

**DIGITAL SUBMISSION SPECIFICATION
FOR
FINAL TRACT AND PARCEL MAPS
LA County Ordinance 99-0080**



Prepared By

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USE OF THIS SPECIFICATION

This specification will pertain to all Tract Maps and Parcel Maps as required per local ordinance and may be used for digital submission of Records of Survey.

This specification will be used for digital submission of cadastral maps in the California Coordinate System.

Two auxiliary documents pertaining to specifications for:

1. **Media Requirements**
2. **Surveys on the California Coordinate System**

should be used in conjunction with this document.

INTRODUCTION

Use of digital mapping systems is becoming prevalent in local government organizations. Typically a parcel level landbase is developed to serve numerous users in a multitude of applications. A major objective of such systems is to reduce redundancy and duplication in map maintenance. In order to enable automation of both the map checking and landbase maintenance process, digital submission of cadastral surveys has been mandated in local ordinances (Orange County Ordinance 3809, Ventura County Ordinance 4087, Los Angeles County Ordinance 99-0080). This document defines the specifications for such a digital submission in Los Angeles County.

The specification has been written to take advantage of the ability of private organizations that are producing cadastral maps in a CADD environment to transmit this data quickly and efficiently. The intent of this specification is to enable the hard-copy and digital submissions to be produced from the same digital data without any modification. The intent is to receive all data that is available in digital form. There are minimum requirements which require certain data elements to be transmitted digitally while other data elements should be delivered digitally if available in digital form.

Submitters working in non CADD environments may find direct conversion from hardcopy maps the most viable approach.

A goal of the specifications is to define a specification which can be attained without a significant change in operational procedures for private sector surveyors. It should be noted however that in order to enhance the usefulness of the digital data some rudiments of structure are required. The only intelligence associated with the data is achieved through layering of the graphics data, i.e. there are no data base linkage requirements of any kind.

Data submitted in accordance with this specification would be consistent with direct conversion by COGO to the parcel level assuming no adjustment of the data. Small discrepancies would exist but would be limited to computational roundoff error.

Submission of digital data may be used for computational purposes in checking the map, for maintaining digital landbases or in document retrieval systems.

FORMAT OF DATA FOR DIGITAL SUBMISSION

The digital submission will consist of two deliverables:

- 1) Traverse Data. An ASCII file containing traverse data i.e. bearings, distances, northings and eastings of boundaries, street centerlines, lot lines, easements, etc.
- 2) Graphics representation. A graphic representation of required elements of the cadastral map as defined in this specification.

Traverse Data Representation

This file will be an ASCII file consisting of traverse data. Fields will be separated by a minimum of one space (HEX 20). Other records may contain headers, closures, et al. All coordinate values in the traverse data file will be on a common coordinate system.

(See **Appendix B** for example.)

Graphical Representation

The format for digital submissions of the graphical data, which will be accepted by all receiving agencies adhering to this specification, is the DXF format.

DXF is an ASCII(1) exchange format initially developed by Autodesk for use with their AutoCAD product. Although this format is not vendor independent, it is possible to generate this format from virtually all micro based CADD packages. A full definition of this format can be found in the AutoCAD documentation. An ASCII DXF format is preferable but a binary format will be accepted as a valid exchange format for digital submissions.

Within AutoCAD the drawing utilities "Purge>All" and "Audit" should be run before saving or exporting the DXF file.

A *Bentley Systems' MicroStation* DGN file is also acceptable.

(See **Appendix A** for example.)

REQUIREMENTS FOR CONVENTIONAL HARDCOPY SUBMISSION

The following requirements pertain to hardcopy maps which are submitted in conjunction with a digital submittal. In order to facilitate the map checking process and to enable direct correlation between the hardcopy map and the digital submission, the following points should be noted.

- 1) Any distance on or internal to the boundary of the map must scale to within 1/40th inch of map scale plus one part in one thousand.

Example: Allowable Scaling Errors given Map Scale

Map Scale	Distance	Allowable Scaling Error
1" : 40'	10'	1.01'
1" : 40'	800'	1.80'
1" : 60'	100'	1.60'
1" : 60'	500'	2.00'
1" : 100'	200'	2.70'
1" : 100'	1,000'	3.50'

- 2) The following convention for symbolization of monumentation will be accepted in addition to the currently accepted conventions:

Three monument symbols will be used. Control points represented by a solid triangle, found monuments represented by a solid circle and set monuments represented by a solid square. Monuments will be numbered and the monument description will be called out separately as required. All symbols will be solid which will enable one data set to produce hardcopy and digital submissions and will avoid problems in reproduction, use of microfiche, etc. This convention of symbolization for monumentation is the preferred and recommended convention.

Monument Symbol Legend

- - Indicates LA County Monument Control Station.
- - Indicates Set Spike and Washer with appropriate stamp.
- - Indicates Found Monuments as noted.
- ① - Indicates Monument number and description

The following Monument Notes (Figure 1) and Parcel Map (Figure 2) illustrates the methodology.

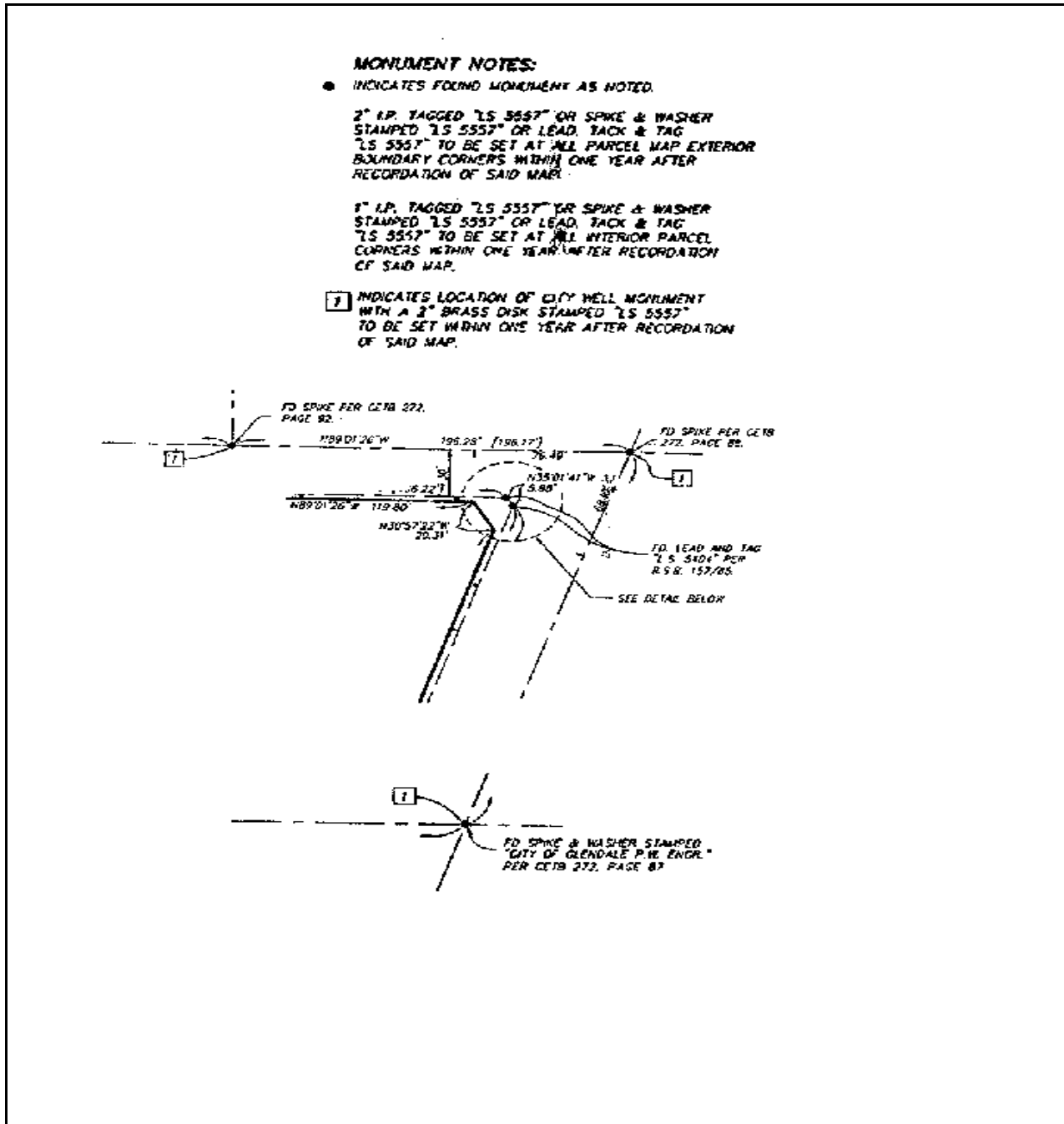


Figure 1

Figure 1: Monument Notes from PM28368

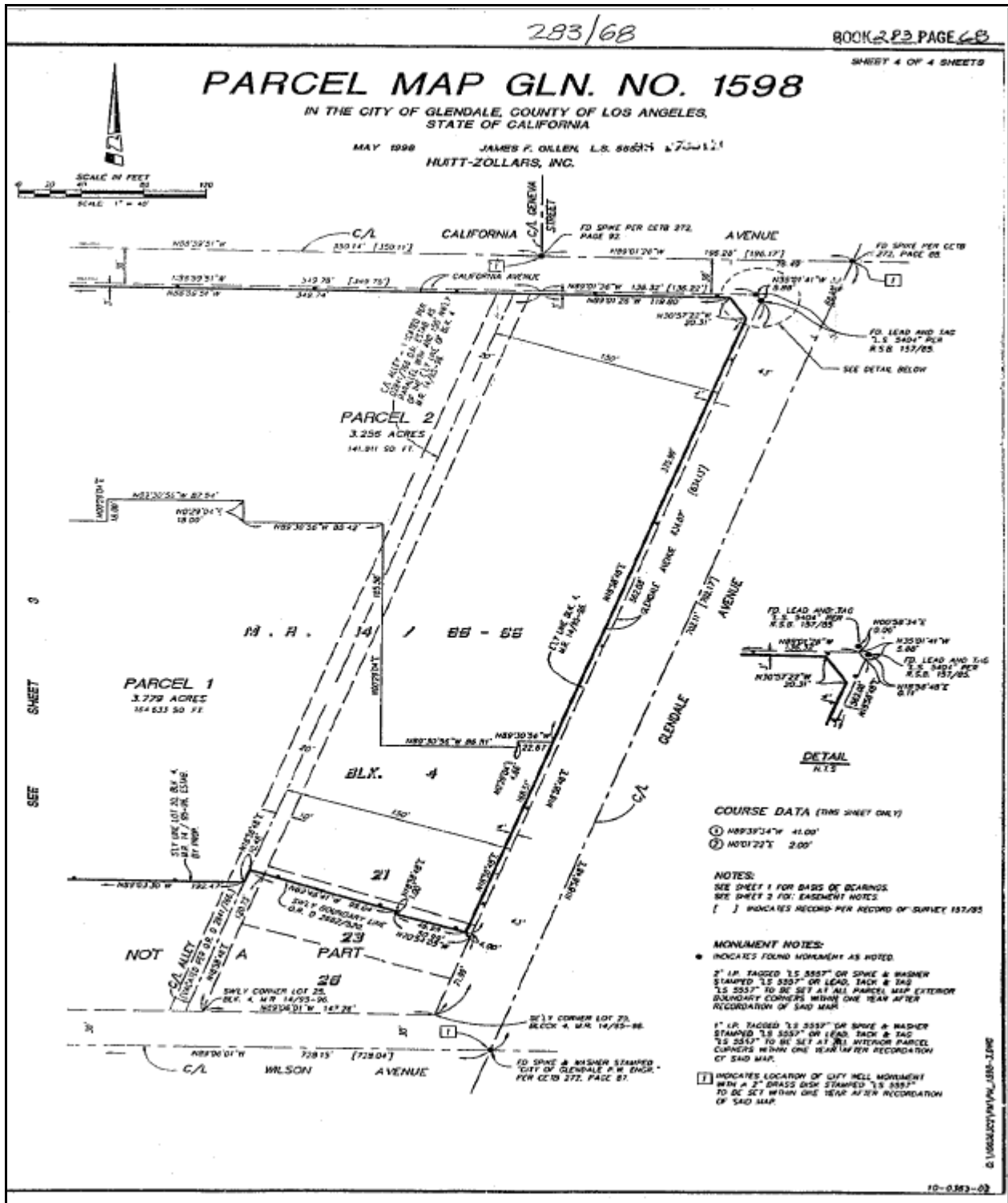


Figure 2

Figure 2: Parcel Map GLN. No. 1598 (PM28368)

DATA INTEGRITY REQUIREMENTS:

The following requirements pertain to the mathematical integrity of the geometric data.

- 1) All coincident points on the external boundary will have the same coordinate values, i. e. boundary lines will be coterminous.
- 2) The maximum error allowable between theoretically coincident points will be .03 feet.
- 3) The maximum error allowable between points on line and the line will be .02 feet.
- 4) The difference between distances calculated by inverting between the coordinates of points in the digital submission and the annotated distances shall not exceed .01 feet.
- 5) The difference in seconds between bearings calculated by inverting between the coordinates of points in the digital submission and the annotated bearings shall not exceed the maximum of $(1031/\text{dist}(\text{ft}), 1")$.

Example: Allowable Error in Bearing for set Distance

Distance (ft)	Allowable Error in Bearing (seconds)
50	21
100	11
200	6
1,200	1

- 6) Boundaries will be transmitted as a closed figure. For example, in DXF a boundary would be represented as one polyline rather than a series of lines, arcs and curves, in SIF as a shape or a complex shape.
- 7) Curvilinear boundaries i.e. not lines or arcs, will be represented by sufficient points to unambiguously define the boundary. Examples of curvilinear boundaries might include centerline of a stream, high water mark, contour lines and transition curves on railroads.
- 8) Annotation submitted digitally will be identical to annotation submitted on the hard copy maps. The section on Data Layering Requirements defines requirements for submission of annotation.

DATA LAYERING REQUIREMENTS

The data will be layered into the following features:

- 1) Boundary Data - pertaining to this survey
- 2) Road Centerline Data - new
- 3) Lot Data - new
- 4) Rights of Way Data - new
- 5) Easement Data - new
- 6) Tie data to geodetic control network - pertaining to this survey
- 7) Monumentation Data - new
- 8) Miscellaneous - all other data

Essentially data specific to the survey being submitted which is directly applicable to landbase maintenance is separated and split into the first seven layers. All other data is transmitted on layer 8.

The following table indicates which features must be transmitted digitally and which are desirable but not required:

Table 1: Data Layer Table

LAYER	CONTENTS	FEATURE	STATUS
1	Boundary Data	Boundary Line Map Name	Required Required
2	Road Centerline Data	Centerline Street names Descriptive Data	Required Required Optional
3	Lot/Parcel Data	Lot Lines Lot Numbers	Required Required
4	Right of Way Data	Right of Way Lines Street widths Descriptive Data	Required Required Optional
5	Easement Data	Easement Lines Descriptive Data	Required Required
6	Tie Data	Graphic Representation (tie lines) California Coordinate System values (where applicable)	Required Required

7	Monumentation	Graphic Symbols Descriptive Annotation	Required Optional
8	Miscellaneous	All Other Data - including ALL bearings, distances and curve data	Optional

In cases where a linear element between two points applies to more than one feature, e.g. boundary line and lot line may be coincidental, this data may be submitted as:

- 1) To avoid duplication of data one graphical element utilizing the following hierarchy to determine the appropriate layer for the graphics data.
 - a) Right of Way
 - b) Centerlines
 - c) Boundary
 - d) Lot Line
 - e) Easement

- 2) Duplicated graphical data sets with each data layer containing a full definition of the feature. For example: a line between two points which is both a boundary line and a lot line would appear on both the boundary layer and the lot line layer.

- 3) A combination of 1) and 2) above. For example, lines which are both boundary lines and lot lines may utilize 2) above, while lines which are both right of way lines and lot lines may utilize 1) above.

Annotation which applies to more than one feature will not be duplicated. For example, a bearing may apply to geodetic ties, a boundary line and a street centerline. In such cases the following hierarchy will determine the appropriate layer for such annotation.

- 1) Ties to Geodetic Control
- 2) Boundary
- 3) Centerline
- 4) Right of Way
- 5) Lot Line
- 6) Easement

Appendix A is a graphical representation of this segregation of the data.

REQUIREMENTS FOR DIGITAL SUBMISSIONS OF SURVEYS ON THE CALIFORNIA COORDINATE SYSTEM OF 1983 BASED ON THE NAD 83 DATUM.

The following section applies only to surveys on the California Coordinate System of 1983 based on the NAD 83 Datum. Local ordinance and state regulations dictate circumstances under which surveys must be tied to this coordinate system.

Any survey submitted on the California Coordinate System of 1983 based on the NAD 83 Datum will, in addition, meet the following requirements:

- 1) The coordinate values in the digital submission will have the exact California Coordinate System values at the boundary tie point and will have computed values using ground distances for all other coordinates.

DXF SUBMISSION REQUIREMENTS:

Table 2: DXF Layer Specifications

FEATURE	LAYER NAME	VALID DATA ELEMENTS
Boundary Data	Boundary	Polyline, Shape
Road Centerline Data	CL	Line, Arc, Polyline, Text
Lot Lines Data	Lot	Line, Arc, Polyline, Text
Rights of Way Data	ROW	Line, Arc, Polyline, Text
Easement Data	Ease	Line, Arc, Polyline, Text
Tie Data	Tie	Line, Polyline, Text
Monument	Mon	Blocks, Text
Miscellaneous	Misc	All except shapes

Table 3: DXF Block Specifications

POINT FEATURE	BLOCK NAME
Found Monument	MFNDMN
Set Monument	MSETMN
Control Point	MCNPNT

The following restrictions will apply to data submitted in the DXF format:

- 1) At a minimum the header to the DXF file will contain:
 - a) Range data
 - b) Block definitions for all blocks used in the drawing.
- 2) 2D or 3D data may be transmitted. If the DXF data contains Z information, this may be used in the computation of the combination factor.
- 3) 3D polylines will not be used except to define irregular boundaries, for example streams, where necessary.
- 4) Shapes will not be permitted as a valid data element for point feature symbology.
- 5) Coordinates will be output to a minimum of three decimal places in the DXF file.
- 6) Linework is to be referenced or rotated to North (pointing toward the top of the computer screen).

CHECKING OF DIGITAL DATA

The digital data will be checked for the following criteria:

- 1) Correct layering
- 2) Closure of the geometry of the boundary.
(See **Appendix B** for examples)
- 3) Verification that annotated and calculated data are consistent.
- 4) Verification that digital and hardcopy maps are consistent.
- 5) Correct geographical position i.e. correct coordinate values. This applies only to Submissions on the California Coordinate System of 1983 based on NAD 83 Datum.

GLOSSARY

Accuracy	The closeness or nearness of the measurements to the true or actual value of the quantity being measured.
ASCII	<u>A</u> merican <u>S</u> tandard <u>C</u> ode for <u>I</u> nformation <u>I</u> nterchange. ASCII is a code for representing English characters as numbers, with each character assigned a number from 0-127.
ASCII file	A text file in which each byte represents one character according to the ASCII code. ASCII files are sometimes called plain text files.
Cadastral	Relating to land boundaries and subdivisions, parcels of land suitable for transfer of title.
CADD	<u>C</u> omputer <u>A</u> ided <u>D</u> rafting and <u>D</u> esign.
COGO	See <u>C</u> oordinate <u>G</u> eometry.
Coordinate Geometry	A method of defining geometric features through the input of bearing and distance measurements.
County-Wide	Applying to the entire geographic area of a County, including incorporated city areas and unincorporated lands.
DOS	<u>D</u> isk <u>O</u> perating <u>S</u> ystem. An older operating system on personal computers. Typically used with Windows 3.x (16 bit).
DXF	<u>D</u> rawing <u>E</u> xchange <u>F</u> ormat - an exchange format for CADD files.
Geographic Information System	A computerized information system for analyzing spatially indexed information.
GIS	See <u>G</u> eographic <u>I</u> nformation <u>S</u> ystem.
Geodetic Control	Coordinate points on California State Plane Coordinate System
Lot	Government lot or subdivision lot representing the boundary of a legally conveyable unit of land identified on a record document. A lot may or may not be coterminous with an Assessor parcel.
NAD 83	<u>N</u> orth <u>A</u> merican <u>D</u> atum 1983. Defined by the National Geodetic Service as the basis for geodetic coordinate measurements.

Parcel Map	A record document subdividing a conveyable land parcel into four or less conveyable land parcels or as defined by Subdivision Map Act 66426 and/or local ordinances.
Precision	The closeness with which the measurements agree with each other.
Record Data	Documents bearing the seal of a Recorder's Office. Generally these documents consist of deeds, records of survey, tract maps, and parcel maps.
Right of Way	Land area providing legal right of passage, i.e., street right-of-way, railroad right-of-way, etc.
Tolerance	A numerical value representing the deviation from desired accuracy.
Tract Map	A recorded document subdividing a conveyable land parcel into more than four conveyable land parcels.
UNIX	An operating system widely used in RISC Workstation.
Windows 95/98/NT	An operating system common on personal computers (32 bit). Windows NT 4.0 WorkStation is DPW standard desktop operating system.

MEDIA REQUIREMENTS FOR DIGITAL MAP SUBMISSIONS

The following information defines acceptable media for the submission of cadastral surveys in digital form. This information should be used in conjunction with the specification for digital submission of cadastral surveys.

Media

Submissions on any of the following media is acceptable:

- IBM or UNIX formatted 3.5" diskette (1.44MB DS,HD)
- HS-8mm data cartridge(2.5/5 GB, 112m)
- CD writeable (650 MB)
- Zip™ disk (100 MB)

Files requiring more than one diskette for transmission will be written to diskette for transmission using the DOS Backup utility or WinZip compression utility. DOS versions 5.0 or greater will be accepted for data transmitted utilizing the backup command. Files that are submitted in DOS backup format must have been located in the root directory when the backup command was issued. The DOS version used to create the backup will appear on the label under format. Files can also be put in a WinZip for Windows 95/98/NT (32-bit)(version 6.0 or greater) archive. No other files will exist on the media. No additional information will exist in the file aside from data being specifically transmitted to the receiving organization.

In addition, receiving organizations may accept alternate media at their discretion. The primary reason for this is to enable organizations with similar systems to transfer the data more efficiently.

Unix submissions will use the CPIO utility for outputting the data. The submitter will be responsible for archival of the digital data until final acceptance.

All diskettes will be submitted with labels indicating the following data and will be signed by the licensed Land Surveyor/registered Civil Engineer submitting the map. The purpose of the signature is to verify the transmittal of the data, not professional responsibility for the data. It is understood by the receiving organization that the digital data does not constitute a professional delivery. It is the responsibility of the receiving organizations to refer to the recorded map for the correct information.

Example: Blank Label for Media

MAP :
DATE :
COMPANY :
LS/RCE :
REG NO. :
FORMAT :
SIGNATURE :

Example: Completed Media Label

MAP	: PM 85-201
DATE	: MARCH 26, 1985
COMPANY	: HUFFNAGLE AND ASSOCIATES
LS/RCE	: NATHAN C. TRISTAN
REG NO.	: L.S. 2005
FORMAT	: DXF/DOS/3.1 BACKUP
SIGNATURE	: <i>Nathan C. Tristan</i>

File Naming Conventions

The submitter may submit files using only the following convention:

- 1) One file will be submitted for each survey regardless of the number of sheets submitted in hardcopy form.

The file on the media will be named according to the map name.

File extensions will be as follows:

DXF Format:	.DXF
DGN Format:	.DGN
Traverse data:	.TRV

Example: File Naming Conventions

Parcel Map No.24739 submitted in.DXF:	PM24739.DXF
PM 24739 accompanying Traverse Data:	PM24739.TRV
Tract Map No.47989 submitted in.DGN:	TM47989.DGN
Record of Survey No.162/22 submitted in.DXF:	RS16222.DXF

SPECIFICATIONS FOR SURVEYS ON THE CALIFORNIA COORDINATE SYSTEM

The following specifications apply to surveys on the California Coordinate System of 1983 based on the NAD 83 Datum. Local ordinances and state regulations dictate circumstances under which surveys must be tied to state plane or NAD 83 coordinates. (See ***“Instructions for the Monumenting and Field Notes of Tract Boundaries and Street Centerlines”***, LA County Engineer, 3-31-82 from LACDPW Land Development Division Public Counters)

- 1) All points coincident with County Geodetic Control Points will have the exact published coordinate values in U.S. survey feet. If a survey is initiated prior to publication of a re-adjustment the, previously adjusted values will be accepted for a period of up to 90 days from the date of current publication.
- 2) The whole number for the coordinate will be shown (i.e. no constant will be applied).
- 3) One point on the external boundary will have a grid coordinate value. All other points on or internal to the boundary will have coordinates based on computations from the grid boundary point using ground distances. The boundary point assigned grid coordinate values should be on the major control line where applicable. The boundary point assigned a grid value will be annotated with the grid coordinates.
- 4) A tie to the geodetic control network will be made to the boundary point showing the California Coordinate System values. Additional ties as required by Ordinance 99-0080 will also be provided.
- 5) The combination factor and coordinate system information, including the date of adjustment, will appear on the recorded map.
- 6) The difference between computed tie distances and annotated tie distances multiplied by the combination factor will not exceed 0.02 feet.

APPENDIX A

Example of Data Layering

This appendix shows the contents of each of the data layers defined as well as the complete map for a typical tract map.

- Figure 1:** Monumentation and associated annotation.
- Figure 2:** Boundaries and associated annotation.
- Figure 3:** Road Centerlines and associated annotation.
- Figure 4:** Lot Lines and associated annotation.
- Figure 5:** Rights of Way and associated annotation.
- Figure 6:** Easements and associated annotation.
- Figure 7:** Tie data to geodetic control and associated annotation.
- Figure 8:** Miscellaneous.
- Figure 9:** Complete Map.

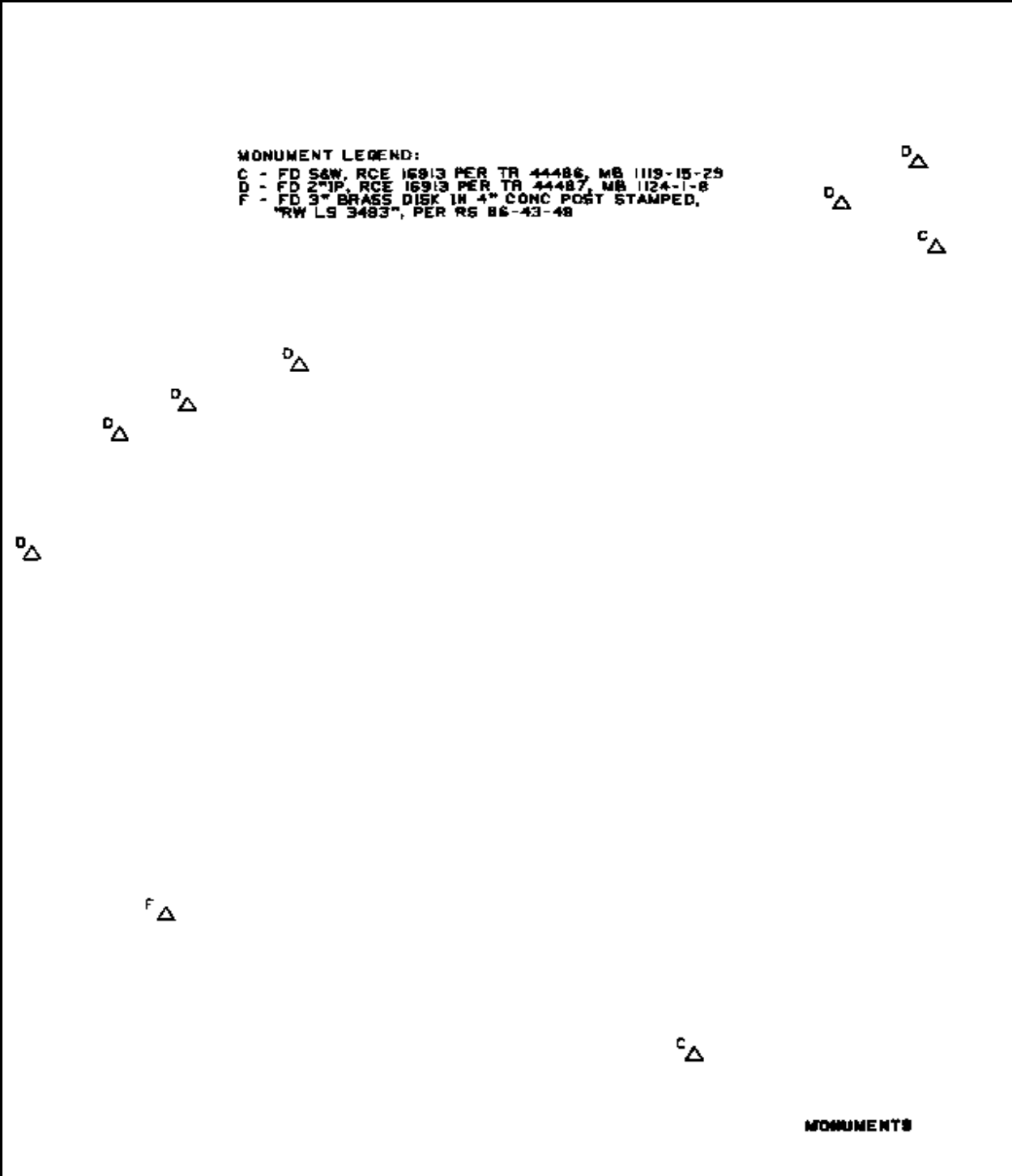


Figure 1: Monumentation and associated annotation.

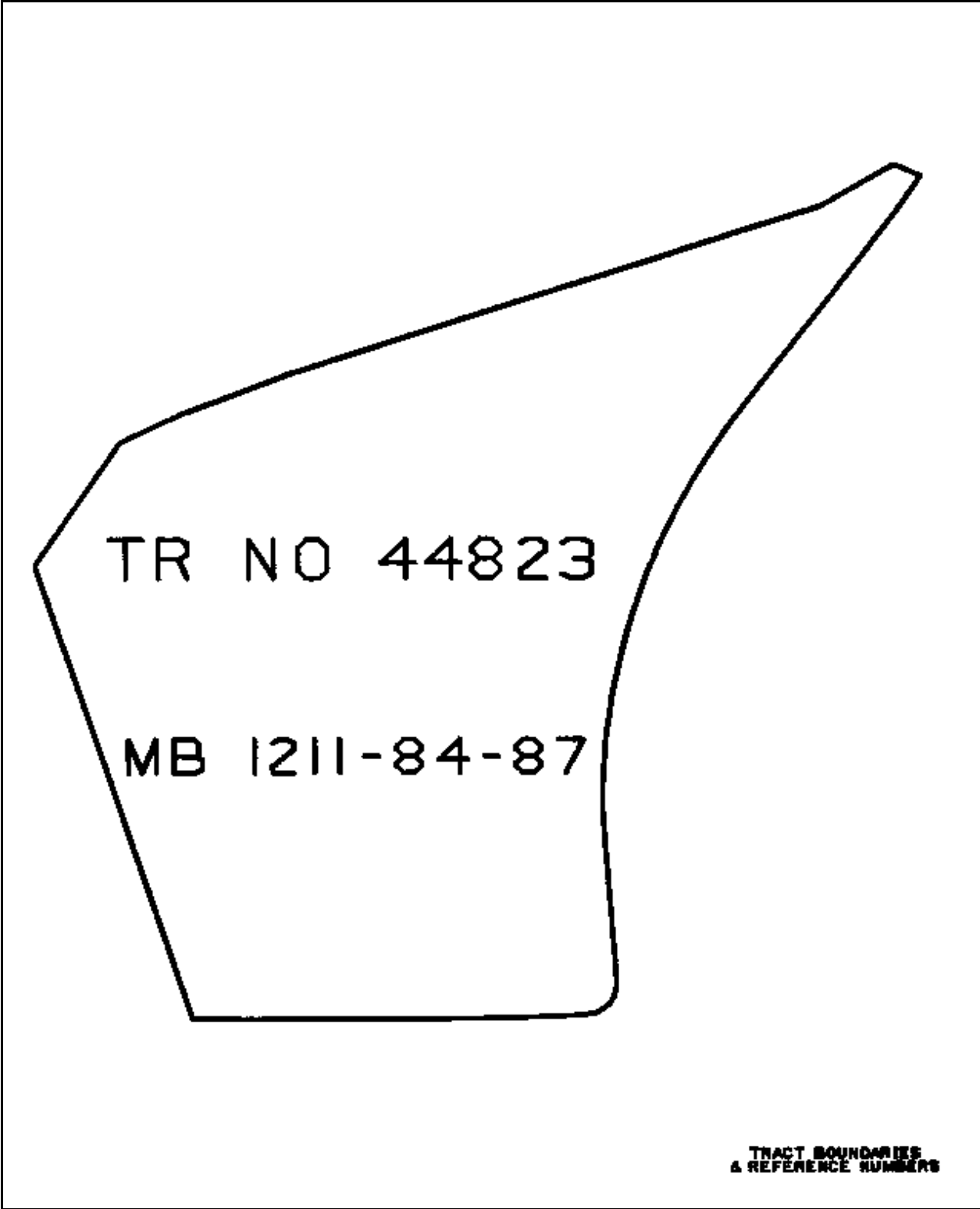


Figure 2: Boundaries and associated annotation.

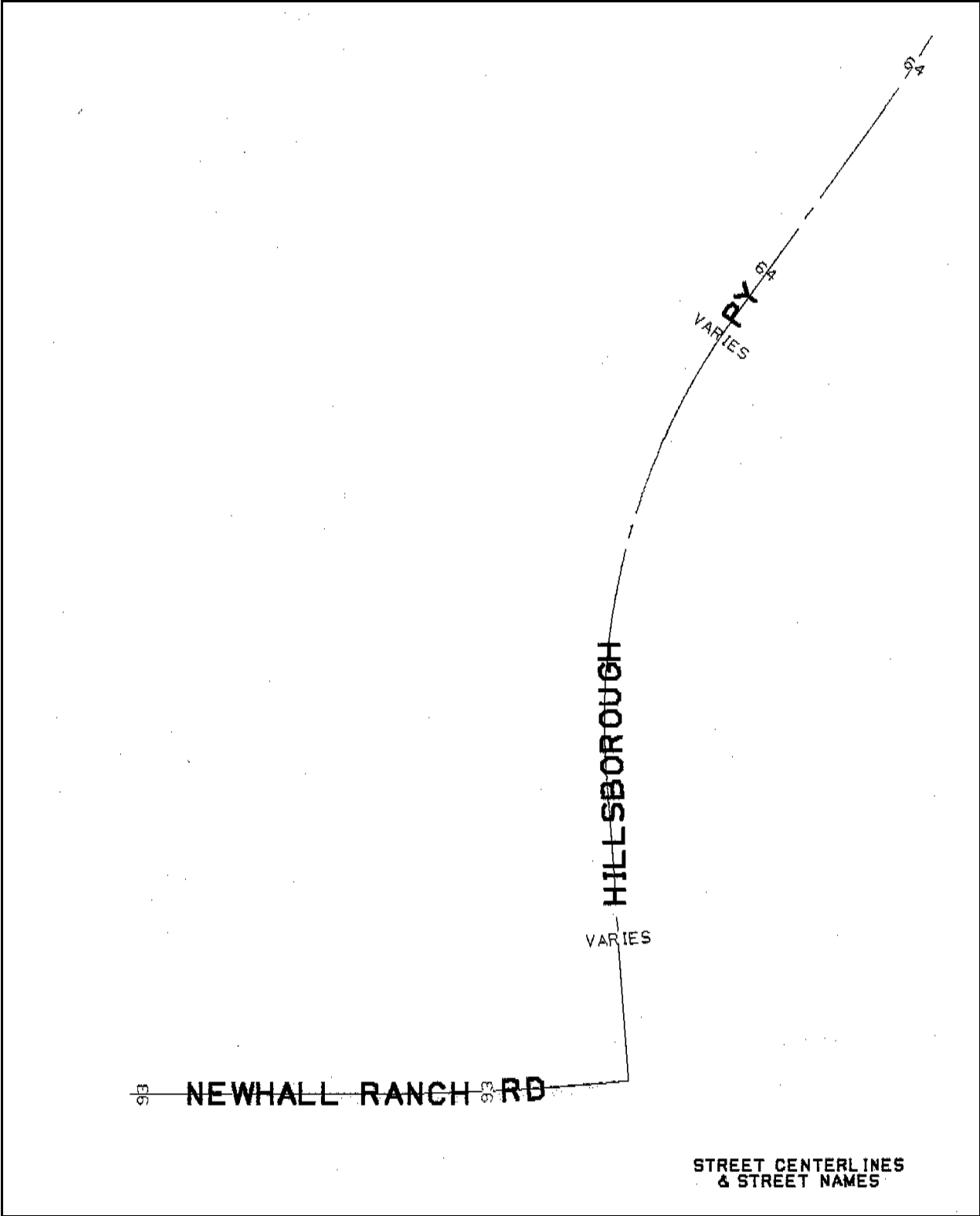


Figure 3: Road Centerlines and associated annotation.

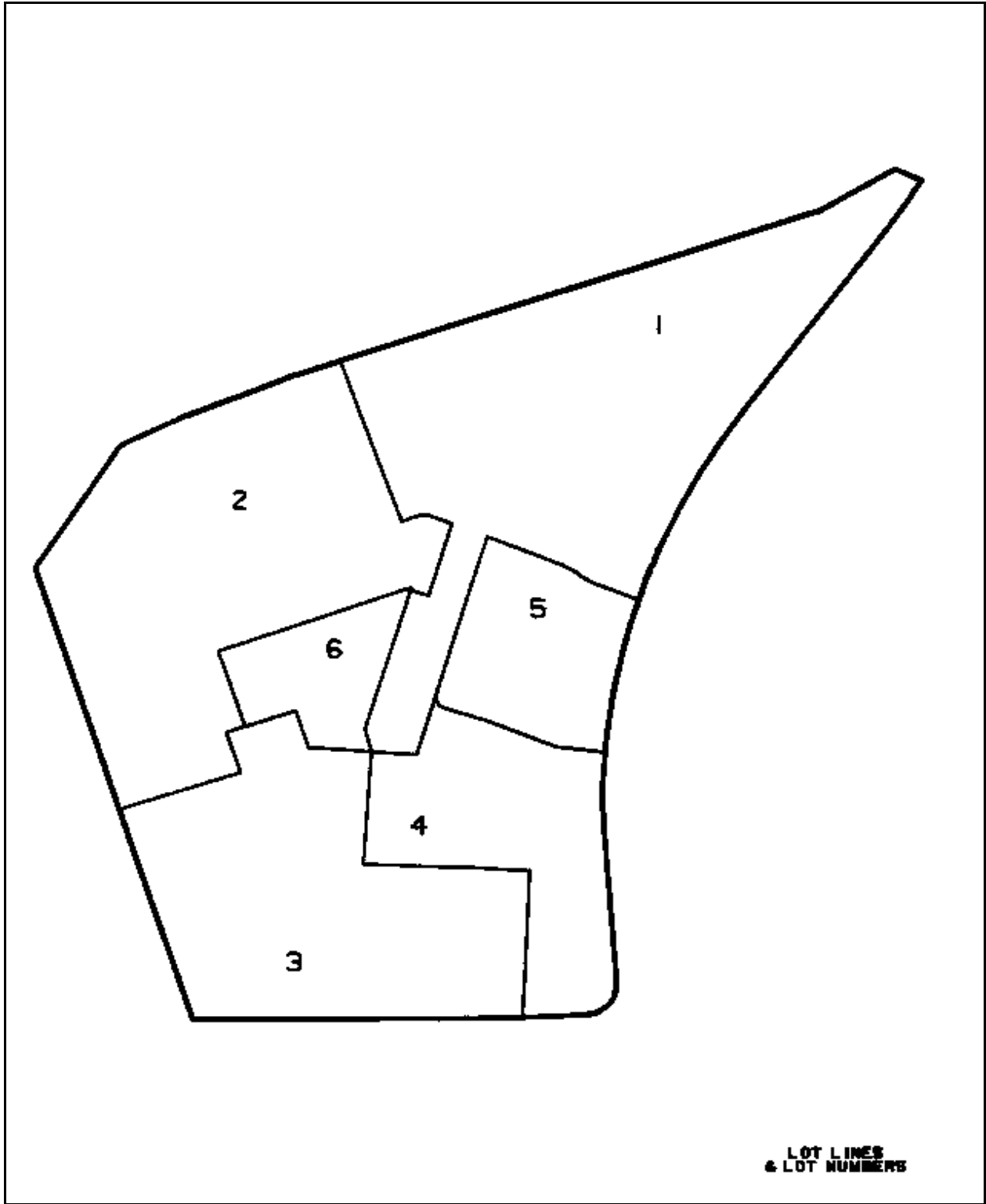


Figure 4: Lot Lines and associated annotation.

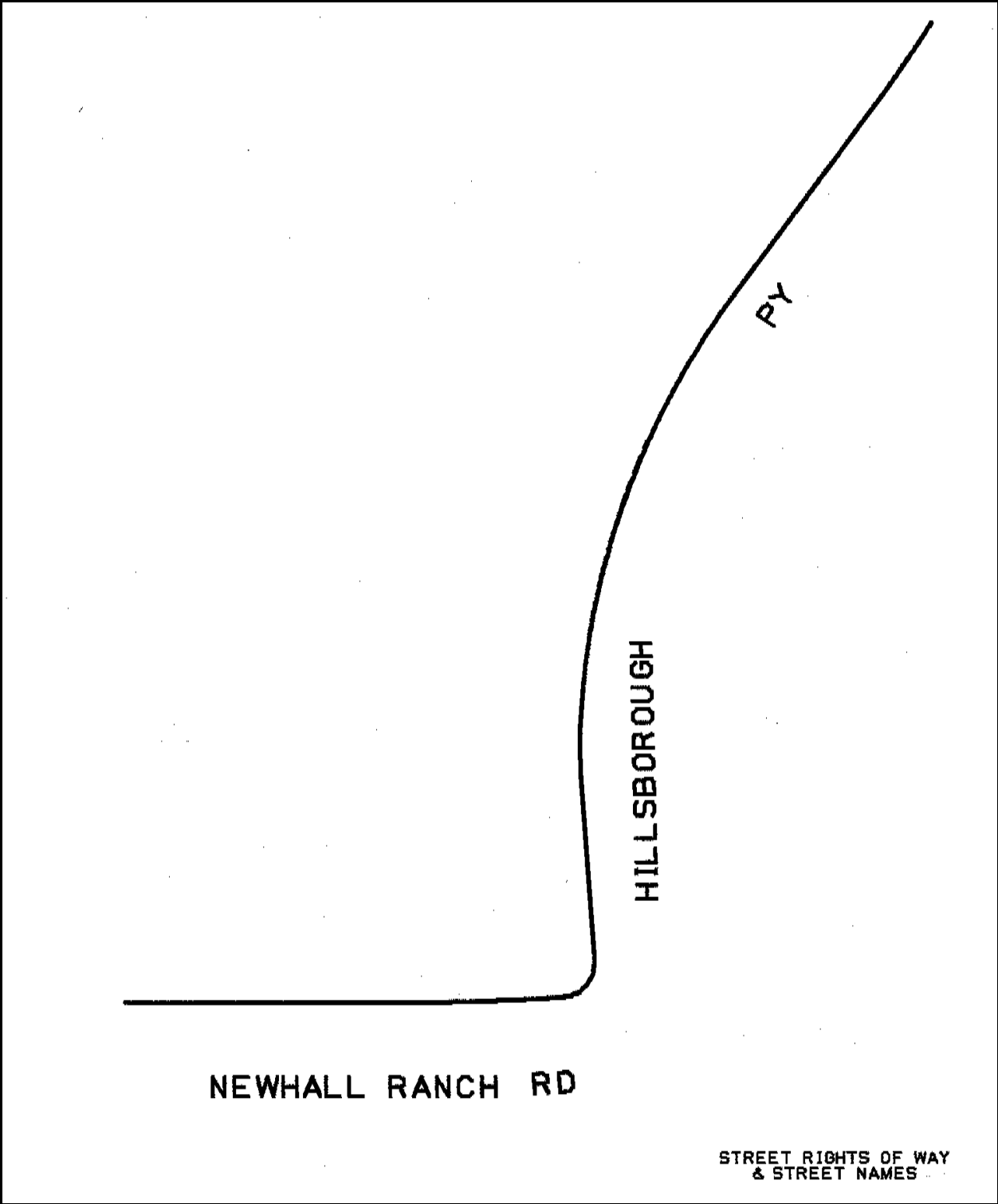


Figure 5: Rights of Way and associated annotation.

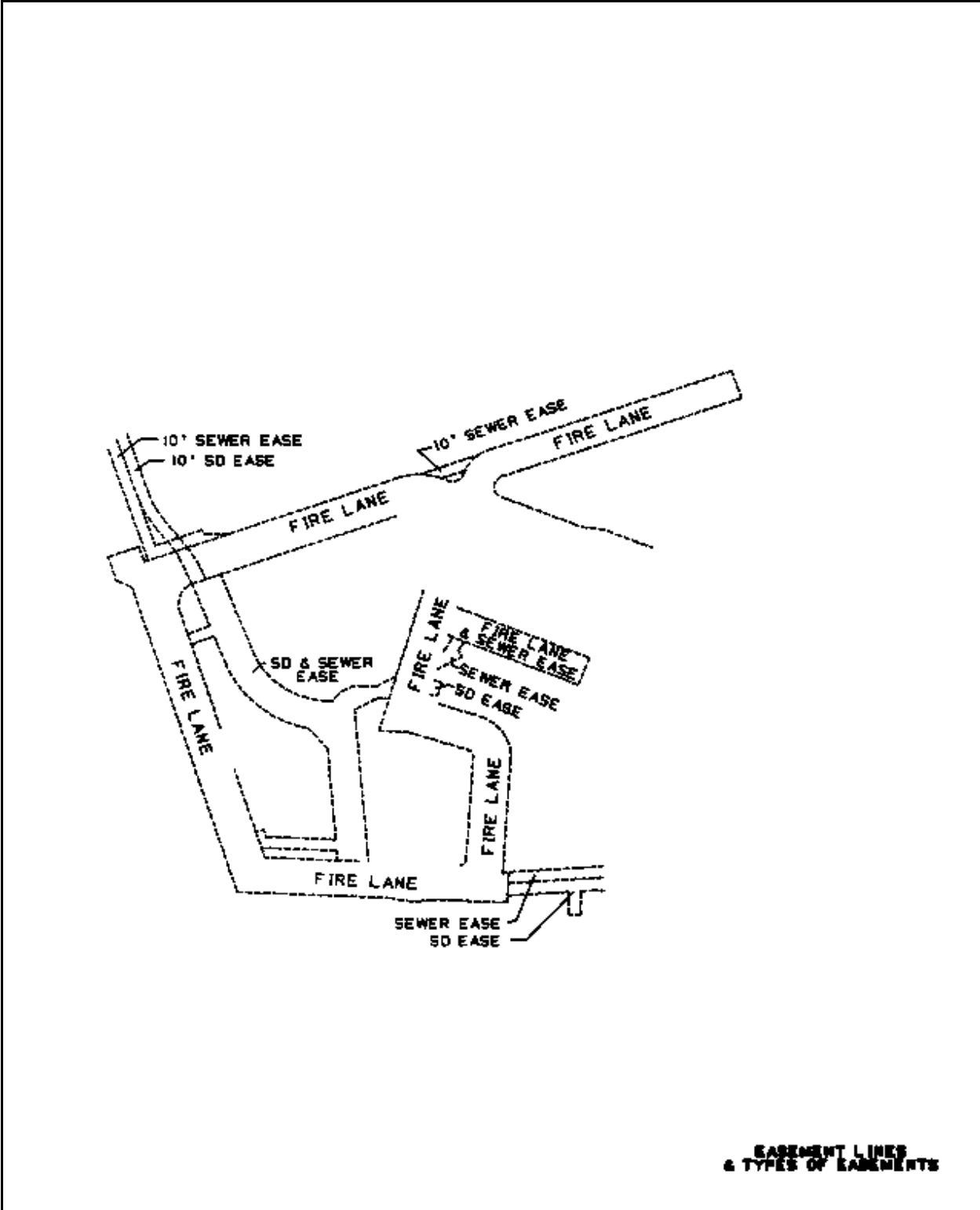


Figure 6: Easements and associated annotation.

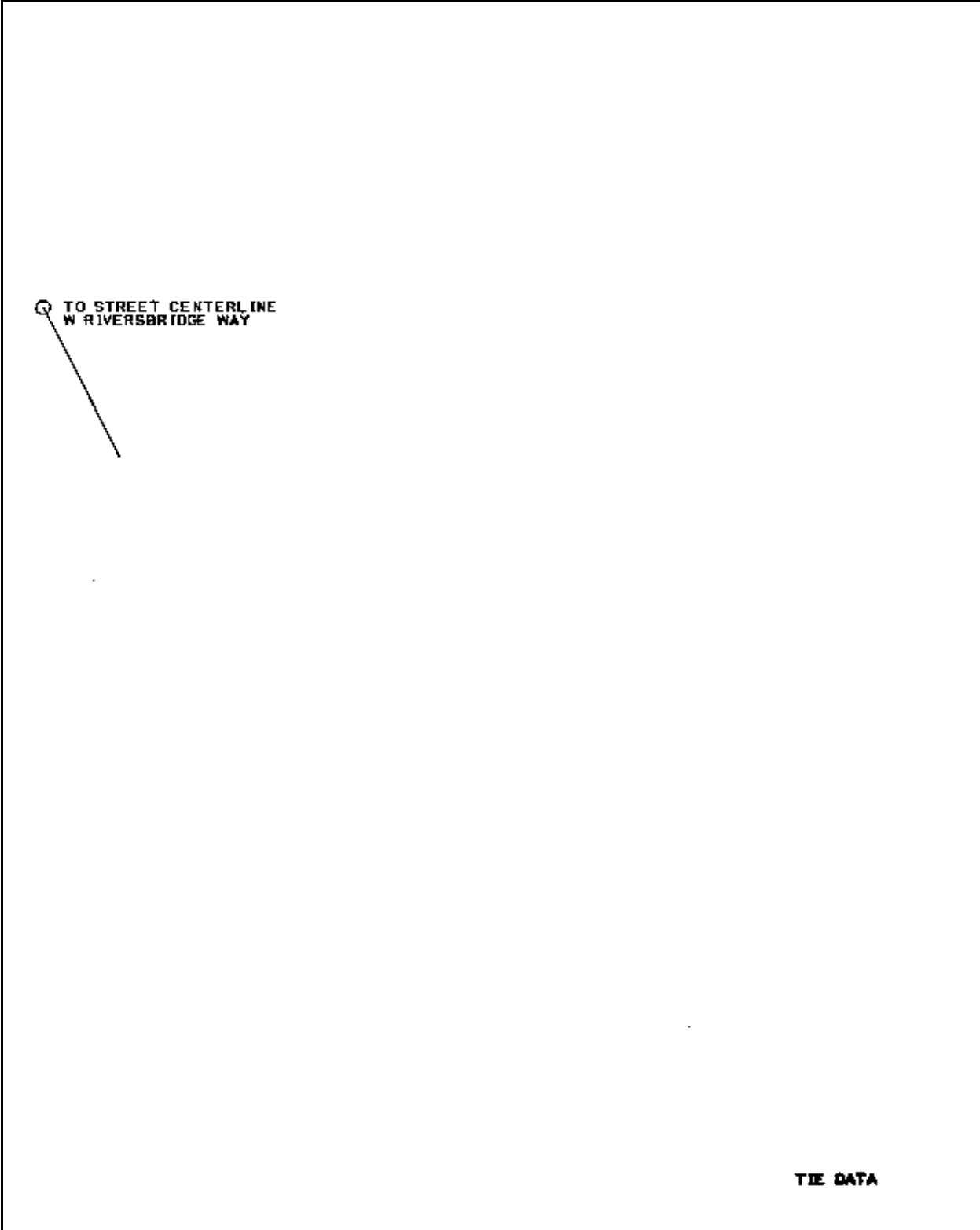


Figure 7: Tie data to geodetic control and associated annotation.

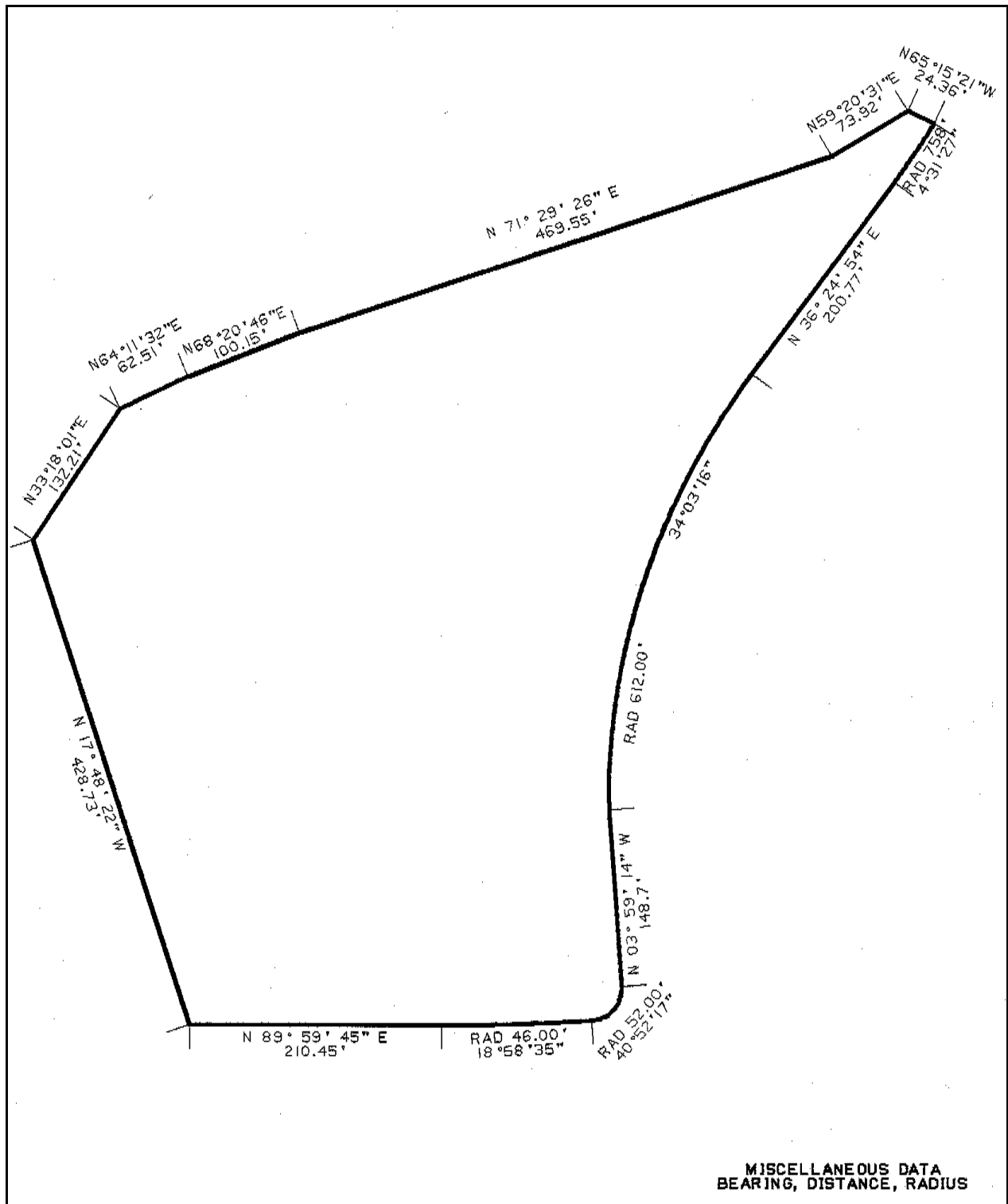


Figure 8: Miscellaneous.

APPENDIX B

Example of Traverse Data Traverse Calculation and Analysis (Tentative tract)

THIS IS THE MAP CHECK					PROJECT: testla.pro
PT#	DESCRIPTION	BEARING	NORTHING	EASTING	ELEVATION
	CURVE DATA	DISTANCE		VERTICAL ANGLE	
MAP CHECK CLOSURE REPORT					
1			5000.00000	5000.00000	
	N53 35'28.000"E	1156.6900 ft			
2			5686.54612	5930.90611	
	S68 19'21.000"E	1669.6000 ft			
3			5069.82617	7482.42815	
	S9 01'11.000"E	1484.5400 ft			
4			3603.64335	7715.16607	
	S56 56'16.000"W	1962.3400 ft			
5			2533.08975	6070.57090	
	N52 26'11.000"W	1526.8000 ft			
6			3463.89093	4860.31168	
	N5 11'22.000"E	1542.3300 ft			
7			4999.89904	4999.81405	
SET IS NOT CLOSED					
Closing latitude			= -0.10096		
Closing departure			= -0.18595		
Closing bearing			= N61 30'04.408"E		
Closing distance			= 0.21159		
Total traverse length			= 9342.30000		
Total error of closure			= 1/44152		
Error of closure in latitude			= 1/92535		
Error of closure in departure			= 1/50240		
Area			= 6243900.26 SQ FT		
Area			= 143.34 ACRES		
TERRAMODEL REPORT					
ON					
TRAVERSE #1					

Figure 1: Tentative Tract Map Bearing/Distances and Closure Report