The Public Land Survey System (PLSS) - Part 2

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The Public Land Survey System (PLSS) is a legal reference system designed to describe and facilitate the sale of land. Formerly managed by the General Land Office (GLO) the PLSS is today regulated by the US Department of the Interior, Bureau of Land Management (BLM). As explained in Part 1 (Manz, 2013) the system is based on an essentially rectangular grid that divides land into 6- by 6-mile squares called townships. Each township is identified by a township (T) and range (R) number, which defines its position relative to a pair of perpendicular reference lines: the principal meridian and a base line. Townships are subdivided into 36 numbered sections of one square mile. Sections may be further subdivided into aliquot parts (half sections, quarter sections, quarter-quarter sections and so on) and/or irregular government lots. Any parcel of land within the PLSS can be legally described in terms of these divisions. The description also serves as a locator, and because two pieces of land cannot occupy the same space, provides every parcel with a unique and immutable identity.

PLSS Legal Descriptions

Legal descriptions, by nature, tend to be long-winded and repetitive, so they are usually written in an abbreviated form using the standard notation adopted by the BLM. Most begin with the name of the subdivision (lot numbers first, if there are any, then the aliquot part) followed in sequence by the section number, the township and range, and lastly, the name of the principal meridian. For instance, a legal description for a 10-acre parcel that reads "the southwest quarter of the southwest quarter of the northwest quarter of Section sixteen, Township one hundred forty-seven North, Range ninety-one West of the Fifth Principal Meridian" (fig. 1a) would, on paper, look like this:

SW¼SW¼NW¼, sec. 16, T. 147 N., R. 91 W., 5th PM

Note that the aliquot part (a quarter-quarter-quarter section) is written as a single, discrete unit with the smaller parcel always to the left of the larger one and no spaces or punctuation. Punctuation, especially the placement of commas, in this portion of a legal description is very important. Strictly speaking, a comma in a legal description means "and the" whereas its omission means "of the" (Bureau of Land Management, 2000). Consequently, missing or misplaced commas in the aliquot part can have a profound effect on the description's interpretation. A comma inserted between, say, the SW¼ and NW¼ in the above legal description would change its notation to SW¼SW¼, NW¼ which, instead of a single 10-acre parcel, describes two: the southwest quarter of the southwest quarter (40 acres) and the northwest quarter (160 acres) of section 16 (fig. 1b). This is why legal descriptions on land records are almost always written in full or at least have the "of the's" and "and the's" spelled out rather than represented by punctuation marks.

The PLSS as a locator

As well as defining property boundaries, the PLSS can be used in place of a numerical coordinate system to locate objects or places on maps that depict the system's grid lines. These include the topographic maps published by the US Geological Survey and the ones found in plat books, county atlases and on a number of online interactive map services such as the North Dakota GIS Hub. The only drawback to the PLSS as a coordinate system is that its descriptive terminology lacks the precision of actual numbers, which means it cannot be used to find the exact location of anything less than 1.25 acres in extent – the minimum area the system recognizes. However, if pinpoint accuracy is not required, it is a very good way to obtain an approximation of something's whereabouts.

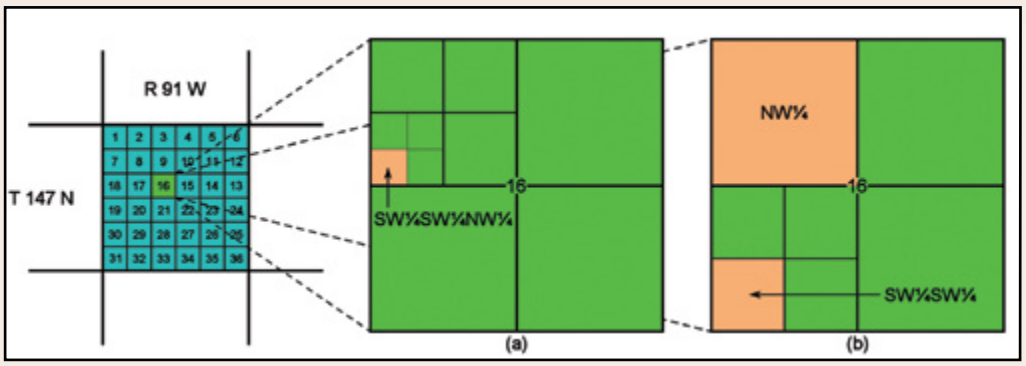

Figure 1. (a) The southwest quarter of the southwest quarter of the northwest quarter of Section sixteen, Township one hundred forty-seven North, Range ninety-one West of the Fifth Principal Meridian (SW¼SW¼NW¼, sec. 16, T. 147 N., R. 91 W., 5th PM), (b) The southwest quarter of the southwest quarter and the northwest quarter of Section sixteen, Township one hundred forty-seven North, Range ninety-one West of the Fifth Principal Meridian (SW¼SW¼, NW¼, sec. 16, T. 147 N., R. 91 W., 5th PM).

A PLSS legal description is also a geographic reference and as such can be used to identify the described parcel on a map. To do this, the general rule is to start with the principal meridian and read the description from the largest areal unit to the smallest. The location of the 10-acre parcel shown in figure 1a, for example, is given by reading its legal description backwards, or from right to left.

A person unfamiliar with the Fifth Principal Meridian would first need to consult a map that shows its position along with that of its base line, and the public land surveys it governs (e.g., BLM, 2012) in order to know where to start looking for this parcel. Then, having calculated from the description's township and range number that the parcel is about 882 (147 x 6) miles north and 546 (91 x 6) miles or so west of the Fifth Principal Meridian's initial point, plotting its estimated location on this map will reveal that this piece of land is somewhere in western North Dakota (figs. 2 and 3).

Most of the time we can afford to ignore the principal meridian and skip this initial step. (Except in formal legal descriptions the name of the meridian is ordinarily dropped for this reason.) In its absence, reading from right to left, the description begins with the range number (R. 91 W.) followed by the township number (T. 147 N.). Unless you already have the right map coverage, the ease with which you will be able to determine the approximate location of this 6- by 6-mile township will depend very much on how well you know the area. It may be necessary to start with a small-scale map such as one of the US Geological Survey's 1:500,000-scale statewide series and go from there. Keep in mind that the level of detail shown on a map tends to increase with scale, so if the parcel you are looking for is relatively small, or the aim is to pick out a landform, building or some other detail within it, the larger the scale, the better. In addition, because map and PLSS boundaries do not always coincide, townships and sections may extend over more than one map sheet, a potential inconvenience that also increases with scale. Alternatively, open up an interactive mapping tool like North Dakota GIS Hub Explorer, make sure that the PLSS layers are visible, and hit the zoom button.

Figure 2. T. 147 N., R 91 W. 5th PM.

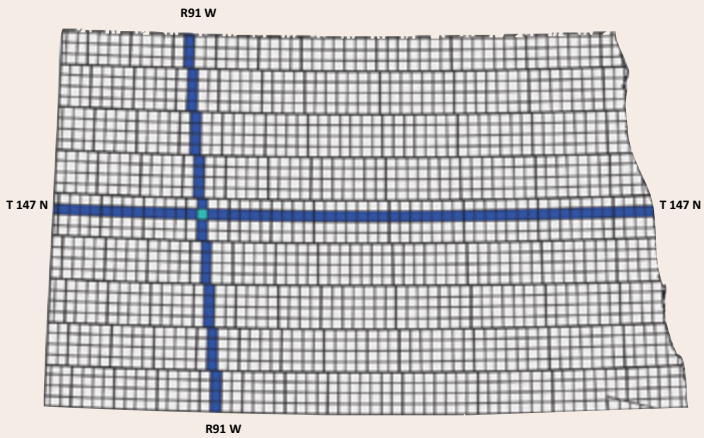

Figure 3. T. 147 N., R 91 W. in green.

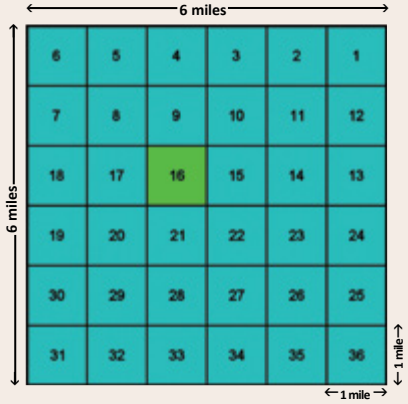

Figure 4a. Sec. 16, T. 147 N., R. 91 W.

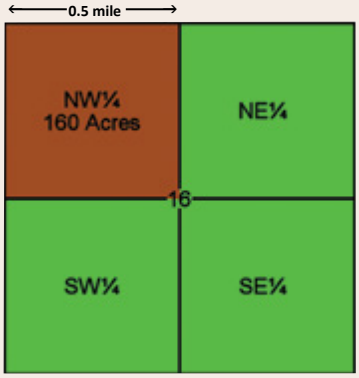

Figure 4b. NW¼, sec. 16, T. 147 N., R. 91 W.

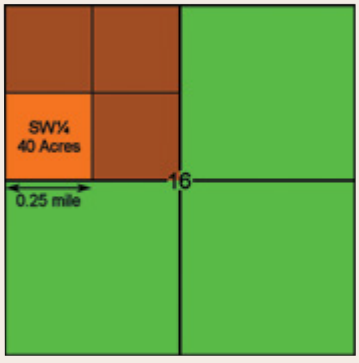

Figure 4c. SW¼NW¼, sec. 16, T. 147 N., R. 91 W.

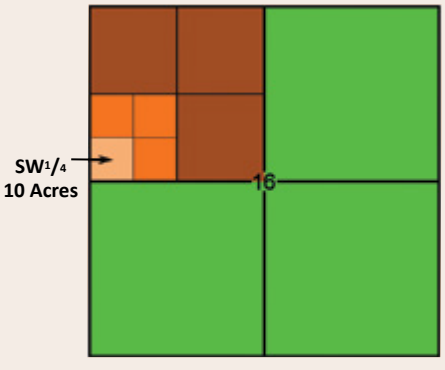

Figure 4d. SW¼SW¼NW¼, sec. 16, T. 147 N., R. 91 W.

Once the township has been pinned down, the rest is easy. Recall that every PLSS township is divided into 36 sections; each, as nearly as possible, 640 acres and one mile square. The parcel we are looking for is in section 16 (fig. 4a). Continuing to read the description from right to left, the first notation after the section number refers to its northwest quarter (fig. 4b). From there we are directed to the southwest quarter of this quarter section (fig. 4c) and lastly to the 10-acre parcel that is the southwest quarter of the southwest quarter of the northwest quarter of section sixteen, Township one hundred forty-seven North, Range ninety-one West (of the Fifth Principal Meridian) (figs. 1a and 4d).

A word of caution however. It is also acceptable to write a PLSS legal description beginning with the principal meridian. According to this convention, the description for the 10-acre parcel in figure 1a would be written as:

5th PM, T. 147 N., R. 91 W., sec. 16, SW¼SW¼NW¼

Although the two descriptions have exactly the same meaning, one is not simply a mirror image of the other. The fact that the township number still precedes the range number is neither here nor there, but what is significant is that the order of the aliquot notations has also not changed. Protocol requires that when describing one parcel of land within another (e.g. a quarter-quarter section) the smaller parcel is always written to the left of the larger one irrespective of how the legal description is written as a whole. The correct way to locate the parcel from this legal description would be to read the description from left to right as far as the section number and then the aliquot part from right to left.

Other PLSS formats

When PLSS legal descriptions began to be stored electronically in the late 1950s and early '60s, surveyors soon realized that the standard BLM notation for public lands was too cumbersome and error-prone for the computer technology of the day and would need to be simplified. A number of alternative formats were introduced, one of which is still used by the North Dakota State Water Commission (SWC) to identify water wells and other vertical borings under its jurisdiction. Originally developed by the US Geological Survey, the notation is designed primarily for point locations rather than acreage (it does not allow for half-sections, nor does it include the name of the principal meridian). A borehole's location is described by an eight-digit number consisting of the township (first three digits), range (next three digits), and section (last two digits) followed by an alphanumeric code of one to four or more characters that denotes the quarter section and smaller subdivisions. Beginning in the northeast quarter and moving anticlockwise, quarter sections, quarter-quarter sections, and so on are designated by the letters A, B, C, and D (fig. 5); and in contrast to the standard form of notation, in this format the smaller parcel is always written to the right of the larger one. The entire description may be written without punctuation, although the township, range, and section numbers are sometimes separated by hyphens, and even the space between the number and alphanumeric code is optional.

Thus:

SW¼SW¼NW¼, sec. 16, T. 147 N., R. 91 W., 5th PM

could be written as:

14709116 BCC or 147-091-16 BCC

If (and there often is) more than one borehole within an area this size, each one is assigned a consecutive terminal number, and the descriptions would be written as: 14709116 BCC1 and 14709116 BCC2, etc. To learn more about this PLSS format visit the SWC's website at www.swc.state.nd and go to any of the databases listed under "Map and Data Resources."

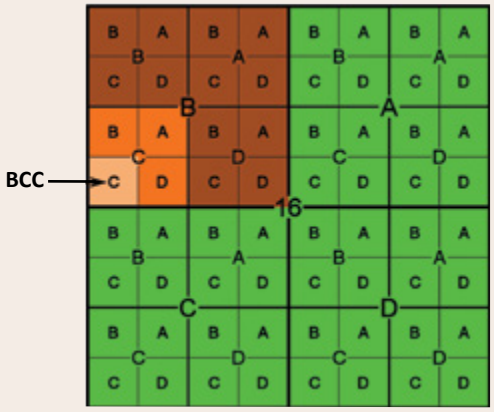

Figure 5. Subdividing sections using USGS notation.

The Original Surveys

The SWC is also the custodian of the original government surveys for North Dakota. These documents are important because they are authoritative and have the last word in any dispute or discrepancy concerning public land records. The boundaries and reference points established by those surveys are inviolate, even if they are not exactly where they are supposed to be (recall the Sisseton Indian Reservation). Modern surveys may be more accurate but they cannot supersede the originals. North Dakota's official government survey documents may be viewed online at www.survey.swc.nd.gov.

References

Bureau of Land Management, 2000, Legal Description and Land Status, www.ntc.blm..gov/krc/uploads/334/2000-01SS_Legal_Description_09-03-08.010km.arc.pdf, (retrieved November 1, 2013).

Bureau of Land Management, 2012, Principal Meridians and Base Lines, http://www.blm.gov/wo/st/en/prog/more/cadastralsurvey/meridians.html, (retrieved November 1, 2013).

Manz, L.A., 2013, The Public Land Survey System (PLSS) – Part 1, Geo News, v. 40, no. 2, p. 12-16.