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LEGXY2 A MICROSOFT WINDOWS PROGRAM TO CONVERT LEGAL DESCRIPTIONS IN KANSAS TO UTM ZONE 14 COORDINATES

by

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LEGXY2 A Microsoft Windows Program to Convert Legal Descriptions in Kansas to UTM Zone 14 Coordinates

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Abstract

LEGXY2 is a Microsoft Windows program that allows the user to convert Kansas legal (USPLSS) point descriptions to UTM Zone 14 Coordinates. USPLSS legal descriptions can be entered interactively or be obtained from legal descriptions stored in the tables or queries of a Microsoft Access database. LEGXY2 relies upon a database descended from the earlier KGS LeoBase II to provide the section coordinates, then further subdivides the section using simple linear interpolation. Both "center of" subdivision and footage point locations can be used.

Introduction

The United States Public Land Survey System (USPLSS) provides the legal basis for land ownership in most of the United States west of the Appalachians. Under this system, an area was to be divided into square townships six miles on a side and oriented along cardinal directions, then subdivided into sections a mile square and oriented along cardinal directions. (See Figure 1.) Because property lines are based on section lines and section lines are often readily apparent in the field, point locations are often specified as being at/near the center of some subdivision of a section, or so many feet east and north of

a section corner. This is particularly true of oil, gas, and water wells. However, producing maps with accurate locations requires use of a more standardized, physical coordinate system, such as longitude-latitude, or distances east and north of some arbitrary point, such as the Universal Transverse Mercator (UTM) system. LEGXY2, the program described herein, converts LEGal descriptions to XY coordinates in the UTM Zone 14 coordinate system for all of Kansas.

Because the USPLSS is a land ownership system and not a grid system, once an area was surveyed, the section corners are not moved. A section is the area enclosed by a set of survey markers laid out by the original survey, and is not subject to readjustment to correct errors made during the survey. Thus, converting from legal descriptions to a physical coordinate system such as longitude-latitude or UTM requires knowledge of the locations of the section corners. LEGXY2 uses the sections in Kansas digitized from 7 ½' quadrangles (Ross, 1994).

The Universal Transverse Mercator (UTM) coordinate system is a widely-used projection that allows easy calculation of distances and preserves angles. UTM coordinates are included as tic marks on almost all topographic maps, and soon the base projection of USGS topographic maps will be UTM. Most publicly accessible geographic data is available in either UTM or geographic coordinates or as legal descriptions, so having a database in UTM or geographic coordinates is recommended. Because UTM allows calculation of distances whereas the geographic angular system and legal descriptions do not, UTM should be used in geographic databases where distances, angles, shapes, or areas are important.

UTM Zone 14 (102° W to 96° W) includes most of the state of Kansas and almost all the present field areas of researchers in the Geohydrology Section of the Kansas Geological Survey. Because of this, many databases are available from KGS-Geohydrology in UTM Zone 14 coordinates. LEGXY2 is provided so that conversion from legal descriptions to UTM coordinates can be made as easy as possible. The Visual Basic source code, which can be used in Microsoft Visual Basic, Excel, or Access, is available as well. The user can tailor the program to his/her needs, including other projections, if desired.

LEGXY2 uses the Clarke spheroid of 1866 and is equivalent to NAD27.

The locations of section corners used by LEGXY2 are approximate, and the interpolation scheme is not the one used in defining property boundaries. The user should not use LEGXY2 in lieu of property surveys, or in any other cases where a 200 foot error would be unacceptable. This program is intended only for use in geology where approximate locations are considered adequate. Use at your own risk.

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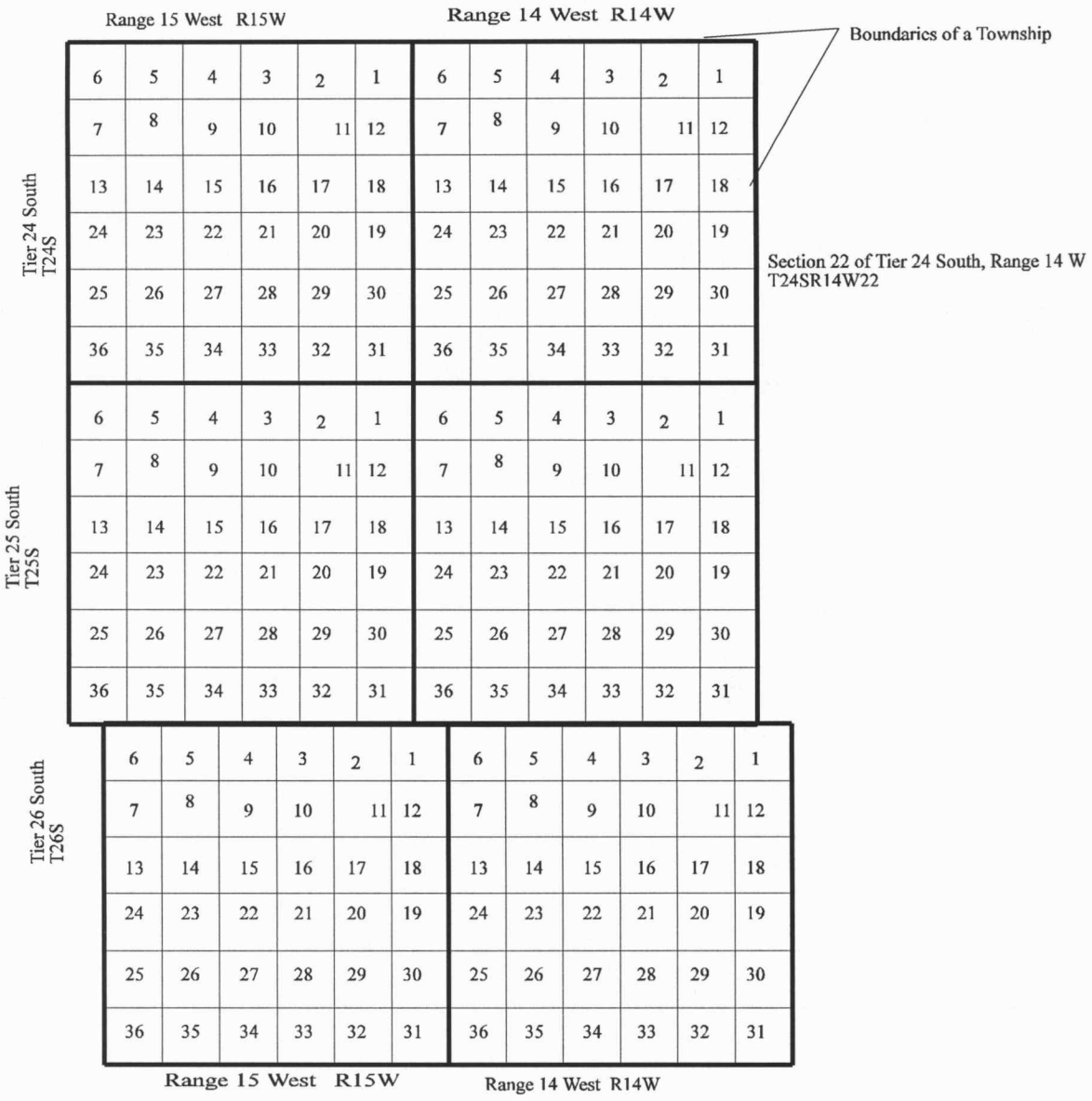
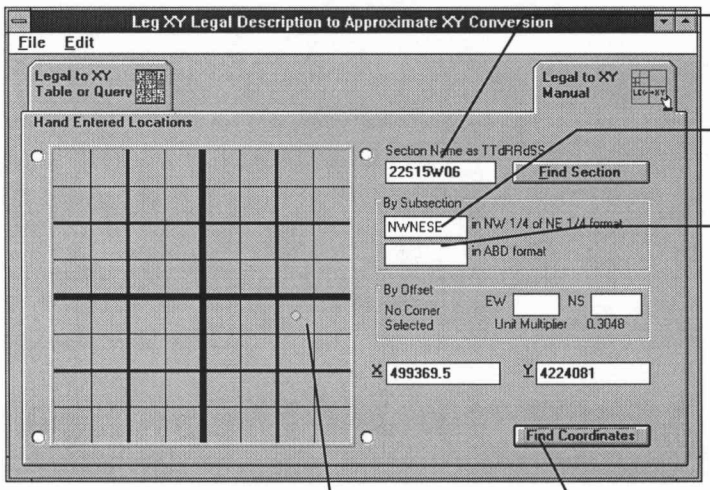

Range 15 West R15W
Range 14 West R14W
Boundaries of a Township
Tier 24 South T24S
Tier 25 South T25S
Tier 26 South T26S
Section 22 of Tier 24 South, Range 14 W T24SR14W22
Range 15 West R15W
Range 14 West R14W

Converting Interactively-Entered Legal Descriptions

There are a large number of ways to specify legal descriptions of points, and LEGXY2 accommodates many of them. Because of this, the program can be somewhat confusing at times: it is best to plot a few legal descriptions on a topographic map, determine the UTM coordinates, try converting with LEGXY2 and compare the results.

The following example illustrates the common case of entering a point described by subdivision. The screen shows the point as the "center of" the NW 1/4 of the NE 1/4 of the SE 1/4 of 22S15W06. If you have data in US Bureau of Land Management's ACB format, use step 2B instead of step 2A.



1) Enter Section, then click the Find Section button

2A) Enter subdivision in NE1/4 of SE/1/4 format

2B) Enter subdivision in BLM's ABCD format

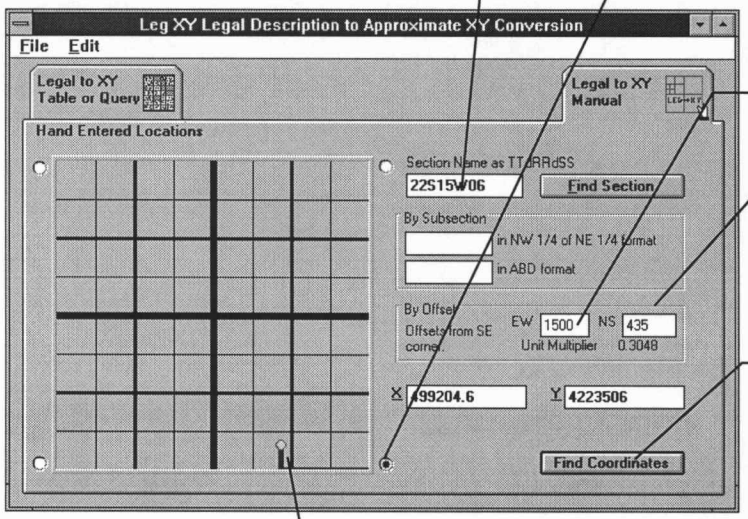
Coordinates vanish once they are invalid

3) Click Find Coordinates once you have finished entering description

Dot indicates where the description points to in an idealized section

Once the program has calculated the coordinates, you can copy them to the clipboard by placing the cursor in the textbox labeled X, and selecting Copy from the Edit menu or pressing CTRL-INSERT, then pasting them into a spreadsheet or WHEAT program.

The following example illustrates the common case of entering a point described by footages from a corner. This screen shows a point 1500 feet west along the south section line and 435 feet north along the west section line from the southeast corner.



1) Enter Section, then click the Find Section button

2) Select corner footages will be from

3) Enter the footage east or west here

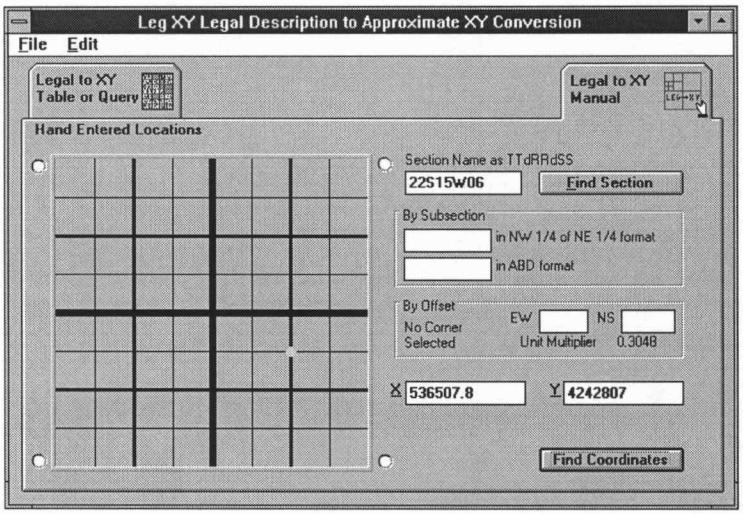
4) Enter the north or south footage here

5) Click on Find Coordinates button

Distances are measured along the two lines intersecting at the specified corner and into the section

Dot and line give idealized location within a section

You can also enter point locations interactively. Select the section, then click on the grid area to select an arbitrary, idealized point, or double-click to move to the center of the closest fourth-level quartering, then click on Find Coordinates.



Copying and Pasting

To copy legal descriptions from another application into LEGXY2, copy the description or parts thereof in the other application, click on the appropriate part of the legal description in LEGXY2, and choose Edit_Paste from the menu. To copy coordinates from LEGXY2 to another application, such as Excel, highlight the coordinates in LEGXY2, select Edit_Copy, go to the other application, and paste the coordinates.

With spreadsheet-like applications, you can copy and paste both X and Y at the same time. With other applications, you must copy and paste them separately.

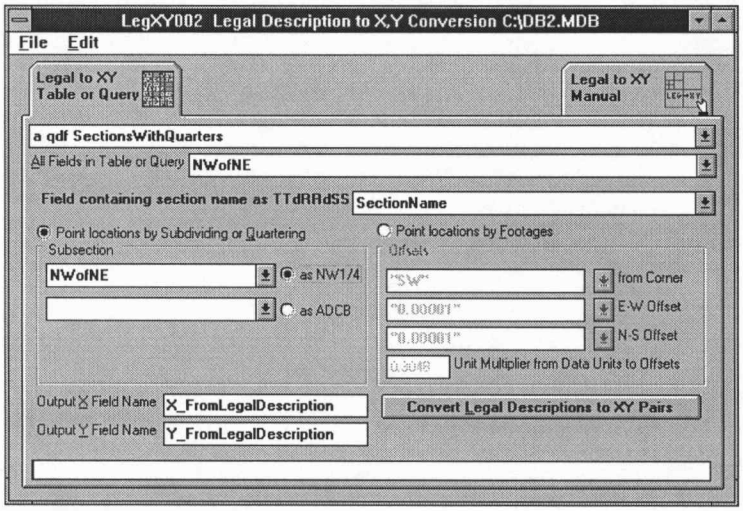
Converting Legal Descriptions Stored in a Database

In addition to converting legal descriptions entered by hand, LEGXY2 allows the user to convert legal descriptions already stored in a database to X,Y coorinates. The coordinates and offsets can be in a table or a query. The user opens the database using the FilelOpen menu item, then selects the table or query containing the input data, chooses the input fields and method of legal description (footages, NW¼ of NE¼, or ABD format), chooses the output fields to contain X and Y (these can be old or created here) and clicks the button Convert Legal Descriptions to XY Pairs.

LEGXY2 examines the field names when deciding what fields to add to the lists of fields. If the field you wanted is not listed, select the field from the list of All Fields in Table or Query, copy it to the clipboard by pressing CTRL-INSERT, move the cursor to the field that should contain it, and paste it by pressing SHFT-INSERT.

If you want to use a constant for one of the input fields, enclose the constant in double quotes, like "SW" . (On the screen shown below, if you chose By Footages, you would get the coordinates of the South West corner.)

For footages, a zero offset is not processed. For quarterings, an unallowable string is not processed. This was done so that a single field can contain both offsets and subdivisions and be successfully processed in two passes (Much Kansas Division of Water Resources data requires this.) If you want coordinates of a corner, select a very small, non-zero offset, as shown below.



Tips

It may be useful to create a dummy query that simply retrieves the fields of interest under new names that LEGXY2 will recognize. It is often necessary to create queries that split an original field into two fields, such as splitting Kansas Division of Water Resources "Qualifiers" into footages west and north of the SE corner.

If you are running LEGXY2 on a network, do NOT install a copy of the USPLSSNN.MDB database on each computer: install one copy on a server, and have everyone use that one copy.

Installation

If you have installed WHEAT E-MAP or other WHEAT-related software, see the directions in the README.TXT file on the included floppy. If this is your first piece of WHEAT-related software, run the SETUP.EXE program on the included diskette. You will probably need to modify the LEGXY2.INI file.

Find the [Legal To XY Conversion] section, and make sure that

```
DatabaseWithUSPLSS_Sections=c:\wheat\usplss\usplss02.mdb
; Complete path to the database containing section outlines
; in WHEAT  XYBLOB format
```

points at the correct location of the database as seen by your computer.

References

Ross, Charles G., 1994, Leo II Automated Conversion between Legand and Geographic Reference forLocations in Kansas, Open File Report 93-53, Kansas Geological Survey.