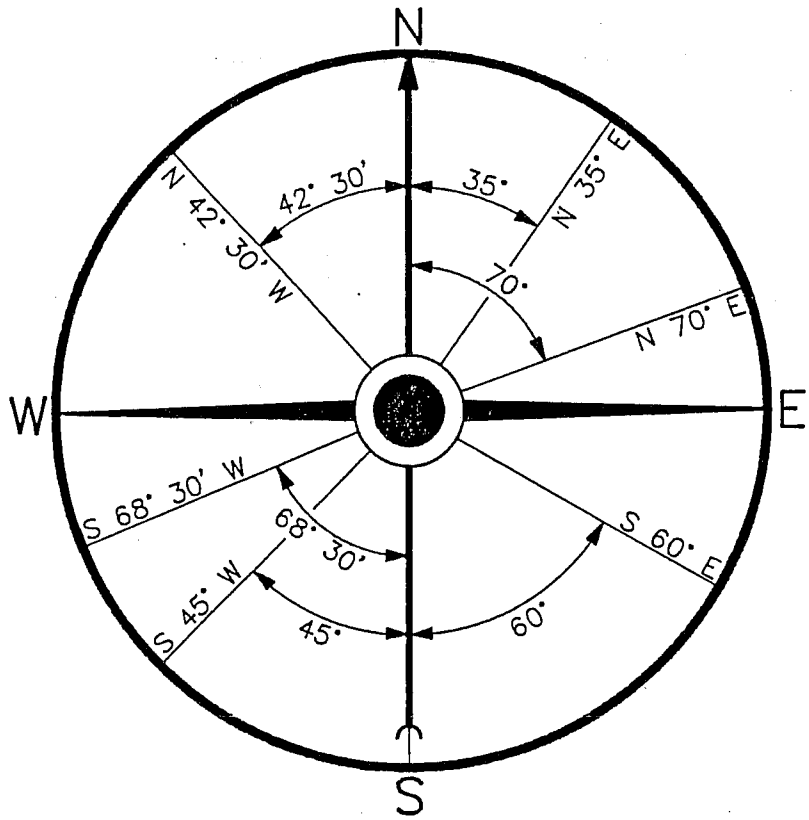
Showing normal subdivision of sections.

Figure 8

(From Manual of Surveying Instructions, 1973, Bureau of Land Management, Page 82)



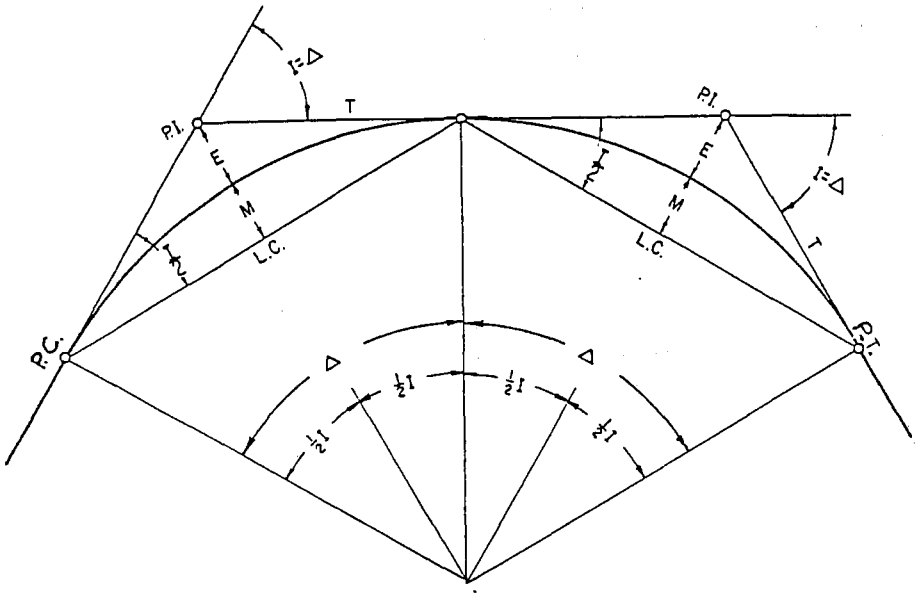
90 DEGREES IN A RIGHT ANGLE
360 DEGREES IN A CIRCLE



60 SECONDS EQUAL ONE MINUTE
60 MINUTES EQUAL ONE DEGREE

Figure 9

Survey Formulas and Definitions
Circular Curves



Deflection angle = $\frac{D}{4}$ for 50' chord

Deflection angle = $\frac{D}{2}$ for 100' chord

D = Degree of curvature in decimal

$R = \frac{5729.58}{D}$ (length of arc 100.007')

$D = \frac{5729.58}{R}$

$R = \frac{360S}{2\pi D}$

$L.C. = 2R \ \mathrm{Sin}\ \frac{1}{2}I$

$R = \frac{50}{\mathrm{Sin}\ \frac{D}{2}}$

$L(\text{in stations}) = \frac{I}{D}$

$T = R \ \mathrm{Tan}\ \frac{1}{2}I$

$L(\text{in feet}) = \frac{I}{D} \times 100$

$M = R - R \cos \frac{1}{2}I$

$R = \frac{E \cos \frac{1}{2}I}{1 - \cos \frac{1}{2}I}$

$E = \frac{R}{\cos \frac{1}{2}I} - R$

$d(\text{in degrees}) = \frac{D}{2} \times \frac{c}{100}$

$d(\text{in minutes}) = 0.3cD$

$\Delta/2 = L/R \ 28.6478938$

$C = 2R \ \mathrm{Sin}\ \Delta/2$

$L = .01745333 \Delta R$

$L = 100\ \Delta/D$

$T = R \ \mathrm{Tan}\ \Delta/2$

$R = 5729.58/D$

$E = T \ \mathrm{Tan}\ \Delta/4$

$R = T / \mathrm{Tan}\ \Delta/2$

$L = \Delta°/180\pi R$

$\text{Area} = \Delta/2/180\pi R^2$

Figure 10

				PUBLIC SERVICE COMPANY OF COLORADO GAS DISTRIBUTION DIVISION GAS CENTRAL SERVICES ENGINEERING DEPARTMENT
SECTION	TOWNSHIP	RANGE	SCALE:	
PRINCIPAL MERIDIAN		COUNTY, COLORADO	DRAWN BY:	
PLAT NO.	DOCUMENT NO.		DATE:	LINE:

FORM (A) 410-24-2622

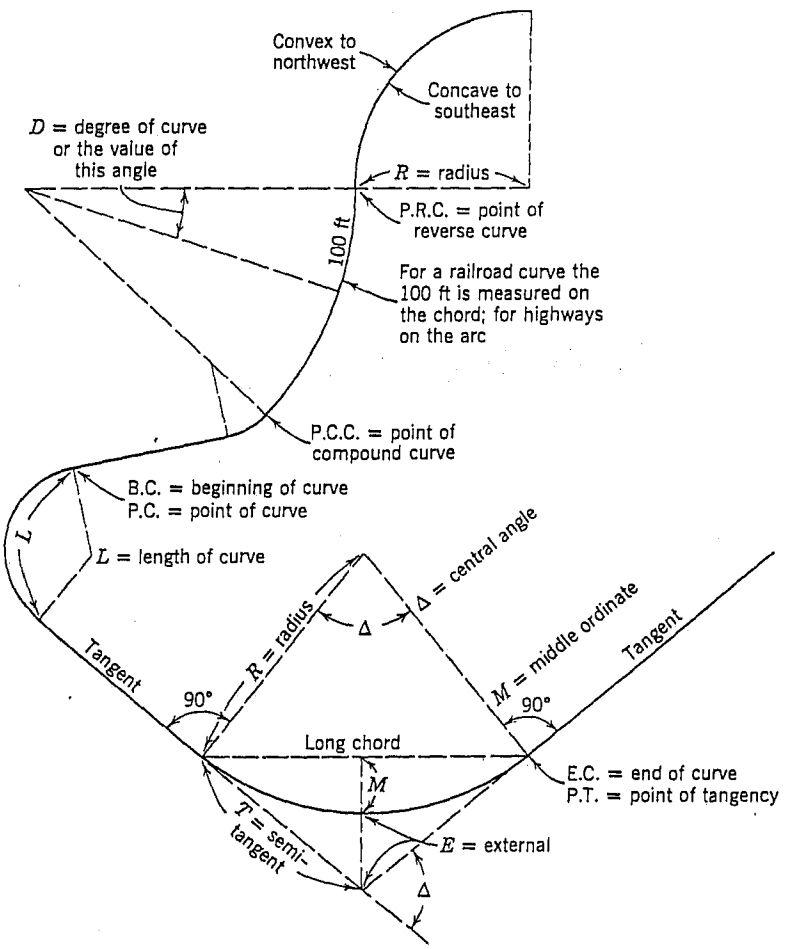


Figure 11

(From Boundary Control and Legal Principles, Brown, Page 14)

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4567 Review Questions for Surveyor	Brinker, Russell	712	$40.00	5712	$34.00 +	2
Adjustment Computations Practical Least	Wolf, Paul	464	$75.00	5464	$70.00 +	2
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Audubon Society Field Guide to North	Little, Elbert	553	$18.50	5553	$14.00 +	1
Barbs, Prongs, Prickers and Stickers	Clifton	910	$20.00	5910	$18.00 +	1
Basic Geodesy	Smith, James R.	532	$45.00	5532	$38.00 +	2
Basic Mathematics	Krugkak, Moore,	711	$17.00	5711	$15.00 +	1
Basic Surveying Computations	Zimmerman, Edward	556	$42.00	5556	$37.00 +	2
Be an Expert With Map and Compass-The	Kjellstrom	975	$17.00	5975	$15.00 +	1
Blacks Law Dictionary-5th Edition		705	$47.00	5705	$42.00 +	4
Boundaries and Landmarks	Mulford	611	$15.00	5611	$12.00 +	1
Boundary Control and Legal Principles	Brown, Curtis M.	605	$79.95	5605	$76.00 +	2
California Plane Coordinate Projection	USC&GS	473	$12.00	5473	$10.00 +	1
Cartographic Design and Production	Keates, John S	453	$54.00	5453	$50.00 +	1
Cartographic Relief Presentation	Imhof	475	$140.00	5474	$137.00 +	1
Christopher Columbus, Cosmographer	Kravath, Fred F.	530	$42.00	5530	$32.00 +	2
Clark on Surveying and Boundaries	Robillard, Bouman	602	$85.00	5602	$80.00 +	3
Collection of Original Instructions to	Minnick, Roy, editor	520	$55.00	5520	$47.00 +	3
Colorado River Survey	Smith, D.;	986	$40.00	5986	$36.00 +	2
Construction Surveying and Layout	Crawford, Wesley G.	646	$60.00	5646	$55.00 +	1
Deed Descriptions I Have Known but Could	Wilson, Donald	935	$45.00	5935	$39.00 +	2
Definitions of Surveying and Associated	ASCE, ASCM	707	$23.00	5707	$20.00 +	2
Development of Railway and Land Subsidy	Rae	633	$50.00	5633	$44.00 +	2
Development of the Public Land Policy,	Bayard	623	$48.00	5623	$38.00 +	2
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Early Sea Charts	Putnam	945	$60.00	5945	$50.00 +	3
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From Plane to Spheroid-Determining the	Smith, James R.	980	$42.00	5980	$33.00 +	3
Geodesy: An Introduction	Torge	474	$60.00	5474	$56.00 +	2

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Geography of Claudius Ptolemy	Ptolemy, Claudius	589	$24.00	5589	$20.00 +	1
George Gauld-Surveyor and Cartographer of	Ware	940	$40.00	5940	$33.00 +	3
Ghost Along the Mohawk	Breault, William, S.J.	566	$27.00	5566	$23.00 +	2
Glossaries for Surveyors	Minnick, Roy, editor	721	$45.00	5721	$38.00 +	2
GPS for Land Surveyors	Jan Van Sickle	651	$59.95	5651	$53.00 +	3
GPS Satellite Surveying	Leick, Alfred	570	$73.00	5570	$71.00 +	2
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History of the Northern Pacific Land Grant	Contreneo	642	$55.00	5642	$48.00 +	3
History of Topographical Maps - Symbols,	Harvey	932	$55.00	5932	$50.00 +	2
Hydrography for the Surveyor and Engineer	Ingham & Abbott	954	$40.00	5954	$38.00 +	1
Illustrated Price Guide to Antique Surveying	Uzes, Francios	928	$10.00	5928	$2.00 +	1
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Introductory Surveying	Wirshing	964	$16.00	5964	$13.00 +	1
Jefferson Stone	Bedini, Silvio A	649	$30.00	5649	$25.00 +	2
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Land Surveying Computations	Buckner, R.B.	571	$30.00	5571	$28.00 +	1
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Land Surveyor Reference Manual	Harbin	972	$40.00	5972	$37.00 +	2
Land System in Maryland, 1720-1765	Gould	625	$39.00	5625	$32.00 +	3
Laws for the California Surveyor	Minnick, Roy,	708	$38.00	5708	$30.00 +	2
Laws of the U.S. Upon Which Public Lands	Government Printing	613	$125.00	5613	$115.00 +	4
Legal Descriptions and Survey Analysis	Wattles, Gurdon	717	$12.00	5717	$10.00 +	1
Legal Principles of Property Boundary	Tillotson	607	$50.00	5607	$47.00 +	2
Legal Research and Writing	Honigsberg Gilbert	813	$25.00	5813	$22.00 +	1
Making of a Land Surveyor	Schmitz, Michael	715	$40.00	5715	$35.00 +	1
Manual for the Use of Prospectors on the	Copp	620	$45.00	5620	$38.00 +	2
Manual of Instructions for Survey of the	Bureau of Land	504	$34.00	5504	$30.00 +	2
Manual of United States Surveying	Hawes	612	$18.00	5612	$15.00 +	1
Map Makers	Wilford	903	$30.00	5903	$24.00 +	2
Map Use-Reading, Analysis, Interpretation	Muehrecke	456	$38.00	5456	$34.00 +	1
Mapping of America	Schwartz,	934	$125.00	5934	$100.00 +	3
Mapping of North America	John Goss	527	$60.00	5527	$50.00 +	2
Mapping the North American Plains	Luebke, F.C.; Kaye,	988	$65.00	5988	$59.00 +	2

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TITLE INDEX and DIVIDEND LIST

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Short Title in alphabetical order.	Author	Catalog Number	Regular Price	Dividend Order Nr.	Dividend Price +	How many Certificates
Maps and Mapmakers	Tooley	452	$40.00	5452	$33.00 +	3
Men To Match My Mountains	Stone, Irving	568	$12.95	5568	$9.00 +	1
Miner was a Bishop	Breault, William, S.J.	536	$15.00	5536	$12.00 +	1
Mineral Land Surveying	Underhill,	619	$50.00	5619	$39.00 +	3
Minisink Patent	LaPotin	644	$42.00	5644	$35.00 +	2
North American Datum Of 1983 (NOAA	Charles R. Schwartz	526	$27.00	5526	$25.00 +	1
Noteforms for Surveying Measurements	Brinker, Barry &	441	$13.00	4441	$10.00 +	1
Original Survey and Land Subdivision	Thrower	519	$18.00	5519	$10.00 +	2
Plotters and Patterns of American Land	Minnick, ed. Wilson,	974	$25.00	5974	$18.00 +	2
Ponce De Leon Land Grant	Bowden	941	$11.00	5941	$8.00 +	1
Power and Weakness	Breault, William	594	$5.00	5594	$3.50 +	1
Practical Surveying for Technicians	Landon, Robert P.	731	$42.00	5731	$37.00 +	2
Preferential Treatment of the Actual Settler	Tatter	643	$53.00	5643	$47.00 +	2
Property	Dukeminier Gilbert	811	$24.00	5811	$22.00 +	1
Public Domain	Donaldson	518	$140.00	5518	$100.00 +	6
Public Land Laws Passed by Congress From	Copp	628	$125.00	5628	$118.00 +	4
Public Land Policies: Management and	Gates	629	$73.00	5629	$66.00 +	2
Public Land Surveys: History, Instructions,	Stewart	610	$45.00	5610	$42.00 +	1
Public Land System of Texas, 1823-1910	McKitrick	635	$44.00	5635	$39.00 +	2
Pueblo Indian Laws of the Rio Abajo, New	Brayer	630	$42.00	5630	$35.00 +	2
Quarterdecks and Spanish Grants	Clar, C. Raymond	909	$25.00	5909	$21.00 +	1
Report of the Exploring Expedition to the	Fremont, John	912	$55.00	5912	$49.00 +	3
Reports of Land Cases, United States	Hoffman, Ogdon	608	$110.00	5608	$100.00 +	4
Reports of the Special Masters of the United	Briccoe, J. ;	593	$110.00	5593	$90.00 +	4
Restoration of Lost or Obliterated Corners	Bureau of Land	506	$13.00	5506	$10.00 +	1
Restoration of Lost or Obliterated Corners &	GPO	507	$28.00	5507	$25.00 +	2
Route Surveying and Design	Meyer, Gibson	425	$74.00	5425	$72.00 +	1
Satellite Geodesy	Seeber, Gunter	729	$125.00	5729	$120.00 +	2
Shaping of Vermont-From the Wilderness to	Graffagnino	947	$70.00	5947	$60.00 +	4
Solutions Manual	Harbin	973	$20.00	5973	$18.00 +	1
Solving Problems in Surveying	Bannister, Arthur	558	$43.00	5558	$39.00 +	2
State of Vermont vs The State of New	NHLS, Compiler	966	$30.00	5966	$24.00 +	2
State Plane Coordinate System Of 1983	James E. Stem	525	$15.00	5525	$12.00 +	1
State Plane Coordinates in Modern	Buckner, R.B.	826	$35.00	5826	$31.00 +	1
Story of Maps	Brown, Llyond	929	$12.95	5929	$9.00 +	1
Sundials-Their Theory and Construction	Waugh	960	$6.00	5960	$4.00 +	1
Surveying	Moffitt, Bouchard	404	$87.00	5404	$84.00 +	2
Surveying for Field Scientists	Ritchie, Wood,	538	$42.00	5538	$38.00 +	2
Surveying Handbook	Brinker, Minnick, ed.	983	$109.95	5983	$102.00 +	3
Surveying Instruments	Deumlich	476	$95.00	5476	$90.00 +	2
Surveying Instruments-Their History	Kiely	925	$34.00	5925	$32.00 +	1
Surveying Measurements and Their Analysis	Buckner, R.B.	480		5480	+	1
Surveying Principles and Applications 3rd	Kavanagh, Barry	984	$72.50	5984	$69.00 +	3
Surveying the Courtroom-A Land Experts	Briscoe, John	958	$60.00	5958	$50.00 +	3
Surveying the Texas and Pacific Land Grant	Bowden	921	$10.00	5921	$7.00 +	1
Surveying Theory and Practice	Davis, Foote,	402	$90.00	5402	$88.00 +	2
Surveying With Construction Applications	Kavanagh, Barry S.	540	$88.75	5540	$84.00 +	2
Surveyors Guide and Pocket Table Book	Dorr	514	$12.00	5514	$10.00 +	1

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Syllabus for Land Surveyor Examinations,	Safford, Charles	722	$40.00	5722	$34.00 +	2
They Left Their Mark- William Austin Burt and	Burt, John, S	977	$40.00	5977	$32.00 +	2
Thinkers and Tinkers- Early American Men of	Bedini, Silvio	901	$30.00	5901	$24.00 +	2
Tidelands Oil Controversy	Bartley	631	$50.00	5631	$44.00 +	2
TimeTrap-How to Get More Done in Less Time	MacKenzie	802	$6.00	5802	$4.00 +	1
Treatise on the Method of Government	Clevenger	513	$12.00	5513	$10.00 +	1
Trigonometry	Ayres, Schaums	710	$17.00	5710	$15.00 +	1
Under the Fig Tree	Breault, William S.J.	555	$9.00	5555	$6.00 +	1
United States Mineral Lands	Copp	641	$75.00	5641	$69.00 +	3
Up and Down California - 1860/1864	Brewer	916	$21.00	5916	$19.00 +	1
Virginia Land Grants	Harrison. Fairfax	636	$44.00	5636	$40.00 +	2
Voice Over the Water	Breault, S.J.,	595	$8.00	5595	$6.00 +	1
Wagon Roads West	Jackson	951	$16.00	5951	$13.00 +	1
Webster's College Dictionary	Random House	576	$27.00	5576	$25.00 +	1
With Compass and Chain: Federal Land	Ernst	624	$49.00	5624	$44.00 +	3
Workbook for Land Survey Systems	McEntyre, John	557	$45.00	5557	$38.00 +	2
Writing Legal Descriptions	Wattles, Gurdon	714	$36.50	5714	$34.00 +	1

ORDER FORM

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9/30/97

TABLE OF LAND MEASUREMENTS

TABLE OF LAND MEASUREMENTS

LINEAR MEASURE	SQUARE MEASURE
7.92 inches = 1 link	144 sq. in. = 1 sq. foot
12 inches = 1 foot	9 sq. feet - 1 sq. yard
3 feet = 1 yard	30 1/4 sq. yds. = 1 sq. rd.
25 links = 1 rod	16 sq. rds. = 1 sq. chain
100 links = 1 chain	1 sq. rd. = 272 1/4 sq. ft.
16 1/2 feet = 1 rod	1 sq. chain = 4356 sq. ft.
5 1/2 yards = 1 rod	10 sq. chains = 1 acre
40 rods = 1 furlong	160 sq. rods = 1 acre
8 furlongs = 1 mile	4,840 sq. yds. = 1 acre
66 feet = 1 chain	43,560 sq. ft. = 1 acre
88 chains = 1 mile	640 acres = 1 sq. mile
320 rods = 1 mile	1 sq. mile = 1 section
8,000 links = 1 mile	36 sq. miles = 1 Twp.
5,280 feet = 1 mile	6 miles sq. = 1 Twp.
1,760 yards = 1 mile	1 sq. mi. = 2.59 sq. kilm.

AN ACRE IS:

43,560 sq. feet	660 feet x 66 feet
165 feet x 264 feet	160 square rods
198 feet x 220 feet	208.7 feet square (approx.)

or any rectangular tract, the product of the length and width of which totals 43,560 sq. feet.

METRIC SYSTEM

Most of the world does its measuring in meters. The United States is now moving toward the metric system. The metric system being used today is called the International System of Units, SI for short, and it has been accepted as the preferred system in nearly all countries of the world.

At some point in the future we will also have to be conversant with the metric system in order to handle legal descriptions and land descriptions. The metric system progresses logically in units of 10. In the metric system, prefixes have the same meanings whether measuring length, volume or mass, the most common being: micro = millionth; milli = thousandth; centi = hundredth; deci = tenth; mega = 1,000,000 times the base; kilo = 1,000 times the base; hecto = 100 times the base, deka = 10 time the base.

To convert between the units in the metric system, you need only move the decimal point to the right or left. The basic dimension of the metric system is the meter which equals approximately 3.3 feet. All dimensions of length can be expressed as variations of a meter: millimeter (mm), centimeter (cm), meter (m), or kilometer (km). Conversions between these measurements are simple decimal locations based on factors of 10.

The basic metric unit of land measurement is a square with each side 100 meters long, covering an area of 10,000 square meters. This unit of land is called the hectare (ha), and is equal to approximately 2.5 acres.

U.S. TO METRIC		METRIC TO U.S.	
Length		Length	
1 inch	= 25.4 millimeters (mm)	1 millimeter (mm)	= 0.04 inch
1 foot	= 0.3 meter (m)	1 meter (m)	= 3.28 feet
1 yard	= 0.9 meter	1 meter	= 1.09 yards
1 mile	= 1.6 kilometer (km)	1 kilometer (km)	= 0.62 mile
Area		Area	
1 sq. inch	= 6.5 sq. centimeters (cm2)	1 sq. centimeter (cm2)	= 0.16 sq. inch
1 sq. foot	= 0.09 sq. meter (m2)	1 sq. meter (m2)	=10.76 sq. feet
1 sq. yard	= 0.8 sq. meter	1 sq. meter	= 1.20 sq. yard
1 acre	= 0.4 hectare (ha)*	1 hectare*	= 2.47 acres
1 sq. mile	= 2.6 sq. kilometers (km2)	1 sq. kilometer	= 0.39 sq. mile

METRIC SYSTEM

Unit	Abbreviation	Number of Meters	Approximate U.S. Equivalent
Length			
myriameter	mym	10,000	6.2 miles
kilometer	km	1,000	0.62 miles
hectometer	hm	100	109.36 yards
decameter	dkm	10	32.81 feet
decimeter	dm	0.1	3.94 inches
centimeter	cm	0.01	0.39 inches
millimeter	mm	0.001	0.04 inches
Area			
square kilometer	sq. km or km2	1,000,000	0.3861 square miles
hectare	ha	10,000	2.47 acres
are	a	100	119.60 square yards
centare	ca	1	10.77 square feet
square centimeter	sq cm or cm2	0.0001	0.155 square inches

LAND MEASUREMENTS

To reduce varas to yards, divide by 1.08.

To reduce yards to varas, multiply by 1.08.

To reduce varas to feet, divide by .36.

To reduce sq. varas to sq. feet, multiply by 7.716049.

To reduce sq. feet to sq. varas, divide by 7.716049.

To reduce sq. vrs. to acres, divide by 5,645.3757.

To reduce sq. varas to acres, multiply by .0001771361

To reduce acres to sq. varas multiply by 5,645.3757.

40 sq. rods equals 1 rood.

4 roods equal 1 acre.

1/2 acre (homestead within city limits) contains 21,780 sq. ft.

To reduce feet to varas, multiply by .36.

1 mile equals 80 chains, 320 rods, 1,760 yards or 5,280 feet.

16 1/2 ft. equals 1 rod, perch or pole.

16" lineal feet equal 1 rod, perch or pole.

40 lineal rods equal 1 furlong or 1/8 mile.

1 vara equals 33 1/3 inches - 36 varas equal 100 ft.

1,900.8 varas equal 5,280 ft. (1 mile).

1 chain equals 100 links equals 66 feet.

1 mile equals 80 chains equals 1,900.8 varas.

1 acre equals 43,560 sq. ft. equals 5,645.3757 sq. vrs.

1 acre equals 208.71 ft. sq. equals 75.1357 vrs. square.

1 square mile equals 640 acres.

1 section of land is 1 sq. mile.

1/4 section contains 160 acres.

160 square rods equal 1 acre.

10,000 sq. links equals 1 sq. chain.

1 acre equals 208.708 ft. by 208.708 ft.

1 chain equals 66 feet, 100 links or 4 rods.

1 link equals 7.92 inches.

1/4 chain or 25 links equals 1 rod.

4 rods equals 1 chain.

144 sq. inches equal 1 sq. ft.

9 sq. feet equals 1 sq. yard.

30 1/4 sq. yards equals 1 sq. rod.

1 sq. rod contains 272 1/4 sq. ft.

1 labor equals 1,000 vrs. sq.
equals 2,777.77 plus ft. sq.
equals 177.14 acres.

1 league equals 5,000 vrs. square French
equals 4,428 acres.

1 league equals 6.919 sq. miles.

25 labors equal 1 sq. league.

1 acre equals 43,560 sq. ft.

1 acre equals 4,840 sq. yards.

1 acre equals 160 sq. rods.

640 acres equals 1 sq. mile or section.

36 sq. miles or sections equals 1 township and contains 23,040 acres.

1 arpent equals about 12 rods.

1 arpent equals from .84 to 1.28 acres depending on locality

ARPENT - (Webster) An old

land measure of varying value, especially one equal to .84 acre still common in parts of Canada. A lineal measure, equal to about 11.5 rods, used locally in Canada.