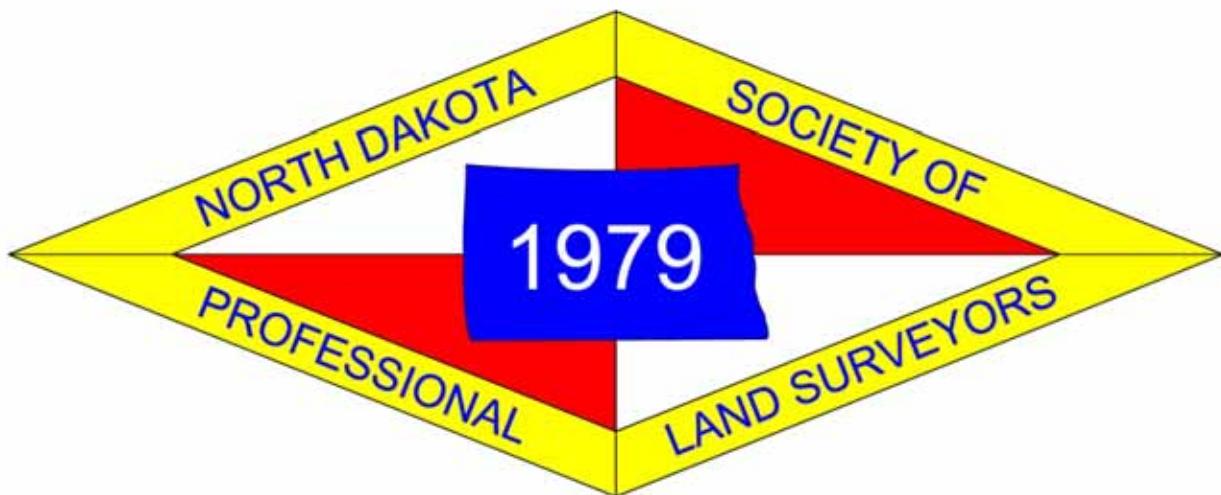


# **MANUAL OF PRACTICE FOR LAND SURVEYING IN NORTH DAKOTA**



**NORTH DAKOTA SOCIETY OF  
PROFESSIONAL LAND SURVEYORS**

ADOPTED MAY 1, 2015

# MANUAL OF PRACTICE FOR LAND SURVEYING

## IN NORTH DAKOTA

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## 1 INTRODUCTION

### 1.1 WHY THIS GUIDE?

To help safeguard property and promote public welfare, the North Dakota Society of Professional Land Surveyors (NDSPLS) has prepared and adopted this manual for Land Surveyors and anyone else interested in land surveys in North Dakota.

We hope these guidelines will help Land Surveyors meet public needs and work to the highest standards possible. We urge you to use the contents of this document for all surveys relating to the creation, establishment or retracement of property boundaries in the state, whether for public or private lands.

Note, however, that while this manual serves as a realistic and prudent guide for adequate surveying performance, Land Surveyors should continue to exercise individual skill, discretion, and judgment on each specific job. Careful consideration should be given to any North Dakota Century Code (NDCC), Ordinance, Administrative Rule, or policy that may be in conflict with the guidelines contained within this manual.

### 1.2 DOCUMENT HISTORY

This document is intended to reflect the consensus of practicing Land Surveyors in the State of North Dakota. The following are key dates and changes:

May 1987. First draft of *Manual Of Practice For Land Surveying In North Dakota*.

February 20, 1988. First edition approved and published.

2001. Document title changed to *Recommended Guidelines For The Practice Of Land Surveying In North Dakota*.

February 2015. Current edition adopted. Title changed back to *Manual Of Practice For Land Surveying In North Dakota*.

The NDSPLS may continue to modify and revise this document to accommodate the advancement of survey technology and procedures as they develop. Changes are reviewed and revised by the Manual of Practice Chairman and Committee and approved by the NDSPLS Board for adoption.



### 1.3 RELATED HISTORICAL MATERIALS

Another Source of useful information in regards to North Dakota survey laws is the *North Dakota Digest of Land Surveying Laws* originally compiled by the North Dakota State Board of Registration for Professional Engineers and Professional Land Surveyors in 1977 and made available to the surveying profession and the general public. It was made up to provide Surveyors with a reference to the new laws regarding land surveying as well as to older regulations which were scattered throughout NDCC. This was done through the assistance of the University of North Dakota School of Law, the North Dakota State Board of Registration for Professional Engineers and Professional Land Surveyors and it's Executive Director. This Law Digest was last updated in 2009 and is used for survey law references in the NDSPLS Manual of Practice for Land Surveying in North Dakota.

### 1.4 LAND SURVEYOR'S RESPONSIBILITIES

Land Surveyors practicing in North Dakota are expected to know and understand state laws, codes, and the acceptable standards of practice used by the Land Surveyors licensed and registered to work in the state, including those that are not already defined in North Dakota Century Code or Article 28 Administrative Code.

Whether you work in public or private capacity or practice, and even if you simply offer to practice land surveying as defined in NDCC 43-19.1-02 (8) "Practice of land surveying," you are expected to know about this document and understand its contents. **Failure to comply with these standards could lead to charges of negligence or incompetence in the practice of Land Surveying.**

This manual reflects the consensus of practicing professional Land Surveyors in North Dakota. Be aware that technologies and practices change over time. As such, these guidelines may be reviewed and revised as needed and found acceptable to the membership.

### 1.5 ABOUT THE NDSPLS

The North Dakota Society of Professional Land Surveyors was established on February 16, 1979.

#### 1.5.1 Mission Statement and Objectives

The principle objectives of the North Dakota Society of Professional Land Surveyors are to unite all of the Professional Land Surveyors in the State of North Dakota; to elevate the standards of the surveying profession in the state of North Dakota; to establish basic minimum standards and requirements for surveys; to assist in promoting legislative and educational programs to improve the professional status of the Land Surveyor; to work



in cooperation with local, county, state, tribal, and local governments in our field of endeavor; to uphold a rigid code of ethics; to strive to improve our relations with our clients and the public by doing our work with precision and integrity; to maintain a good relationship between Land Surveyors and Engineers.

#### 1.5.2 Bylaws

The NDSPLS publishes its constitution and bylaws in the current NDSPLS directory.

#### 1.5.3 Board of Directors

To find names and contact information for our board members, contact NDSPLS 1811 East Thayer Ave. Bismarck, ND 58501 or email: [info@ndsppls.org](mailto:info@ndsppls.org). The board includes the following roles:

- President
- President Elect
- Vice President
- Secretary
- Treasurer
- Past President
- NSPS Governor
- Chapter Presidents

#### 1.5.4 Committees

The NDSPLS performs much of its work through the following committees and chairs:

- Administrative Secretary
- Awards
- Convention
- Education
- Education Assistance Program (EAP)
- Ethics
- GIS
- Historical
- Legislation & Bylaws
- Membership
- Nominations
- Policy/Procedures Manual
- Public Information
- Guidelines for The Practice of Land Surveying In ND
- Trigstar
- Webpage
- Special Committees



## 2 PROFESSIONAL BEHAVIOR

### 2.1 ROLE OF THE LAND SURVEYOR

As a professional, you exercise reasonable skill and care that any Land Surveyor of ordinary skill and prudence would exercise under similar circumstances. Your duty is objective in nature and is to arrive at the best possible answer. You are held liable for failure to exercise due skill and care in making a survey. As a professional, you must meet your obligations to perform your job and take complete responsibility for your work.

**Aid public understanding.** A Professional should promote public education and the appreciation of Professional engineering and land surveying. Promote the achievements and protect the profession from misrepresentation and misunderstanding. We encourage you to maintain interest in the public welfare and be ready to apply your special knowledge, skill, and training for the use and benefit of the public.

### 2.2 PROFESSIONAL JUDGMENT STATEMENT

A professional Surveyor's judgment is held to a high standard. Properly carry out your duties to the public in regards to liability for negligence or negligent misrepresentation. Exercise the reasonable skill and care that a Land Surveyor of ordinary skill and prudence would exercise under similar circumstances. Statements made by the Land Surveyor should be factual and direct to the point based on the information held—without bias to a client or to an adjoining landowner.

### 2.3 REGISTRATION LAWS FOR PROFESSIONAL LAND SURVEYOR

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**The NDSPLS has adopted the following sections as stated in NDAC Chapter 28-02.1-03 through Chapter 28-02.1-06.**

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**Types of registration.** Engineers and Land Surveyors may become registered professional practitioners by examination, endorsement, or by temporary permit.

1. **Registration by examination.** Registration by examination is generally a two-step process for those applicants who have met the general qualification requirements; who have met certain education requirements or who have the experience deemed to be satisfactory and acceptable to the board, or both; and who have successfully passed the examinations prescribed by the board.



- a. The board has the written examination prepared by the national council of examiners for Engineers and Surveyors as its standard of examinations and qualifications.
  - b. The board may require one or more questions in examinations measuring familiarity with the code of ethics. Similarly, in furtherance of the board's determination of rehabilitation, an examination on the code of ethics may be required.
2. **Registration by endorsement.** Registration by endorsement is for engineers or Land Surveyors who hold a current registration in another jurisdiction who substantially meet or have met, in the opinion of the board, the following requirements and qualifications:

**Qualifications and requirements - Registered Land Surveyor**

(1) A graduate of a four-year or more land surveying or engineering program accredited by the accreditation board for engineering and technology must satisfy the following requirements:

- (a) Pass an eight-hour examination in fundamentals of land surveying.
- (b) Have a minimum of four years of experience in land surveying work of a character satisfactory to the board and indicating that the applicant is competent to practice land surveying.
- (c) Pass an examination in the principles and practices of land surveying.
- (d) Pass an examination pertaining to land surveying laws, procedures, and practices in North Dakota.

(2) A graduate from a land surveying or engineering program not accredited by the accreditation board for engineering and technology and approved by the board must satisfy the following requirements:

- (a) Pass an eight-hour examination in fundamentals of land surveying.
- (b) Have a minimum of six years of experience in land surveying work of a character satisfactory to the board and indicating that the applicant is competent to practice land surveying.
- (c) Pass an examination in the principles and practices of land surveying.



(d) Pass an examination pertaining to land surveying laws, procedures, and practices in North Dakota.

(3) All other land surveying applicants not qualifying under paragraphs 1 and 2 must satisfy the following requirements:

(a) Pass an eight-hour examination in fundamentals of land surveying.

(b) Have a minimum of eight years of experience in land surveying work of a character satisfactory to the board and indicating that the applicant is competent to practice land surveying. Up to two years of credit toward experience requirements may be granted upon completion of equivalent time in a board-approved land surveying or engineering curriculum.

(c) Pass an examination in the principles and practices of land surveying.

(d) Pass an examination pertaining to land surveying laws, procedures, and practices in North Dakota.

3. **Temporary permit - Temporary registration.** Educational and experience requirements must comply with North Dakota law. A one-time temporary permit may be issued on the basis of one project and may not exceed one year. The applicant must be legally qualified to practice in the state or country of residence and must have current registration. A temporary permit must be approved prior to submission of plans and specifications for the execution of a project. Temporary permits for Land Surveyors are not authorized by North Dakota law.

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**The NDSPLS has adopted the following section as stated in NDAC 28-02.1-04-01.**

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General Requirements

All applicants must:

1. Complete their applications on forms furnished by the board.
2. Complete the application under oath (an affidavit is required).
3. Furnish references as required but may not include board members or relatives of the applicant as references.
4. In the case of student applicants for the fundamentals of engineering and for the fundamentals of land surveying examinations, certification by the dean of the college or the dean's appropriate designee agreed upon by the board may be used in lieu of references.



**Qualifications and Requirements- Land Surveyor Intern**

**28-02.1-06-01** Land Surveyor Intern applicants must satisfy the requirements located in North Dakota Century Code section 43-19.1-16.1

**Qualifications and Requirements-Professional Land Surveyor by Examination**

**28-02.1-06-02** Professional Land Surveyor by examination. A person applying for registration as a professional land surveyor by examination must have a land surveyor intern certificate and the appropriate experience as required by North Dakota Century Code section 43-19.1-16. The experience must be prior to writing the principles and practice of surveying examination.

Upon successful completion of the principles and practice of surveying examination, professional land surveyor applicants must pass an examination pertaining to land procedures and practices in North Dakota.

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**2.4 CODE OF ETHICS**

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**The NDSPLS has adopted the following section as stated in NDAC 28-03.1-01-01. 28-03.1-01-01.**

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**General Statement**

In order to establish and maintain a high standard of integrity, skills, and practice in the profession of engineering and land surveying, the code of ethics contained in this chapter is binding upon every person holding a certificate of registration as a professional Engineer or Land Surveyor, and upon all agents, employees, officers, or partners. This chapter is specifically designed to further safeguard the life, health, property, and public welfare of the citizens of North Dakota, and must be construed to be a reasonable exercise of the police power vested in the board of registration for professional Engineers and Land Surveyors by virtue of North Dakota Century Code chapter 43-19.1, and as such the board can establish conduct, policy, and practices to be adopted. These rules are to be read and interpreted without regard to race, creed, or sex. The Engineer or Land Surveyor who holds a certificate of registration from the board is charged with having knowledge of the existence of this chapter for professional conduct as an Engineer or Land Surveyor, and also must be deemed to be familiar with the provisions and to understand them. Such knowledge shall encompass the understanding that the practice of engineering and land surveying is a privilege as opposed to a right, and the Engineer or Land Surveyor must be forthright and candid in statements or written responses to the board or its representatives on matters pertaining to professional conduct. All references in this chapter to engineers and the profession of



engineering must be deemed to include Land Surveyors and the practice of land surveying. The Engineer or Land Surveyor must be guided in all professional relations by the highest standards of integrity, and shall act in professional matters for each client or employer as a faithful agent or trustee.

#### 2.4.1 Guidelines for Professional Conduct

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**The NDSPLS has adopted the following section as stated in NDAC 28-03.1-01-04.**

---

##### Protection of Public

Registrants shall be cognizant that their first and foremost responsibility is to the public welfare in the performance of services to clients and employers. The registrant:

1. Will regard one's duty to the public welfare as paramount.
2. Is encouraged to seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health, and well-being of the registrant's community.
3. Will not complete, sign, or seal plans or specifications that are not of a design safe to the public health and welfare and in conformity with accepted standards. In the course of work on a project, if a registrant becomes aware of an action taken by the client or employer against the registrant's advice, which violates applicable state or municipal laws and regulations and which, in the registrant's judgment, will adversely affect the public life, health, or safety, the registrant shall take the following action:
  - a. Advise the client or employer in writing of the registrant's refusal to consent to the decision and give reasons for that refusal.

#### 2.4.2 Principles of Professional Conduct

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**The NDSPLS has adopted the following section as stated in NDAC 28-03.1-01-17.**

---

##### Professional Conduct

1. Registrants shall indicate any reservation on a reference for an applicant if they have reason to believe the applicant is unqualified by education, training, or experience to become licensed. The registrant's opinion shall be based on the qualifications a reasonable and prudent professional would require an applicant to possess.



2. A registrant shall not submit a materially false statement or fail to disclose a material fact requested in connection with the application for certification or licensure in this state or any other state.
3. Registrants shall comply with the licensure laws and rules governing their professional practice in any United States jurisdiction.
4. A registrant shall not further the application for certification or licensure of another person known by the registrant to be unqualified in respect to character, education, or other relevant factor.

The member will be guided in all of his/her professional relations by the highest standards of integrity, and will act in professional matters for each client or employer as a faithful agent or trustee.

1. The registrant will be realistic and honest in all estimates, reports, statements, and testimony.
2. The registrant will admit and accept his/her own errors when proven obviously wrong and refrain from distorting or altering the facts in an attempt to justify his/her decision.
3. Registrant will advise his/her client or employer when he/she believes a project will not be feasible.
4. Registrant will not accept outside employment to the detriment of his/her regular work or interest without the consent of his/her employer.

### 3 DEFINITIONS

The following describes some key terms used in land surveying. However, note the following:

- Where definitions or terms are not specifically mentioned in this manual, see the *Definitions Of Surveying And Associated Terms* revised edition 2005 ACSM (American Congress on Surveying and Mapping) or most recent edition.
- When referencing Surveying Instructions not specifically mentioned in this *Manual of Practice*, use the *Manual of Surveying Instructions* of the BLM 2009 or the most recent *BLM Manual*.
- Whenever the meaning of a word or phrase is defined in any statute, such definition applies to the same word or phrase wherever it occurs in the same or subsequent statutes or rules, except when the contrary intention plainly appears.



### 3.1 PRACTICE OF LAND SURVEYING

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**The NDSPLS has adopted the following definition as stated in NDCC Chapter 43-19.1-02 (8).**

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8. a Means making land boundary determinations by providing or offering to provide professional services using such sciences as mathematics, geodesy, and photogrammetry and involving the making of geometric measurements and gathering related information pertaining to the physical or legal features of the earth; improvements on the earth; and improvements on the space above, on, or below the earth and providing, utilizing, or developing the same into land survey products such as graphics, data, maps, plans, reports, descriptions, or projects. As used in the subsection, professional services include acts of consultation, investigation, testimony evaluation, expert technical testimony, planning, mapping, assembling, and interpreting gathered measurements and information related to any one or more of the following:
  - (1) Determining by measurement the configuration or contour of the earth's surface or the position of fixed objects on the earth's surface;
  - (2) Determining by performing geodetic land surveys the size and shape of the earth or the position of any point on the earth;
  - (3) Locating, relocating, establishing, reestablishing, or retracing property lines or boundaries of any tract of land, road, right of way, or easement;
  - (4) Making any land survey for the division, subdivision, or consolidation of any tract of land;
  - (5) Locating or laying out alignments, positions, or elevations for the construction of fixed works;
  - (6) Determining by the use of principles of land surveying the position for any survey monument, boundary or non-boundary, or reference point and establishing or replacing any such monument or reference point;
  - (7) Creating, preparing, or modifying electronic or computerized or other data for the purpose of making land boundary determinations relative to the performance of the activities in paragraphs 1 through 6.



8. b Includes:

- (1) Engaging in land surveying;
- (2) By verbal claim, sign, advertisement, letterhead, card, or any other way representing to a person to be a Professional Land Surveyor;
- (3) Through the use of some other title implying to be a Professional Land Surveyor or that the person is licensed or authorized under this chapter; and
- (4) Holding out as able to perform or performing any land surveying service or work or any other service designated by the practitioner which is recognized as land surveying.

### 3.2 PROFESSIONAL LAND SURVEYOR

A Land Surveyor who complies with the requirements for education, experience, and character and who has been registered and licensed by the North Dakota State Board of Registration for Professional Engineers and Professional Land Surveyors. (See NDCC 43-19.1-02.10)

### 3.3 RESPONSIBLE CHARGE

Direct control and personal supervision of engineering or surveying work. (See NDCC 43-19.1-02.11)

### 3.4 DIRECT SUPERVISION

Activities of the person who is in charge of technical, engineering, or land surveying work in progress, whose professional skill and judgment are embodied in the plans, specifications, reports, plats, or other documents required to be certified pursuant to section NDAC 28-02.1-08-03. A person in direct supervision of work directs the work of other registrants, interns, draftspersons, technicians, or clerical persons assigned to that work.

### 3.5 STREET

Streets, highways, avenues, boulevards, parkways, roads, lanes, walks, alleys, viaducts, subways, tunnels, bridges, public easements, and rights of way, and other ways.

### 3.6 SUBDIVISION

The division of a tract or parcel of land into lots for the purpose, whether immediate or future, of sale or of building development, and any plat or plan which includes the creation of any part of one or more streets, public easements, or other rights of way, whether public or private, for access to or



from such lots, and the creation of new or enlarged parks, playgrounds, plazas, or open spaces. Also defined in Title 11 NDCC Chapter 11-33.2-01.

### 3.7 OUTLOTS

This term is not mentioned in NDCC or other readily available sources for definition. However, you may find it used on original town site maps. Out lot tracts or areas of land that are not platted into blocks, lots, streets and alleys. This term is also labeled on platted town sites from the railroad platted towns. It is not interchangeable with the terms "Auditors Plat" or "Auditors Lot," but rather a simple term used for platted lands which may be rural or within the city limits. It is suggested to check with the local governing body for use and reference of this type name, and is subject to local regulation.

### 3.8 SUBLOTS

Divisions of government sections within a town.

Lots should be designated as "Sub Lots" beginning with Sub Lot One within each Government Section. Existing Out Lots, Sub Lots, and Auditors Lots or Parcel numbers should be retained and treated as Sub Lots for Indexing. That is to say, new lots should be numbered as a Sub Lot with the next available sequential number. Indexing should be a "S.L.Plat" in the tract index for that aliquot part of the section in which it falls.

The use of sublots (sometimes written as "sub lots") is discussed in more detail in the Index: History of Sublots.

### 3.9 CADASTRAL MEASUREMENTS

Measurements used to define the location of public land survey system (PLSS) corners and boundaries.

### 3.10 GEOGRAPHIC COORDINATE DATA BASE (GCDB)

A database containing geographic coordinates, and their associated attributes, for all corners of the PLSS.

### 3.11 GROUND DISTANCE

The horizontal distance measured at the mean level elevation between two points.

### 3.12 UTM ZONE

The **Universal Transverse Mercator** (UTM) grid has a projection in zones 6 degrees wide in longitude, the GRS80 Ellipsoid if using NAD83 and the Clarke's Ellipsoid of 1866 if using NAD27. The NAD83 is now the datum generally preferred. The longitude of the origin is the central meridian of each zone; the latitude of the origin is 0 degrees at the equator. North



Dakota has two UTM zones. Zone 13 covers areas of North Dakota with a longitude of 102 degrees or more—approximately the western 1/3 of the state—Zone 14 covers areas of ND with a longitude of 102 degrees and less—the rest of the state into MN.

### 3.13 LOCAL COORDINATES

A local coordinate system consists of values which are transformed from X,Y,Z coordinates in an assumed coordinate system. The X and Y axes are located in a horizontal plane and are located in the directions of local east and north, respectively. The Z or the vertical values are defined from whatever datum is stated.

### 3.14 GEODETIC COORDINATES

The quantities of latitude and longitude that define the position of a point on the surface of the Earth with respect to the reference ellipsoid. These are also called geographic coordinates. These geodetic coordinates (latitude and longitudes) may be transformed into grid coordinates and all survey computations relating to them may then be made by the methods and formulas of plane surveying.

### 3.15 GRID COORDINATES

Two distances which fix the position of a point on a grid.

### 3.16 EASEMENT

An interest in land created by grant or agreement that confers a right on owners (private or public) to some profit, benefit, dominion, or lawful use of the estate of another. An easement restricts but does not abridge the rights of the fee owner. The first person is accorded partial use of such land for a specific purpose. An easement is technically a right-of-way, specifically for passage purposes such as for a railroad, pipelines, pedestrians, vehicles, aqueducts, etc. (See ACSM Definitions 2005)

### 3.17 RIGHT OF WAY

Any strip or area of land granted by deed or easement, for construction and maintenance according to designated use such as electric power, telephone, gas, oil, water and other pipelines. Right-of-way has come to mean the land over which passage is permitted or suffered, even if the land has been dedicated in fee to the responsible governmental jurisdiction for the purposes of maintenance and taking it off the tax rolls. While the roadway is the actual portion of the public way over which vehicles, pipelines, etc. actually pass, the right-of-way is the entire expanse of land taken out of unrestricted private ownership- usually a set



width with ample room for various other ancillary features. (See ACSM Definitions 2005)

### 3.18 MAP

A representation on a plane surface, at an established scale, of the physical features (natural, artificial, or both) of a part or the whole of the Earth's surface, by the use of signs and symbols, and with the method of orientation indicated. The map frequently describes its adjective form to distinguish the map from maps of other types. It should contain the record of the projection upon which it is constructed.

### 3.19 PLAT

A diagram drawn to scale showing all essential data pertaining to the boundaries and subdivisions of a tract of land, as determined by survey or protraction. A plat should show all the data required for a complete and accurate description of the land which it delineates, including the bearings (or azimuths) and lengths of the boundaries of each subdivision. A plat may constitute a legal description of the land and be used in lieu of a written description.



## 4 SERVICE AGREEMENTS AND PROCEDURES SERVICE AGREEMENT MODELS/ HOLD HARMLESS INDEMNIFICATION SHEET

When contracting with a client, Land Surveyors and their offices or branch offices should draw up a service agreement with a client. It is completely up to the various land surveyors and their companies to decide if an agreement should be used or not.

### 4.2 PROCEDURAL OUTLINE (No specific information at this time reference only)

#### 4.2.1 Determine the Scope of a Project

The Surveyor serves the client faithfully, but refuses to do that which is illegal or unethical, or violates his/her duty to the public or to fellow practitioners. The Land Surveyor should question the client in sufficient detail to obtain an understanding of the client's needs and requirements and define the services to be performed. If it is necessary to obtain more information than the client has supplied, the Land Surveyor should advise the client that such information must be furnished or obtained prior to determining the necessary services.

#### 4.2.2 Find Land Descriptions, Records, And Research

1. When a survey is to be conducted, the client must provide a land description of the property to be surveyed. If land descriptions allude to unique conditions, the Surveyor should consult other sources of information referred to in the land description in order to assemble suitable written evidence of the corners and lines of the property being surveyed. Important records may include, but are not limited to the following:
  - Records of previous surveys
  - Land descriptions of adjacent properties
  - Records of adjacent highways, railroad and utilities
  - Records of public agencies.
2. Abstracts, deeds, Certificates of Title, title opinions, title binders or combinations thereof are sources of proper land descriptions. The Land Surveyor should ask the client for additional information that may help with such matters such as prior surveys, easements, or other encumbrances. **Tax statements and other abbreviated documents are usually inadequate sources of a proper land description.**



3. The Land Surveyor may need to obtain current descriptions of other properties in the area. Land Surveyors should exercise reasonable care in doing record research, but cannot be held liable for errors or omissions caused by defects in the chain of title for the property being surveyed, or that of the adjoining owners. Title defects may be revealed through an examination of title by those professionals trained and experienced in this area.

#### 4.2.3 Evaluate Capabilities to Complete Job

It is the Land Surveyor's responsibility to determine whether he or she is properly qualified, or has the proper knowledge, experience, personnel, equipment and resources available to undertake the contemplated project. Having appraised the project and evaluated the foregoing criteria, the Land Surveyor should plan a method of successfully completing the project.

#### 4.2.4 Estimate Cost and Acceptance of the Project

The Land Surveyor should conduct estimates as follows:

1. Inform the client of the approximate cost of the project in advance of doing the work. Some research is also advisable before cost estimating.
2. If previously unknown factors are discovered during the course of the work, which will seriously affect either the cost or the completion schedule of the project, inform the client or the client's agent upon such discovery.
3. For the mutual protection of both client and Surveyor, prepare and supply the client or his/her agent with a memorandum, letter, confirmation of work ordered, or contract for the project. The Land Surveyor may establish with the client the extent of any known limitations to the Surveyor's responsibility.

#### 4.2.5 Prepare for Field Surveys

Once the project is accepted, the Land Surveyor should proceed as follows:

1. Gather, examine and analyze recorded data.
2. Form preliminary conclusions.
3. Plan the procedure for performing the field surveys.
4. Obtain permission to enter all lands needed for investigation work and survey data and values of control corners.

#### 4.2.6 Conduct Preliminary Field Investigation

In the field, conduct the survey in the field with appropriate personnel, equipment, and procedures and any additional investigation as necessary as follows:



1. Search for, locate, and identify monuments and other real evidence that affects the survey.
2. Investigate possible parole evidence, identify obliterated control monument positions, and take testimony when possible.
3. Take necessary measurements to correlate found evidence.
4. Where relevant, locate and describe lines of occupation between ad joiners.
5. Record information in appropriate form.

#### 4.2.7 Finalize Findings

With preliminary fieldwork completed, follow these procedures:

1. Make computations to verify measurements.
2. Evaluate the evidence.
3. Contact other previous Surveyors if his/her work disagrees with yours. The disagreement should be investigated and resolved if possible.
4. Apply the proper theory of location in accordance with law or precedent.
5. Set appropriate monuments to delineate the boundary lines surveyed.
6. Prepare a **Certificate of Survey and Plat** showing the results of the boundary survey. The Certificate of Survey should be accompanied by a written report when appropriate. When a survey report is made, appropriate reference to the report should be made on the Certificate of Survey.
7. Make sure that the COS or plat is recorded in the local County Recorder's office.



## 5 MONUMENTS AND COORDINATE SYSTEMS

### 5.1 GENERAL

This section provides guidelines for working with monuments and coordinate systems.

#### 5.1.1 Monumentation

Every boundary survey performed in North Dakota shall be monumented, or witness monumented, at all boundary corner locations. All corners shall be marked with a physical monument of a type or character, and set in a manner providing a degree of permanency consistent with that of the local terrain and physical features. Monuments set by a Surveyor shall be made of durable material and should include an element that makes it possible to detect the monument by means of some device for finding ferrous or magnetic objects. Where possible, monuments set by a Surveyor shall bear an identification of the Surveyor by his or her Land Surveyor registration number. The minimum requirements for monuments set is set forth in NDCC 47-20.1-10.

In the event that it is not practical to set a monument of minimum requirements, monuments may be any of a large assortment of markers including iron pipes, cast concrete, cut stone, cast iron, iron rods or pins, chiseled crosses, survey mag or PK type masonry nails, etc. **Note: Wood stakes shall not be used as permanent monuments.** Also small rods and masonry nails are to be used only in such cases in which it is impossible to set more substantial monuments. Examples of acceptable monuments are:

- Steel re-bar: 5/8" diameter or larger, 18" or longer.
- Steel pipe: 3/4" inside diameter or larger, 18" or longer.
- Concrete or stone markers: 4" in diameter or 4" square, 18" or longer and buried in the ground with rebar embedded in the concrete to allow for detection by a locator.
- A drill hole, or a scribed or chiseled mark, in existing concrete or stone.
- A survey masonry PK type spike/nail in pavement, etc.
- Stainless steel or aluminum washers set with brass or aluminum nails with RLS number stamped on top. (Usually used in roadways or walkways where iron monuments cannot be driven properly).



- Only one RLS number stamped per monument.

**Witness monumentation** refers to the setting of an offset corner on the boundary line when it is not possible or practical to set the actual corner monument. For example, in business sections of urban areas, buildings may be erected on the property line. In such cases chiseled crosses could be set on the extension of the lot lines at a convenient distance from the true corner and labeled W.C. with a distance to the corner.

**Reference monument** refers to the setting of an offset monument not on the boundary line, with a cap referencing the distance to the actual corner and labeled R.M.

It is recommended that all monuments be prominently marked by the Surveyor in such a manner as to enable the client to easily find the monument. The markings should be appropriate to the conditions and vegetation cover, and may range from paint on pavement with a mason nail in urban areas, to steel fence posts in rural areas. We also suggest that the Surveyor caution the client on the value and importance of the boundary monuments and recommend various methods whereby they can be protected and preserved. If it is not practical to set a monument at all, the record shall indicate that the corner is not marked or monumented, and why not.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.1-10.**

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**Minimum corner requirements.** The registered Land Surveyor establishing or rehabilitating corner markers shall place as a minimum acceptable marker, a durable ferromagnetic monument not less than eighteen inches [45.72 centimeters] in length and not less than one-half inch [12.7 millimeters] in sectional dimension driven to a survey elevation depth to which is affixed a cap bearing the center point and the registered Land Surveyor's certificate number firmly impressed thereon.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.1-11.**

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**Corner records to be certified.** No corner record shall be filed unless the same is signed by a registered Land Surveyor and stamped with the Surveyor's seal.



## 5.1.2 Coordinates

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**The NDSPLS has adopted the following as stated in NDCC 47-20.2-01.**

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**North Dakota coordinate system zones defined.** The systems of plane coordinates which have been established by the national oceanic and atmospheric administration national ocean survey/national geodetic survey or its successors for defining and stating the geographic positions or locations of points on the surface of the earth within this state are, as of July 1, 1989, to be known and designated as the North Dakota coordinate system of 1927 and the North Dakota coordinate system of 1983. For the purpose of the use of these systems, the state is divided into a north zone and a south zone:

1. The area now included in the following counties constitutes the north zone: Divide, Williams, McKenzie, Mountrail, Burke, Renville, Ward, McLean, Bottineau, McHenry, Sheridan, Pierce, Rolette, Towner, Benson, Wells, Foster, Eddy, Ramsey, Cavalier, Pembina, Walsh, Nelson, Grand Forks, Griggs, Steele, Traill.
2. The area now included in the following counties constitutes the south zone: Dunn, Golden Valley, Slope, Bowman, Adams, Hettinger, Stark, Mercer, Oliver, Morton, Grant, Sioux, Emmons, Burleigh, Kidder, Logan, McIntosh, Stutsman, Barnes, LaMoure, Dickey, Cass, Ransom, Sargent, Richland.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.2-02.**

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**North Dakota coordinate system names defined.** As established for use in the north zone, the North Dakota coordinate system of 1927 or the North Dakota coordinate system of 1983 is named, and in any land description in which it is used it must be designated the North Dakota coordinate system of 1927, north zone, or the North Dakota coordinate system of 1983, north zone. As established for use in the south zone, the North Dakota coordinate system of 1927 or the North Dakota coordinate system of 1983 is named, and in any land description in which it is used it must be designated the North Dakota coordinate system of 1927, south zone, or the North Dakota coordinate system of 1983, south zone.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.2-03.**

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**North Dakota coordinate system defined.** The plane coordinate values for a point on the earth's surface, used in expressing the geographic position or location of such point in the appropriate zone of this system, shall consist of two distances, expressed in United States survey feet [meters] and decimals of a foot [meter] when using the North Dakota coordinate system of 1927.



One of these distances, to be known as the X-coordinate, shall give the position in an east-west direction; the other, to be known as the Y-coordinate, shall give the position in a north-south direction. These coordinates shall be made to depend upon and conform to plane rectangular coordinate values for the monumented points of the North American horizontal geodetic control network as published by the national ocean survey/national geodetic survey, or its successors, and the plane coordinates which have been computed on the systems defined in this chapter. Any such station may be used for establishing a survey connection to either North Dakota coordinate system. For the purposes of converting coordinates of the North Dakota coordinate system of 1983 from meters to feet, the international survey foot must be used. The conversion factor is: one foot equals 0.3048 meter exactly.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.2-04.**

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**Federal and state coordinate description same tract – Federal precedence.** Whenever coordinates based on the North Dakota coordinate system are used to describe any tract of land which in the same document is also described by reference to any subdivision, line, or corner of the United States public land surveys, the description by coordinates must be construed as supplemental to the basic description of each subdivision, line, or corner contained in the official plats and field notes filed of record, and, in the event of any conflict, the description by reference to the subdivision, line, or corner of the United States public land surveys prevails over the description by coordinates, unless the coordinates are upheld by adjudication, at which time the coordinate description will prevail. This chapter does not require any purchaser or mortgagee to rely on a description, any part of which depends exclusively upon the North Dakota coordinate system, unless the description has been adjudicated as provided in this section.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.2-05.**

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**North Dakota coordinate system origins defined.**

1. For the purposes of more precisely defining the North Dakota coordinate system of 1927, the following definitions by the United States coast and geodetic survey are adopted:

- a. The North Dakota coordinate system of 1927, north zone, is a Lambert conformal conic projection of the Clarke spheroid of 1866, having standard parallels at north latitudes, forty-seven degrees twenty-six minutes and forty-eight degrees forty-four minutes along which parallels the scale shall be exact. The origin of coordinates is at the intersection of the meridian one



hundred degrees thirty minutes west of Greenwich and the parallel forty-seven degrees zero minutes north latitude. This origin is given the coordinates:  $x = 2,000,000$  feet [609.6 kilometers], and  $y = 0$  feet [0 kilometers].

- b. The North Dakota coordinate system of 1927, south zone, is a Lambert conformal conic projection of the Clarke spheroid of 1866, having standard parallels at north latitudes forty-six degrees eleven minutes and forty-seven degrees twenty-nine minutes along which parallels the scale shall be exact. The origin of coordinates is at the intersection of the meridian one hundred degrees thirty minutes west of Greenwich and the parallel forty-five degrees forty minutes north latitude. This origin is given the coordinates:  $x = 2,000,000$  feet [609.6 kilometers], and  $y = 0$  feet [0 kilometers].
2. For the purposes of more precisely defining the North Dakota coordinate system of 1983, the following definition by the national ocean survey/national geodetic survey is adopted:
  - a. The North Dakota coordinate system of 1983, north zone, is a Lambert conformal conic projection of the North American datum of 1983, having standard parallels at north latitude of forty-seven degrees twenty-six minutes and forty-eight degrees forty-four minutes along which parallels the scale shall be exact. The origin of coordinates is at the intersection of the meridian one hundred degrees thirty minutes west of Greenwich and the parallel forty-seven degrees zero minutes north latitude. This origin is given the coordinates:  $x = 600,000.0000$  meters, and  $y = 00.0000$  meters.
  - b. The North Dakota coordinate system of 1983, south zone, is a Lambert conformal conic projection of the North American datum of 1983, having standard parallels at north latitude of forty-six degrees eleven minutes and forty-seven degrees twenty-nine minutes along which parallels the scale shall be exact. The origin of coordinates is at the intersection of the meridian one hundred degrees thirty minutes west of Greenwich and the parallel forty-five degrees forty minutes north latitude. This origin is given the coordinates:  $x = 600,000.0000$  meters, and  $y = 00.0000$  meters.

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The NDSPLS has adopted the following as stated in NDCC 47-20.2-06.

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**North Dakota coordinate system - Use of term.** The use of the North Dakota coordinate system of 1927 north zone or south zone or the North Dakota coordinate system of 1983 north zone or south zone on any map, report of survey, or other document must be limited to coordinates based on the North Dakota coordinate systems as defined in this chapter. The map, report, or document must include a statement describing the standard of accuracy, as defined by the national ocean survey/national geodetic survey, maintained in developing the coordinates shown therein. The coordinates must be established in conformity with these standards:

1. No coordinates based on the North Dakota coordinate system, purporting to define the position of a point on a land boundary, may be presented to be recorded in any public records or deed records unless the point is connected to a triangulation or traverse station established in conformity with the standards prescribed in this chapter.
2. Coordinate values used in land descriptions under this section must be certified by a duly registered Land Surveyor under the laws of this state.

Properly conducted OPUS observations and solutions by NGS can be used to tie public land system corners for record other than being connected to a triangulation or traverse station established in conformity with the standards prescribed in this chapter.

## 5.2 STANDARDS

**Accuracy.** The surveyor must use the correct procedure to attain the horizontal and/or vertical control accuracy demanded of the survey project. The current National Geodetic Survey standards are a good reference for all types of geodetic control networks and boundary works.

- Positional Accuracy for Cadastral Control is less than 0.164 US feet in the 95% confidence circle.
- Positional Accuracy for Cadastral Measurements is less than 0.328 US feet in the 95% confidence circle.

## 5.3 ORDER OF IMPORTANCE

The law provides that the corners marked during the process of an original survey shall forever remain fixed in position, even disregarding technical errors that may have passed undetected before acceptance of the survey. Major importance is given to evidence relating to the original position of the corner. In fact, it is given far greater weight than the record relating to



bearings and lengths of lines. The corner monument and its accessories constitute direct evidence of the position of the corner.

1. The boundaries of the public lands, when approved and accepted, are unchangeable.
2. The original township, section, and quarter section corners must stand as the true corners which they were intended to represent, whether in the place shown by the field notes or not.
3. Quarter-quarter-section corners not established in the original survey shall be placed on the line connecting the section and quarter-quarter section corners, and midway between them, except on the last half mile of section lines closing on the north and west boundaries of the township, or on the lines between fractional or irregular sections.
4. The center lines of a section are to be straight, running from the quarter-section corner on one boundary to the corresponding corner on the opposite boundary.
5. In fractional sections where no opposite corresponding quarter-section corner has been or can be established, the center line must be run from the proper quarter-section corner as nearly in a cardinal direction to the meander line, reservation, or other boundary of such fractional section, as due parallelism with the section boundary will permit.
6. All dependent resurveys are retracement and establishment of the line of the original survey. The dependent resurveys are to be referenced to the original Government Land Office (GLO)-approved official surveys and all approved supplemental surveys and the best available evidence of the true position of the original corners. We suggest that Surveyors review and be familiar with chapters V and VI of the *BLM Manual of Surveying Instructions* (2009 or most current revision).

#### 5.4 PUBLIC RECORD

Original General Land Office (GLO) records of plats and notes are available from the following sources:

- North Dakota State Water Commission in Bismarck or online at <http://survey.swc.nd.gov/>.
- Local county recorder's office or on line at <http://ndrin.com>.
- Local city government office for any records or documents in its holdings.
- Local county engineer's office for records, plats, maps, and documents.



- Other Public Records Available. (For more information, see the subhead "Types" under the chapter "Land Descriptions," elsewhere in this document.)

## 5.5 EVIDENCE

Evidence proves a fact directly without presumption or inference. It can be anything legally submitted to a competent tribunal as a means of ascertaining the truth of any alleged matter of fact under investigation before it, means of making proof, or a medium of proof. Evidence can be material objects such as physical monuments.

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### **The NDSPLS has adopted the following as stated in NDCC 64-02-09**

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Standards of weights and measures.

The commission shall maintain the following standards of weights and measures, which must conform to the United States standards:

- One Surveyor's chain, sixty-six United States survey feet in length.
- One yard [in meters, equal to 36 divided by 39.37] measure.
- One United States survey foot [in meters, equal to 12 divided by 39.37] measure and one international foot [exactly .3048 meters] measure.
- One inch [25.40 millimeters] measure.
- One one hundred pound [45.36 kilograms] weight.
- One fifty pound [22.68 kilograms] weight.
- One twenty-five pound [11.34 kilograms] weight.
- One ten pound [4.54 kilograms] weight.
- One one pound [.4536 kilogram] weight.
- One half-pound [.2268 kilogram] weight.
- One quarter-pound [.1134 kilogram] weight.
- One one-eighth of a pound [.0567 kilogram] weight.
- One one-sixteenth of a pound [.0284 kilogram] weight or one ounce [28.35 grams] weight.
- One set of apothecaries' weights from one pound [.4536 kilogram] to one grain [64.80 milligrams] and one set of troy weights from one pound [.3732 kilogram] to one grain [64.80 milligrams].
- Other weighing and measuring devices necessary to test and calibrate standards.

These standards are the legal standards of weights and measures for this state, and must be used for testing the secondary standards used to test weighing or measuring devices.



## 6 SURVEY CORNER RECORDS

Once a Land Surveyor locates a corner, a record must be certified and filed. This chapter provides guidance for both completing new and finding previously filed corner records.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.1-01.**

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### SURVEY AND CORNER RECORDATION ACT

**Purpose.** It is the purpose of this chapter to protect and perpetuate public land survey corners and information concerning the location of such corners by requiring the systematic establishment of monuments and recording of information concerning the marking of the location of such public land survey corners and to allow the systematic location of other property corners, thereby providing for property security and a coherent system of property location and identification of ownerships, and thereby eliminating the repeated necessity for reestablishment and relocations of such corners where once they were established and located, and, to authorize any registered Land Surveyor to locate, erect, maintain, record and perpetuate landmarks, monuments, section corners, quarter corners, meander lines or boundary lines heretofore or hereafter established.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.1-02.**

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**Definitions.** Except where the context indicates a different meaning, terms used in this chapter shall be defined as follows:

1. "**Accessory Corner**" means any exclusively identifiable physical object whose spatial relationship to the corner is recorded. Accessories may be bearing trees, bearing objects, monuments, reference monuments, line trees, pits, mounds, charcoal filled bottles, steel or wooden stakes or other objects.
2. "**Corner**," unless otherwise qualified, means a property corner, or a property controlling corner, or a public land survey corner, or any combination of these.
3. "**Monument**" means an accessory that is presumed to occupy the exact position of a corner.
4. "**Practice of Land Surveying**" means the assuming of responsibility for the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries, and monuments after they have been established, the survey of land



areas for the purpose of determining the topography thereof, the making of topographical delineations, and the preparing of maps and accurate records thereof, when the proper performance of such services requires technical knowledge and skill.

**This Practice of Land Surveying has now been superseded by the new definition under NDCC Chapter 43-19.1-02 (8).**

5. "**Property Controlling Corner**" means a public land survey corner, or any property corner, which does not lie on a property line of the property in question, but which controls the location of one or more of the property corners of the property in question.
6. "**Property Corner**" means a geographic point on the surface of the earth, and is on, a part of, and controls a property line.
7. "**Public Land Survey Corner**" means any corner actually established and monumented in an original survey or resurvey used as a basis of legal description for issuing a patent for land to a private person from the United States government.
8. "**Reference Monument**" means a special monument that does not occupy the same geographical position as the corner itself, but whose spatial relationship to the corner is recorded, and which serves to witness the corner.
9. "**Registered Land Surveyor**" means a Surveyor who is registered to practice land surveying under chapter 43-19.1 regulating the registration and practice of professional engineering and Land Surveyors, or who is authorized under said chapter to practice land surveying as defined herein.

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**The NDSPLS has adopted the following as stated in NDCC 47-20.1-03.**

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**Filing of corner record required.** A Surveyor shall complete, sign, stamp with the Surveyor's seal, and file with the Recorder of the county where the corner is situated a written record of corner establishment or restoration to be known as a "corner record" for every public land survey corner and accessory to such corner which is established, reestablished, monumented, remonumented, restored, rehabilitated, perpetuated, or used as control in any survey by such Surveyor, and within ninety days thereafter, unless the corner and its accessories are substantially as described in an existing corner record filed in accord with the provisions of this chapter.



**The NDSPLS has adopted the following as stated in NDCC 47-20.1-04.**

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**Filing permitted as to any property corner.** A registered Land Surveyor may file such corner record as to any property corner, property controlling corner, reference monument, or accessory to a corner.

## 6.1 PUBLIC RECORDER

The following describes how the Public Recorder of the county containing a corner manages the recording process:

*Note. Certifying the corner record is the responsibility of the Land Surveyor. The Recorder will not file a corner record until it is first signed by a registered Land Surveyor and stamped with the Surveyor's seal.*

1. The Recorder receives the completed corner record and preserves it in a hardbound book. The books are numbered in numerical order as filled.
2. The Recorder numbers the forms in numerical order as filed.
3. The Recorder places the book and page number in which the said corner record is filed near that same corner on a cross-index plat which the Recorder provides for such purpose.
4. The Recorder makes these records available for public inspection during all usual office hours.

**Official corner record.** When a corner has been established and filed, that corner record enters the official record and becomes available to all state and federal government agencies without cost; however, the Recorder may charge a reasonable fee for furnishing certified copies of the official record to others.

## 6.2 REHABILITATION

**The Land Surveyor must rehabilitate monuments.** In every case where a corner record of a public land survey corner is required to be filed under the provisions of this chapter, the Surveyor must reconstruct or rehabilitate the monument of such corner and accessories to such corner, so that it remains as permanent a monument as is reasonably possible and so that the same may be reasonably expected to be located in the future.



### 6.3 RESPONSIBILITY

Corner records to be certified. No corner record shall be filed unless the same is signed by a registered Land Surveyor and stamped with the Surveyor's seal. Only one registered Land Surveyor's stamp, seal, and signature per corner record document filed.

Other corner records may be filed for the same corner, but must be on a separate document.



## 7 LAND DESCRIPTIONS

### 7.1 WRITING PRINCIPLES

In general, we recommend Land Surveyors follow the principles outlined in *Writing Legal Descriptions* by Gurdon Wattles.

The NDCC also includes requirements as follows:

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#### **The NDSPLS has adopted the following as stated in NDCC 47-19-03.1.**

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**Deeds and contracts for deeds to include name and address of drafter of legal description. (otherwise known as the Scrivener Law).** The recorder may not record a deed or contract for deed containing a metes and bounds legal description which affects the title to or possession of real property that otherwise may be recorded under this chapter unless the name and address of the individual who drafted the legal description contained in the deed or contract for deed appears on the instrument in a legible manner. A deed or contract for deed complies with this section if it contains a statement substantially in the following form: "The legal description was prepared by \_\_\_\_\_ (name) \_\_\_\_\_ (address) or obtained from a previously recorded instrument." This section does not apply to any instrument executed before January 1, 2000, or any instrument executed or acknowledged outside the state. The validity and effect of the record of any instrument in a recorder's office may not be lessened or impaired by the fact the instrument does not contain the statement required by this section.

#### 7.1.1 Writing Or Reading Legal Descriptions

When you write or read legal descriptions, determine the items that have control or authority over other conditions. Follow the established order of superiority of calls or elements, known as the rules of construction. Here is a general summation of those rules:

- Monuments, natural or artificial or legal referring to matters of record or some combination of these kinds of monuments which are recited. The recital of these in descriptions adds to the supremacy of them over other conditions.
- Monuments, physical or record, not recited but disclosed by reference to maps and other record documents.
- Recital of a boundary record, such as reference to a map or deed.
- Recited distance and/or bearing ties to record corners or lines not on the boundary of this property.
- Distances on this boundary, without ties to any of the foregoing.
- Bearings on the boundary or angles between lines, without ties.



- Areas stated as a corollary or an addendum to the description.

## 7.2 RECORD MAPS

A record map should provide a representation on a plane surface, at an established scale, of the physical features (natural, artificial, or both) of a part of the Earth's surface, by the use of signs and symbols, and with the method of orientation indicated.

The type of information the record map conveys is described in adjective form to distinguish the map from maps of other types. A map should contain a record of the projection on which it is constructed.

### 7.2.1 Types

The following are types of record maps:

- Official City and County and State area location maps.
- General Location utility maps.
- Federally and State Owned Lands maps.
- Public and privately owned lands maps.
- Resource location maps.
- Restricted area maps.
- Water locations maps of rivers, lakes, streams, and creeks.

## 7.3 CERTIFICATIONS AND STATEMENTS

Requirements for certifications and statements regarding surveys, parts, and uses are found throughout this manual, see especially in the section Surveys. In addition to monumentation, you must provide a certificate assuring that the monuments have been accurately set in accordance with law.

Example: I,[surveyor's name], hereby certify that I am a Licensed Land Surveyor in the state of North Dakota, that this survey was made by me or under my direction and supervision between [name] and [name] and that the survey is true and complete as shown, that all monuments, and marks set, together with those found, are of the character and occupy the positions shown thereon, and are sufficient to enable this survey to be retraced.

Signed \_\_\_\_\_ Date \_\_\_\_\_

On every survey plat the surveyor should certify as to what he/she has done. The form used varies, depending on its purpose. If there is not a certification, statement, or a narrative describing what the surveyor has done on the face of the plat or document, and the surveyor has stamped and sealed the document, it is understood that everything on the face of that document is correct and to the surveyors satisfaction, and the surveyor has now accepted responsibility for all of that information.



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## 8 SUBDIVISION OF SECTIONS

Several laws and other resources provide guidance on subdivision of sections. The rules and methods for accomplishing this task are in Chapter III of the BLM 2009 Manual of Surveying Instructions or current manual and are used and applied in North Dakota rules.

### 8.1 PLATTING LAWS AND REGULATIONS

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**The NDSPLS has adopted the following as stated in NDCC 11-33.2-01.**

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**Subdivision defined.** For the purposes of this chapter, unless the context otherwise requires, "subdivision" means the division of a lot, tract, or parcel of land, creating one or more lots, tracts, or parcels for the purpose, whether immediate or future, of sale or of building development, and any plat or plan which includes the creation of any part of one or more streets, public easements, or other rights of way, whether public or private, for access to or from any such lot, tract, or parcel, and the creation of new or enlarged parks, playgrounds, plazas, or open spaces.

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**The NDSPLS has adopted the following as stated in NDCC 11-33.2-02.**

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**County power to regulate subdivision.** For the purpose of promoting health, safety, morals, public convenience, general prosperity, and public welfare, the board of county commissioners of any county is hereby empowered to regulate and restrict within the county the subdivision of land. This chapter shall not serve to invalidate any ordinance, resolution, regulation, decision, plat approval, or other action taken or adopted, by a board of county commissioners or county planning commission, prior to or subsequent to July 1, 1981, which regulates or otherwise affects the subdivision of land, except that, subsequent to July 1, 1981, the provisions of section 11-33.2-12 shall apply to any county requiring plat approval as a prerequisite to the subdivision of land.

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**The NDSPLS has adopted the following as stated in NDCC 40-50.1-01.**

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**Laying out townsites, additions, and subdivisions - Survey and plat required - Contents of plat.** Any person desiring to lay out a townsite, an addition to a townsite, or a subdivision of land shall cause the land to be surveyed and a plat made of the land. The written plat must comply with the following:

1. The plat must describe particularly and set forth all the streets, alleys, and public grounds, and all outlots or fractional lots within or adjoining the townsite or jurisdiction, together with the names, widths, courses,



boundaries, and extent of all such streets, alleys, and public grounds, and giving the dimensions of all lots, streets, alleys, and public grounds.

2. All lots and blocks, however designated, must be numbered in progressive numbers and their precise length, width, and area be stated on the map or plat. The streets, alleys, or roads which divide or border the lots must be shown on the map or plat.
3. The plat must indicate that all outside boundary monuments have been set and indicate those interior monuments that have been set. There must be shown on the plat all survey and mathematical information, including bearings and distances, and data necessary to locate all monuments and to locate and retrace all interior and exterior boundary lines appearing on the plat. All interior lot lines and exterior boundary lines of the plat must be correctly designated on the plat and show bearings on all straight lines, or angles at all angle points, and central angle, radius, and arc length for all curves. All distances must be shown between all monuments as measured to the hundredth of a foot [0.3048 centimeter]. All lot distances must be shown on the plat to the nearest hundredth of a foot [0.3048 centimeter] and all curved lines within the plat must show central angles, radii, and arc distances. A north arrow and the scale of the plat must be shown on the plat. The scale must be of a dimension that the plat may be easily interpreted. If a curved line constitutes the line of more than one lot in any block of a plat, the central angle for that part of each lot on the curved line must be shown.
4. Ditto marks may not be used on the plat for any purposes.
5. If a river, stream, creek, or lake constitutes a boundary line within or of the plat, a survey line must be shown with bearings or angles and distances between all angle points and their relation to a waterline, and all distances measured on the survey line between lot lines must be shown, and the survey line shown as a dashed line.
6. The unadjusted outside boundary survey and the plat survey data must close by latitude and departure with an error that does not exceed one part in ten thousand parts.
7. All rivers, streams, creeks, lakes, and all public highways, streets, and alleys of record must be correctly located and plainly shown and designated on the plat.
8. The names and adjacent boundary lines of any adjoining platted lands must be dotted on the plat.



9. The scale must be shown graphically and the basis of bearings must be shown. The plat must be dated as to the completion of the survey and preparation of the plat.
10. The purpose of any easement shown on the plat must be clearly stated. Building setbacks may not be shown on the plat.
11. Any plat which includes lands abutting upon any lake, river, or stream must show a contour line denoting the present shoreline, water elevation, and the date of survey. If any part of a plat lies within the one hundred year floodplain of a lake, river, or stream as designated by the state engineer or a federal agency, the mean sea level elevation of that one hundred year flood must be denoted on the plat by numerals. Topographic contours at a two-foot [60.96-centimeter] contour interval referenced to mean sea level must be shown for the portion of the plat lying within the floodplain. All elevations must be referenced to a durable benchmark described on the plat with its location and elevation to the nearest hundredth of a foot [0.3048 centimeter], which must be given in mean sea level datum.

Reference to the vertical datum of NGVD29 or NAVD 88 is the preferred vertical use today. If using GPS to measure the vertical datum it is also advised to state the Geoid model used in those measurements.

## 8.2 PROCEDURES-REFERENCES

See also the *BLM Manual of Surveying Instructions 2009* or the current BLM manual. See also *Restoration of Lost Or Obliterated Corners & Subdivision of Sections BLM 1883-1974*.



## 9 SURVEYS

### 9.1 BOUNDARY SURVEYS

A boundary survey establishes or re-establishes a boundary line on the ground and/or obtains data for constructing a map or plat showing a boundary line. This falls under the category of Practice of Land Surveying. You can find more about boundary surveys, specifically platting irregular boundaries, in the Index under Platting Irregularities.

### 9.2 SURVEY STANDARD

A survey standard is a survey that in scale, accuracy, and content that satisfies criteria prescribed for such a survey by a competent authority.

#### 9.2.1 Accuracy Standards

The surveyor must use the correct procedure to attain the horizontal and/or vertical control accuracy demanded of the survey project.

Reference to *Standards and Specifications for Geodetic Control Networks*, September 1984, or the latest revision, by the Federal Geodetic Control Committee, Rockville, Maryland, or whatever the scope of the project calls for. This publication can be used as a guide for similar projects also.

### 9.3 AUDITORS SURVEY/PLAT

Per NDCC 57-02-39, the county auditor has the authority to request a survey to be made and a plat of said survey to be placed on record for any tract of land that is divided into irregular shapes that can only be described by a metes and bounds description. For more on platting auditor/irregular lots, see Platting Irregularities in the Index.

### 9.4 PROPERTY SURVEYS

A property survey is a record of property lines, easements and land placement. It may include cadastral, location, lot, improvement, and a number of other types of surveys. It is a survey that is made to establish or to re-establish a boundary line on the ground or to obtain data for constructing a map or plat showing a boundary line.

#### 9.4.1 Classification of Property Surveys

##### 9.4.1.1 CITY SURVEYS

Heavily urbanized sections of any city and many industrial areas. City surveys typically include Lot and Elevation surveys. Plot plans are also related to City Surveys.



**9.4.1.1a CITY PLAT SUBMITTAL CHECKLIST**  
(see EXHIBIT #2 for reference on checklist)**9.4.1.2 URBAN AND SUBURBAN SURVEYS**

Includes property in any densely settled or built up part of a town or city. Land used for residential or industrial subdivision of moderate to high value. Rural property for which development is planned or assured in the near future, and whose value is increasing rapidly.

**9.4.1.3 SUBURBAN AND RURAL SURVEYS**

Includes any property such as farms and wooded areas or terrain which primarily consists of marshes, mountains, and wetlands which have lesser immediate value, but have potential for future development.

**9.5 CADASTRAL SURVEYS**

Cadastral surveys are the surveys of the public lands of the US, including retracement surveys for the identification and restoration of property lines. Cadastral relates land boundaries and subdivisions made to create units suitable for transfer or to define the limitations of title. This type of survey registers real property of a political subdivision with details of area, ownership, and value. See Index for more about the structure of a Cadastral survey report.

**9.6 LOCATION SURVEYS**

Location surveys are made in preparation for construction. They involve measurement of elevation, distance, and direction or angle, and staking on the ground of each detail of a design facility. Note that the plans for an engineering project (road, canal, etc.) are prepared in the office from survey data obtained in the field. These plans then form a paper location, and are the basis of the location survey.

**9.7 IMPROVEMENT SURVEYS**

Improvement location surveys depict on-site property improvements that have been proposed or record existing or recent improvements that have been made on a property. These surveys ensure that improvements are within the boundary lines of the property and do not lie in setbacks or other rights-of-way or easements. Any reference distance ties to property boundaries from items located on these surveys are by definition the Practice of Land Surveying, and require a licensed surveyor in ND to make those determinations.



## 9.8 CITY SURVEYS

City surveys typically include Lot and Elevation surveys. Plot plans are also related to City surveys. See the Index (Exhibit 2) for an example of a city plat submittal checklist.

## 9.9 LOT SURVEYS

A residential lot survey is a type of city survey that maps a property showing its boundaries. Lot surveys show the relative location of a house, shed, fence, and other buildings or improvements on the property. Before new construction or improvements such as additions, fences, or garages are constructed, it is critical to review property lines and setbacks.

### 9.9.1 Common Steps for Lot Surveys

The local permitting process often indicates the level of survey detail required, but common steps include the following:

1. Research the parcel or tract legal descriptions and property lines.
2. Locate existing survey monumentation in the field.
3. Set missing lot corners and monuments for homeowners review.
4. Prepare and draft a lot survey exhibit (may require the above information, together with proposed improvements for client and municipality review if needed).

Note that Item 3 above falls into the category of the Practice of Land Surveying as per NDCC 43-19.1-02 (8) (see also the chapter "Definitions" in this manual). Therefore, a licensed land surveyor in North Dakota must review it.

Local permitting may also require the following:

- Lot dimensions
- Legal description
- Site address
- Home owner or builders name
- Setback lines with dimensions
- Non access control lines
- Building footprint proposed or existing and driveway location and dimension
- Location of existing street light poles, junction boxes, hydrants, storm sewer inlets and utility boxes
- Other physical items on the property deemed pertinent to the property.



All lot survey exhibits must be stamped, dated, and signed by a licensed Professional Land Surveyor in North Dakota.

## 9.10 ELEVATION SURVEYS

An elevation survey is a type of survey that determines the elevation of an unknown point by referencing it to a known point elevation point called a benchmark, BM, or vertical control point on a known or published datum. The Surveyor measures the vertical difference between the two points and applies the proper values. This is done in topographic surveys and road surveys along with house and sewer construction projects.

### 9.10.1 Important Guidelines for Elevation Surveys

- North Dakota requires that a licensed Professional Surveyor determine the elevation of the home or property in relation to the current flood elevation values and datum for that area of work.
- When completing an Elevation Survey, state the vertical datum being used such as NGVD 29 or NAVD 88. When using GPS to measure the vertical distances it is also important to note the Geoid model being used.
- 

### 9.10.2 Elevation Certificates

Elevation certificates can be of varying types according to the agency requesting them. These can be requested from the city, banks, title companies, county, tribal, state, or federal levels, and the information required on these certificates can vary from agency to agency. You must check with the agency requiring these certificates to determine the content. Usually the agency has an example or copy of the information. As stated above, one of the most important requirements of this type of certificate is that you state the datum used for the vertical information (NGVD29 or NAVD88), and for vertical measurements done with GPS that you state the Geoid model used.

### 9.10.3 FEMA Elevation Certificates

FEMA elevation certificates are used for flood information on the federal level and for flood insurance purposes. Some cities and counties have adopted these certificates for reference in the elevation certificate process. To get the most recent FEMA Elevation certificate and instructions go to <https://www.fema.gov> and look for form FEMA 81-31 and the instructions for it.



### 9.11 PLOT PLANS

A plot plan is an architecture, engineering, and/or landscape architecture plan drawing that shows the buildings, utility runs and locations, equipment layout, the position of roads, and other constructions of an existing or proposed project site at a defined scale.

When combined with a boundary survey, a plot plan should adhere to provisions of the regulatory agency, and to those provisions of "Boundary Surveys" that are not in conflict with the provisions of the regulatory agency. If a boundary survey is not performed and monuments are not placed, then the provisions of the regulatory agency apply. If reference or measurements are made to the property boundary line or lines this falls under the definition of the Practice of Land Surveying and must be done or supervised by a North Dakota licensed Professional Land Surveyor.

Make sure that the user understands the purpose and limitations of this type of plan. We suggest that the words "**THIS IS NOT A BOUNDARY SURVEY**" appear prominently on the map.

### 9.12 RURAL SURVEYS

(See Certificate of Surveys (COS) and Irregular Tracts in the Index as well as Auditors Lot surveys and Cadastral surveys in this chapter (page 37 & 38). See also Outlots and Sublots in the chapter "Definitions.")

### 9.13 MORTGAGE SURVEYS

Mortgage surveys are typically less detailed than lot surveys. However, they are still subject to a number of guidelines:

#### 9.13.1 Mortgage Loan Survey Requirements

1. A Registered Land Surveyor must sign, stamp, and date the mortgage loan survey.
2. All mortgage loan surveys should contain the following information:
  - Title (mortgage loan survey).
  - North arrow accurately correlated to the courses shown on the property lines.
  - Indication of basis of bearings or azimuths when used.
  - A numerical scale.
  - Date of survey.
  - Visible encroachments.
  - Land description of the property.
  - Land Surveyors certification.



3. Mortgage loan surveys may also contain the following information:
  - Name of owner of the property or the name of the person who requested the inspection.
  - A descriptive location of the property by township name, township and range, city, or county, in addition to the land description.
  - Horizontal lengths of lines of the subject property wherein such lengths are the public record as in a deed or on a recorded plat.
  - Legend.
  - Easements located in accordance with descriptions furnished or as shown on a plat of record.
  - Lot and block numbers, and names of thoroughfares and waterways.
  - Dimensions of structures showing size and location together with the type of construction, obvious use, and street address, if any.
  - All property corner monuments found and identified as to character.
  - Known boundary or description gaps or overlaps. Gaps and overlaps should be dimensioned wherever possible.

## 9.14 CONDOMINIUM SURVEYS

A condominium survey includes a map and description of rights to land or space defined by state law and containing allocated interests, common elements, and independent use units. The form of ownership on these types of surveys are less than the whole. The fee ownership of separate portions of multistoried buildings by statute provides the mechanics and facilities for formal filing and recordation of a divided interest in real property, where the division is vertical as well as horizontal. The creation, survey, and definition of condominiums are governed by state law.

### 9.14.1 Condominium Laws

The North Dakota Century Code includes several laws of interest to anybody conducting surveys with condominiums. The following are the most relevant; however, **we strongly recommend you review all of NDCC chapter 47.04.1 in its entirety and any other codes and laws pertaining to condominiums.**

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**The NDSPLS has adopted the following as stated in NDCC 47-04.1**

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Condominium Ownership Of Real Property

**47-04.1-01. Definitions.** In this chapter, unless context otherwise requires:

1. "Common areas" means the entire project excepting all units therein granted or reserved.
2. "Condominium" is an estate in real property consisting of an undivided interest or interests in common in a portion of a parcel of



real property together with a separate interest or interests in space in a structure, on such real property.

3. "Interest" means the fractional or percentage interest or interests ascribed to each unit by the declaration provided for in section 47-04.1-03.
4. "Limited common areas" means those elements designed for use by the owners of one or more but less than all of the units included in the project.
5. "Project" means the entire parcel of real property divided, or to be divided into condominiums, including all structures thereon.
6. "To divide" real property means to divide the ownership thereof by conveying one or more condominiums therein but less than the whole thereof.
7. "Unit" means the elements of a condominium which are not owned in common with the owners of other condominiums in the project.

**47-04.1-02. Recording of declaration to submit property to a project.**

When the sole owner or all the owners, or the sole lessee or all of the lessees of a lease desire to submit a parcel of real property to a project established by this chapter, a declaration to that effect shall be executed and acknowledged by the sole owner or lessee or all of such owners or lessees and shall be recorded in the office of the recorder of the county in which such property lies.

**47-04.1-03. Contents of declaration.** The declaration provided for in section 47-04.1-02 shall contain:

1. A description or survey map of the surface of the land included within the project.
2. Diagrammatic floor plans of the structures built or to be built thereon in sufficient detail to identify each unit, its relative location and approximate dimensions.
3. A description of the common elements.
4. A description of the limited common elements.
5. The fractional or percentage interest which each unit bears to the entire project. The sum of such shall be one if expressed in fractions and one hundred if expressed in percentage.



**47-04.1-04. Declaration of restrictions.** The owner of a project, shall, prior to the conveyance of any condominium therein, record a declaration of restrictions relating to such project, which restrictions shall be enforceable equitable servitudes where reasonable, and shall inure to and bind all owners of condominiums in the project. Such servitudes, unless otherwise provided, may be enforced by any legal or equitable owner of a condominium in the project.

**47-04.1-05. Reference to declaration for description of unit and common elements.** All subsequent deeds, mortgages, or other instruments may describe the individual units, the common elements, the land, or limited common elements by reference to appropriate numbers or letters as they appear on the declaration provided for in section 47-04.1-03 without repeating in detail the description of the units, common elements other than the land, or limited common elements. The reference must include the book and page of the recorded declaration.

#### 9.15 WIND TOWERS

The Public Service Commission requires at least 1400 feet between a tower and an occupied dwelling. This is meant to protect the property owner from noise and shadows, and a possible tower collapse.

At this time there are lists of requirements by the North Dakota Public Service Commission (PSC), but no additional formal rules on wind towers.

#### 9.16 CELL TOWERS

At this time there are no formal rules or available information on rules for cell towers from the North Dakota Public Service Commission (PSC).

#### 9.17 EASEMENT SURVEYS

An easement describes a non-possessing interest or right held by one person in land of another whereby the first person is accorded partial use of such land for a specific purpose. An easement survey evaluates an interest in land created by grant or agreement that confers a right on owners (public or private) to some profit, benefit, dominion, or lawful use of the estate of another. An easement restricts but does not abridge the rights of the fee owner to the use and enjoyment of his or her land. Three types of easements exist: Surface, Subsurface, and Overhead. (See EXHIBITS #1,4,5,6 for a sample review). It is the intent of this manual to hold the same standards for easement surveys as is documented on the State of North Dakota Board of University and School Lands website <https://land.nd.gov/surface/right-of-way.aspx>. In the narrative the centerline will be shown in US feet or rods long, and the easement area contains acres, more or less. The easement area and location is further



described as illustrated in EXHIBIT which is attached to and is a part of the easement description. The strip of land will be described as XX feet wide with X feet on each side of the described following centerline.

The document creating the easement should define the scope of the easement. An easement generally can be used for only the purpose expressly stated in the document that created it. If the geographic extent or location of an easement is not described in the document creating it, the owner of the servient estate has the first right to designate its location.

Land Surveyors profession is specifically educated and trained in the preparation of land descriptions. A good land description is concise, clear and complete- thereby describing one unique, identifiable location on the surface of the Earth. The weight of authority has outlined that if a description can be located on the ground as a unique parcel by a competent surveyor, it is considered sufficient. Easements must contain specific legal descriptions of the property right transferred and the location thereof.

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**The NDSPLS has adopted the following as stated in NDCC 47-05-02.1.**

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**Requirements of easements, servitudes, or nonappurtenant restrictions on the use of real property.** Real property easements, servitudes, or any nonappurtenant restrictions on the use of real property, which become binding after July 1, 1977, shall be subject to the requirements of this section. These requirements are deemed a part of any agreement for such interests in real property whether or not printed in a document of agreement.

1. The area of land covered by the easement, servitude, or nonappurtenant restriction on the use of real property shall be properly described and shall set out the area of land covered by the interest in real property.
2. The duration of the easement, servitude, or nonappurtenant restriction on the use of real property must be specifically set out, and in no case may the duration of any interest in real property regulated by this section exceed ninety-nine years. The duration of an easement for a waterfowl production area acquired by the federal government, and consented to by the governor or the appropriate state agency after July 1, 1985, may not exceed fifty years. The duration of a wetlands reserve program easement acquired by the federal government pursuant to the Food, Agriculture, Conservation, and Trade Act of 1990 after July 1, 1991, may not exceed thirty years.



3. No increase in the area of real property subject to the easement, servitude, or nonappurtenant restriction shall be made except by negotiation between the owner of the easement, servitude, or nonappurtenant restriction and the owner of the servient tenement.

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**The NDSPLS has adopted the following as stated in NDCC 54-01-17.1.**

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**Granting Easements to State-Owned Land - Procedure.** A state agency may, when it deems such action to be in the best interest of the state, grant easements upon or across any real property which it administers and which is owned by the state for the use or benefit of a state institution under its jurisdiction. Any property rights transferred under the authority of this section must be transferred and conveyed by quitclaim instrument or easement executed in the name of the state of North Dakota by the governor and attested by the secretary of state. **Such quitclaim instrument or easement must contain specific legal descriptions of the property right transferred and the location thereof.**

**Surface Easement.** The right to use only the surface of the land; as for easements of access, flowage, or for rights of way.

**Subsurface Easement.** The right to use the land at a designated distance below the surface of the land; as for pipelines, electric and telephone circuits and cables etc.

#### 9.18 RIGHT OF WAY SURVEYS

A right of way is any strip or area of land, including surface, overhead, or underground, granted by deed or easement, for construction and maintenance according to designated use such as drainage and irrigation canals, ditches, electric power, telegraph and telephone, gas, oil, water, and other pipelines, highways, roadways, including right of portage, sewers, flowage or impoundment of surface water and tunnels.

Right-of-Way Surveys and Easement Surveys have the same sort of requirements and technically are the same. The statement in NDAC Chapter 28-02.1-13-01 has been adopted by the NDSPLS as the requirements for this type of survey and is stated in its entirety on page 47. These surveys which convey and easement or right-of-way having a term of five years or more must be retracable in each section of land over which they cross by using established subdivision or public land survey system monuments existing or placed at the time of the conveyance. (See EXHIBITS #1 & #8 for a reference).



## 9.19 PIPELINE SURVEYS

Pipeline surveys usually follow guidelines for either an easement or a right of way. (See Exhibits #1,#8,#9 for examples of pipeline surveys in a minimal accepted format.)

Pipeline surveys are a servitude and encumbrance on the use of real property. They therefore fall into the requirements of easements 47-05-02.1 and must be properly surveyed and described.

This NDCC is restated to show emphasis for both pipelines and right of way surveys.

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**The NDSPLS has adopted the following as stated in NDCC 47-05-02.1.**

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**Requirements of easements, servitudes, or nonappurtenant restrictions on the use of real property.** Real property easements, servitudes, or any nonappurtenant restrictions on the use of real property, which become binding after July 1, 1977, shall be subject to the requirements of this section. These requirements are deemed a part of any agreement for such interests in real property whether or not printed in a document of agreement.

- 1. The area of land covered by the easement, servitude, or nonappurtenant restriction on the use of real property shall be properly described and shall set out the area of land covered by the interest in real property.**
- 2. The duration of the easement, servitude, or nonappurtenant restriction on the use of real property must be specifically set out, and in no case may the duration of any interest in real property regulated by this section exceed ninety-nine years. The duration of an easement for a waterfowl production area acquired by the federal government, and consented to by the governor or the appropriate state agency after July 1, 1985, may not exceed fifty years. The duration of a wetlands reserve program easement acquired by the federal government pursuant to the Food, Agriculture, Conservation, and Trade Act of 1990 after July 1, 1991, may not exceed thirty years.**
- 3. No increase in the area of real property subject to the easement, servitude, or nonappurtenant restriction shall be made except by negotiation between the owner of the easement, servitude, or nonappurtenant restriction and the owner of the servient tenement.**



**The NDSPLS has adopted the following as stated in NDCC 28-02.1-13**

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### **DOCUMENTS USED TO CONVEY REAL PROPERTY OR ANY INTEREST THEREIN**

**28-02.1-13-01. Survey requirements for preparation of legal descriptions and conveyance of property.** Any registrant preparing a description, including without limitation a legal, property, or boundary description for, or assisting in the filing of, a document that will, or may, be used to convey real property or any interest therein, other than easements, including without limitation an auditors plat, outlot, deed, or conveyance of rights of way, must conduct a survey of the property being conveyed and comply with all the requirements related thereto contained in North Dakota Century Code sections 40-50.1-01 and 40-50.1-02.

Descriptions used in conveyances of rights of way in which possession of title is obtained may be prepared without the setting of all exterior monuments if all four of the following requirements are met:

1. The rights of way are retraceable by using established monuments;
2. Exterior monuments are set wherever there is a change of width to the rights of way;
3. Exterior monuments are set wherever there is a change in direction of the rights of way other than changes of direction at section corners; and
4. Monuments are set at intersections of rights of way with section lines or section line rights of way.

Descriptions used in the conveyance of easements having a term of five years or more must be retraceable in each section of land over which they cross by using established subdivision or public land survey system monuments existing or placed at the time of the easement conveyance.

**[History:** Effective October 1, 2004; amended effective July 1, 2009.]

#### **9.20 ROADWAYS**

For information on roadway surveys, see Exhibit #7 for Right of Way checklist information.



### 9.21 AS-BUILT OR POST CONSTRUCTION SURVEYS

As built and post construction surveys are performed after a construction project has been completed to re-establish the principal horizontal and vertical control points and to locate all structures and improvements. See also Record Drawings or As-Built Drawings EXHIBIT # 3.

### 9.22 ALTA SURVEYS

The American Land Title Association (ALTA) is a national trade association representing the interests of the abstract title and title insurance industries. This organization's requirements change from time to time. When conducting surveys for titles, we recommend that you check with American Congress on Surveying and Mapping (ACSM) and ALTA ([alta.org](http://alta.org)) for the current minimum standards and detail requirements.

### 9.23 LAND TITLE SURVEYS

Land title surveys are a comprehensive type of boundary survey that addresses issues of concern to lenders and title companies. These surveys should adhere to all provisions of "Minimum Standard Detail Requirements for Land Title Surveys," described in the current ALTA/ACSM guidelines (see Alta Surveys for more information). If reference or measurements are made to the boundary or boundary lines this falls under the Practice of Land Surveying and requires this work to be completed by a Licensed Surveyor in North Dakota or under his/her supervision.

### 9.24 RECORD DRAWINGS OR AS-BUILT DRAWINGS

A survey performed after a construction project has been completed to re-establish the principal horizontal and vertical control points and to locate all structures and improvements. Refer to the Record Drawing or the As-Built Survey Specifications (A Post Construction Survey) ACSM Definitions revised 2005 for guidelines.

Also see Exhibit #3 for items to consider for inclusion to an as-built plats for roads, power lines, cables, pipe lines.

### 9.25 TOPOGRAPHICAL SURVEYS

Topographical surveys determine the configuration (relief) of the surface of the earth (ground) and the location of natural and artificial objects.

#### 9.25.1 Guidelines for Topographical Surveys

Please check the definition of the Practice of Land Surveying on page 11. Definition 3.1. This is also NDCC 43-19.1-02 (8). for reference.



1. When the topographical map is combined with a boundary survey, the certification shall be signed by a North Dakota Registered Land Surveyor and adhere to all provisions of "Boundary Surveys".
2. When there is no boundary survey, all topographic maps shall contain the following information:
  - a. Title (avoid use of the word "survey"; Topographic Map is suggested).
  - b. A north arrow.
  - c. A numerical scale.
  - d. Date.
  - e. Contour Interval.
  - f. Vertical Datum (NGVD 1929 or NAVD88) or Local Datum. Be specific and state the datum of the project.
  - g. Bench Mark.
3. Topographic Maps may also contain the following information:
  - a. Name of owner of the property or the name of the person who requested the map.
  - b. Identify the location of the property.
  - c. A graphic (bar) scale.
  - d. Legend.
  - e. Indication of basis of bearings or azimuths when used.
  - f. Names of thoroughfares and waterways.
  - g. Size and location of structures together with the type of construction, obvious use, and street address, if any.
  - h. Identify the person and/or firm who prepared the map.

Make sure that the user understands the purpose and limitations of this type of map. We suggest that the words "**THIS IS NOT A BOUNDARY SURVEY**" appear prominently on the map.

## 9.26 PRELIMINARY SURVEYS

A preliminary survey is conducted to obtain data from which to develop a plan. It is made in the detail, to the accuracy, and of the scope for accomplishing adequately a design and preparing detailed construction plans. The words "**PRELIMINARY SURVEY**" should be prominently displayed on the face of the plan.

### 9.26.1 Content And Statements

Preliminary surveys should contain the items listed above in Topographical Surveys, parts 2a-g and 3a-3h, as well as evidence of the following:



- **Records research**, showing that all records relating to the property have been researched and that copies have been entered into the survey field files.
- **Monuments** have been recovered in the field and location and description of those monuments have been noted as to size, type, and location.
- **Rights of Way and Access** has been determined for the property, and that distances to those lines have been surveyed and noted.
- **Street names** have been noted and marked along with street widths, abutted properties, and private roadways and other easements.
- **Visible evidence** of physical access such as curbs, driveways, etc. and potential encroachments without expressing a legal opinion as to ownership or nature.

#### 9.27 COMPILED MAPS

The purpose of this map will dictate what generally will be shown.

1. All compiled maps shall contain the following information:
  - Title (do not use the word "survey").
  - A north arrow.
  - A numerical or graphic scale.
  - Date
2. Compiled maps may also contain the following information:
  - Name of owner or client.
  - A location map and/or a descriptive location of the property by township, city or county.
  - Legend.
  - Description of source material.

Make sure that the user understands the purpose and limitations of this type of map. We suggest that the words "**THIS IS NOT A BOUNDARY SURVEY**" appear prominently on the map.



## 10 GPS SURVEYS

A global positioning system is a navigation and positioning system based on a constellation of 24 satellites, operated and maintained by the Department of Defense. The Global Positioning System (GPS) is a U.S. owned utility that provides users with positioning, navigation, and timing (PNT) services. The satellites are positioned in six earth-centered orbital planes. The system can support a constellation of up to 30 satellites in orbit.

A real-time differential GPS (RTD GPS) survey is carried out with a radio transmitter at the base station. The radio transmissions contain range rate corrections as well as pseudorange corrections for specific epochs, which are sent to the roving receivers in near real time.

A real-time kinematic GPS (RTK GPS) survey method is similar to differential GPS in which errors are eliminated using carrier phase-shift measurements. Pseudorange errors are also computed by a receiver at a base station and transmitted to roving receivers. When conducted with dual-frequency receivers and at least four satellites, near centimeter accuracies are provided.

### 10.1 GPS Guidelines

The guidelines outlined in this manual consist of field data acquisition methods, field survey operations and procedures, data processing and analysis methodologies, and documentation. Using these guidelines and the manufacturer's specifications provide a means for the surveyor to evaluate the survey and to verify the specified accuracy standard has been achieved.

These guidelines are designed to ensure a survey performed with GPS technology is repeatable, legally defensible, and referenced to the National Spatial Reference System (NSRS) by providing the following:

- a). Elimination or reduction of known and potential systematic error sources.
- b). Occupational (station) and observational (baseline) redundancy to clearly demonstrate the stated accuracy.
- c). Documentation of baseline processing, data adjustment, and data analysis that demonstrates the recommended procedures and required accuracy.
- d). Compliance with Bureau of Land Management Manual of Instructions for the Survey of the Public Lands of the United States, 2009 or current edition and state laws.



Any variations from these guidelines should be designed to meet the above criteria and to achieve the accuracy standard of the survey as required by this document. All variations shall be documented in the project report and field notes.

**Note:** GPS survey guidelines continually evolve with the advancements in equipment and technologies. Changes to these guidelines are expected as these advancements occur. The size, scope, and site conditions of a project may also require variations from these guidelines.

Source <http://www.gps.gov/systems/gps/>

## 10.2 GNSS SURVEYS

The term “global navigation satellite system” (GNSS) refers to a constellation of satellites providing signals from space transmitting positioning and timing data. By definition, a GNSS provides global coverage.

GNSS receivers determine location by using the timing and positioning data encoded in the signals from space. The United States Global Positioning System (GPS) and Russia’s Global’naya Navigatsionnaya Sputnikovaya Sistema (GLONASS) are examples of GNSS. Europe will have a constellation of 30 Galileo satellites to be used in the GPS and GLONASS systems.

## 10.3 COORDINATE SYSTEMS, DATUMS, GEOID MODELS, AND UNITS OF MEASUREMENT IN NORTH DAKOTA

There are many types of surveys that require different criteria in this state. A specific coordinate system may need to perform the survey based on the client or agencies scope of work or to properly retrace an existing survey. These are common coordinate systems used in North Dakota.

### 10.3.1 Local Coordinate System

Local coordinate systems are user defined systems typically found in large building or construction sites, power plants, gasification plants, some counties, or in older surveys which did not utilize GPS receivers. Users and designers designate a basis of bearing (usually grid north) and assign an X and Y value. The Z value is assigned to a local benchmark or feature.

### 10.3.2 Universal Transverse Mercator (UTM)

As stated previously North Dakota has two UTM zones. Zone 13 (North) between 108° and 102° and in Zone 14 (North) between 102° and 96° longitude. Universal Transverse Mercator projections are best utilized by large projects which cover a majority of the state heading in any direction. The UTM is a worldwide coordinate system and in the US the unit of measurement is the US foot for establishing coordinates. Use the GRS80



Ellipsoid if using NAD 83 coordinates, and for North America, Clarke's Ellipsoid of 1866 for using NAD 27.

#### 10.3.3 NAD 27

Most surveys prior to 1983 were completed in the NAD 27 and utilized the US Survey feet. There are still many projects and facilities that utilize NAD 27 as their primary coordinate system. NAD 27 is separated into two zones, the North Zone 3301, and the South Zone 3302.

#### 10.3.4 NAD 83

Most surveys performed after 1983 are completed in NAD 83 and utilize International feet. NAD 83 is also separated into two Zones, the North Zone 3301, and the South Zone 3302.

These Zones are defined in Chapter 5.1.2 Coordinates.

There are 3.28083990 International feet = 1 meter.

There are 3.28083333 US feet = 1 meter.

Visit various municipality's links for specific coordinate system projections.

Bismarck <http://www.bismarcknd.gov/DocumentCenter/Home/View/3262>  
Minot

<http://www.minotnd.org/pdf/engineering/survey/Geodetic%20Control%20Network.pdf>

#### 10.3.5 State Plane Coordinates

See Chapter 5.1.2 Coordinates for more details on this.

### 10.4 VERTICAL INFORMATION

#### 10.4.1 National Geodetic Vertical Datum of 1929 (NGVD 29)

This was a determination of the mean sea level datum that has been used as a standard datum for heights. The sea level is subject to some variations from year to year, but as the permanency of any datum is of prime importance, a sea level datum should after adoption, be maintained indefinitely even though it may differ slightly from later determinations of mean sea level based on longer series of observations. Most USGS bench marks are listed on the NGVD 29.

#### 10.4.2 North American Vertical Datum of 1988 (NAVD 88)

A vertical control datum determined by a minimal constraint adjustment of leveling observations taken throughout Canada, United States, and Mexico.

The height of the primary tidal benchmark at Father Point/Rimouski, Quebec is held fixed.



This is the vertical datum used most today usually with a Geoid reference listed behind the datum ie NAVD 88 (Geoid 03) or (Geoid 12A) etc. In 1993 NAVD 88 was affirmed as the official vertical datum in the National Spatial Reference System (NSRS) for the Conterminous United States and Alaska. Source [http://www.ngs.noaa.gov/PUBS\\_LIB/NAVD88/navd88report.htm](http://www.ngs.noaa.gov/PUBS_LIB/NAVD88/navd88report.htm)

#### 10.4.3 GEOID MODELS

The geoid model is continuously improving as more and more data becomes available. It is important to use a proper geoid used at the time when retracing previous surveys.

Geoid 12A	-Current geoid. Active since 2012
Geoid 09	-Replaced by Geoid 12A. Active from Sept. 2009 to 2012
Geoid 03	-Replaced by Geoid 09. Active from 2003 to 2009.

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**The NDSPLS gratefully acknowledges this information shared for this GPS segment of the *Guidelines for the Practice of Land Surveying in North Dakota* from the USDA Forest Service and the USDI Bureau of Land Management, and PLS Robert Kohler with Basin Electric**

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#### 10.5 STANDARDS FOR POSITIONAL ACCURACY

The following standards are for GPS technology only and shall be used to define the minimally acceptable levels of differential relative positional accuracy required of a Government Cadastral Survey.

Table 1: Local Accuracy Standards

95% Confidence Circle	Application
Less than 0.050 (m)	Cadastral Project Control
Less than 0.100 (m)	Cadastral Measurements

**Local Accuracy** is an average measure (e.g., mean, median, etc.) of the relative accuracies of the coordinates for a point with respect to other adjacent points at the 95% confidence level.

Table 2: Network Accuracy Standards

95% Confidence Circle	Application
Less than 0.100 (m)	Cadastral Project Control
Less than 0.200 (m)	Cadastral Measurements



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The **Network Accuracy** of all cadastral measurements should be reported per the Federal Geographic Data Committee (FGDC) Geospatial Positioning Accuracy Standards to show the relationship of the cadastral survey relative to the National Spatial Reference System.

A least squares adjustment or other multiple baseline data analysis is performed to produce a weighted mean average to verify the required level of positional accuracy has been achieved.

#### 10.5.1 ABOUT THESE GUIDELINES

The guidelines outlined in this document consist of field data acquisition methods, field survey operations and procedures, data processing and analysis methodologies, and documentation. The use of these guidelines and the manufacturer's specifications provide a means for the surveyor to evaluate the survey and to verify the specified accuracy standard has been achieved.

These guidelines are designed to ensure a survey performed with GPS technology is repeatable, legally defensible, and referenced to the *National Spatial Reference System (NSRS)* by providing for the following:

- Elimination or reduction of known and potential systematic error sources.
- Occupational (station) and observational (baseline) redundancy to clearly demonstrate the stated accuracy.
- Documentation of baseline processing, data adjustment, and data analysis that demonstrates the recommended procedures and required accuracy.
- Compliance with the *Bureau of Land Management Manual of Instructions for the Survey of the Public Lands of the United States, 2009* and state laws.

**Note.** GPS survey guidelines continually evolve with the advancements in equipment and techniques. Changes to these guidelines are expected as these advancements occur. The size, scope, and site conditions of a project may also require variations from these guidelines.

Any variations from these guidelines should be designed to meet the above criteria and to achieve the accuracy standard of the survey as required by this document. All variations shall be documented in the project report.

#### 10.6 FIELD DATA ACQUISITION METHODS

A variety of GPS field data acquisition methods may be used for Cadastral Measurements and Cadastral Project Control.



Field Documentation Items for a GPS survey project.

- Project Report
- Project sketch or map showing independent baselines used to create the network
- Station descriptions
- Station obstruction diagrams
- Observation logs
- Raw GPS observation (tracking) data files
- Baseline processing results
- Loop closures
- Repeat baseline analysis
- Least squares unconstrained adjustment results
- Least squares constrained adjustment results
- Final coordinate list

Field survey operations should be performed using the manufacturer's recommended receiver settings and observation times. Operating under adverse conditions may require longer observation times than specified by the manufacturer. It is important to note antennae heights on both the rover and the base receivers, and the measure up point of referenced is coordinated with the data collector. Adjustable height rods and tripods should be checked regularly to check for slippage. Plumb centers should be checked periodically for proper adjustment.

#### 10.6.1 Static Positioning

Static positioning typically uses a network or multiple baseline approach for positioning. It may consist of multiple receivers, multiple baselines, multiple observational redundancies, and multiple sessions. A least squares adjustment of the observations is required if there are multiple occupations and observations. This method provides the highest accuracy achievable and requires the longest observation times. Static positioning is primarily used for ties to the National Spatial Reference System (NSRS) when observing Cadastral Project Control. This method may also be used for the Cadastral Measurement portion of a cadastral survey. Post-processing a single observation can be achieved using OPUS (see OPUS in Chapter 10.8). Static positioning is primarily applied when establishing a first-order Control Network where published NGS monuments are not present or greater than 12 miles from a project location.

Station Site Selection is the most important factor for determining GPS station location for a project's needs. Stations should be situated in locations which are relatively free from horizon views and obstructions. In general a clear view of the sky is required. Locations near strong radio



transmissions or electrical transmission lines should be avoided because of radio frequency transmitters, including cellular phone equipment.

#### 10.6.2 Fast-Static Positioning

This method requires shorter occupation times (i.e., 5 to 20+ minutes) than static positioning and may use a radial baseline technique, network technique, or a combination of the two. Fast static requires a least squares adjustment or use of processing software capable of producing a weighted mean average of the observations. Fast-static positioning may be used for observing both the Cadastral Project Control and the Cadastral Measurements of a cadastral survey. Field procedures are the same as Static only with shorter occupation times.

#### 10.6.3 Post-Processed Kinematic (PPK) Positioning

Post processed kinematic survey methods provide the surveyor with a technique for high production Cadastral Measurements and can be used in areas with minimal obstructions of the satellites. PPK uses significantly reduced observation times compared to static or fast-static observations. This method requires a least squares adjustment or other multiple baseline statistical analyses capable of producing a weighted mean average of the observations. PPK positioning is used for observing the cadastral.

#### 10.6.4 Real-Time Kinematic (RTK) Positioning

Real-time kinematic positioning is similar to a PPK or a total station radial survey. RTK does not require post-processing of the data to obtain a position solution. This allows for real-time surveying in the field.

This method allows the surveyor to make corner moves (stake out) similar to total station/data collector methods. RTK positioning is used for the Cadastral Measurement portion of a Cadastral Survey.

Real-time surveying technology may utilize dual-frequency (L1/L2) techniques for initialization. The subsequent RTK measurements are then accomplished using the L1 carrier phase frequency and are subject to the baseline length limitations of 10km. New RTK measurement technologies can now use the L1/L2 frequencies coupled with improved atmospheric models to determine baseline lengths. This results in longer baselines that can be measured using RTK.

**Caution: Operations under a forest canopy using PPK or RTK methods are not recommended. However, these methods are acceptable if they result in a solution, which meets the survey standards.**



The surveyor must make an informed decision when choosing the appropriate methodology to be used in a particular project area. For survey projects in a forest canopy environment with marginal sky visibility, static, or fast-static GPS methods or even conventional optical methods should be considered in-lieu of using RTK or PPK.

#### 10.6.5 Cadastral Project Control

Cadastral Project Control is the network of the GPS stations, tied to the NSRS, which is surveyed to control all subsequent GPS Cadastral Measurements.

The Cadastral Project Control network shall be established by either static or fast-static survey methods.

The Cadastral Project Control network may be established at the same time the Cadastral Measurements are made. However, the points and resulting baseline vectors used in the Cadastral Project Control network shall be processed to derive the baseline solutions and be adjusted by least squares independently of the observed Cadastral Measurements.

The Cadastral Project Control network is designed to meet the following purposes:

- Provides a framework to reference the survey to a datum, a mapping projection, and the NSRS.
- Supports registration of the Cadastral Measurements into the *Geographic Coordinate Data Base* (GCDB).
- Serves as the basis for all subsequent GPS Cadastral Measurements.
- Allows for reporting of the Network Accuracy for the Cadastral Measurements per FGDC Geospatial Positioning Accuracy Standards.
- A well-designed Cadastral Project Control network will offer the surveyor more flexibility for using fast static, kinematic, and RTK survey methods for the Cadastral Measurement portion of a survey. It provides an adequate amount of reference (base) station locations, ties the Cadastral Measurement points together, allows for expanding area of the survey, and provides accurate checks throughout survey project.
- The number of stations in the Cadastral Project Control network depends upon factors such as project size, topography, positioning method used, and access. A minimum of two or more Cadastral Project



Control stations should be established as a reference for the Cadastral Measurements.

- All Cadastral Project Control networks should be referenced (tied) to at least two High Accuracy Reference Network (HARN) stations/High Precision Geodetic Network (HPGN) or Continuous Operating Reference Station (CORS) of the NSRS.
- In the absence of HARN/HPGN or CORS stations, other GPS control stations that are referenced to the NSRS and published by or available through other federal, state, or local agencies may be used. The use of such stations shall be evaluated by the surveyor regarding the relationship to the NSRS before inclusion into the Cadastral Project Control network and prior to any Cadastral Measurements occurring.
- The current national reference datum is the North American datum of 1983 (NAD83) of 1986. All control and project information should be referenced to the most current epoch of NAD 83 for example: Wyoming NAD 1983 (1993).

All Cadastral Project Control networks should conform to the following:

- Be referenced to two or more NSRS or other published horizontal control stations, located in two or more quadrants, relative to the cadastral project area.
- Points are established by two or more *independent baselines*.
- Contain loops of a minimum of three baselines.
- Baselines have a fixed integer double difference solution or adhere to the manufacturer's specifications for baseline lengths exceeding the fixed solution criteria.
- All stations in the cadastral project control network should have two or more *independent occupations*.
- The Cadastral Project Control network must be a geometrically closed figure. Therefore, single radial (spur) lines or side shots to a point are not acceptable.

#### 10.6.6 Cadastral Measurements

Cadastral Measurements are the measurements used to define the location of PLSS corners and boundaries. Cadastral Measurements are referenced to the Cadastral Project Control coordinates or by direct ties to the NSRS.



All Cadastral Measurement observations, except RTK, should conform to the following:

- Be constrained to two or more Cadastral Project or NSRS stations, which are located in two or more quadrants relative to the cadastral project area.
- Points are established by two or more independent baselines.
- Contain loops of a minimum of three independent baselines.
- Baselines have a fixed integer double difference solution or adhere to the manufacturer's specifications for baseline lengths exceeding the fixed solution criteria.
- Any station pair used as azimuth or bearing reference for use with conventional survey measurements during the course of a cadastral survey should be included in a network or measured with a minimum of two independent vectors using the RTK techniques described below.
- All stations in the cadastral measurements shall have two or more independent occupations.
- Single radial (spur) lines or side shots to a point are not acceptable.

#### 10.6.7 RTK CORNER MEASUREMENTS

Corner measurements are usually made with RTK using one or more base and one or more rover receiver configurations.

RTK corner measurements shall be made after the system setup check procedures have been completed.

Specified observation times for the highest level of accuracy using RTK for corner measurements as per manufacturer's recommendations are recommended (for example, 180 seconds of time or when the horizontal (0.02m) and vertical (0.050m) precision has been met for a Trimble kinematic control point).



Under optimal conditions (clear sky, low RMS), a deviation from the manufacturer's suggested times is appropriate (for example, a corner may be observed using 30 seconds of time and 20 epochs of measurement data). However, observation times should be set to account for field conditions, measurement methods (i.e., Trimble "topo point" or "kinematic control point"), and the type of measurement checks being performed.

#### 10.6.7.1 RECOMMENDED METHODS FOR RTK CORNER MEASUREMENT

One method is to observe the unknown point two or more times with the same point name (e.g., 100700) and use a duplicate point tolerance measurement criteria of 2.5 cm. When observing these measurements, the antenna shall be inverted and the receiver reinitialized between observations.

Another method at each found corner location or temporary point (unknown position), two baselines measurements (M1 and M2) are stored to the data collector or receiver for a specified number of seconds or epochs to meet a specified level of precision (for example, the time requirement for a Trimble kinematic control point) depending upon manufacturer's recommended procedures.

Observation time may be increased due to the constraints of on-the-fly (OTF) post-processing kinematic (i.e., 200+ sec) if the field data is post-processed as a check.

- The antenna should be inverted to force a loss of satellite lock, in between the M1 and M2 measurements, to force the system to reinitialize. The point values resulting from the first baseline measurement is stored and labeled (e.g., 100700M1), and the point resulting from the second baseline measurement is stored and labeled (e.g., 100700M2).
- A field check of the level of accuracy between the measurements may be done by an inverse between M1 and M2. The resulting inverse distance should be less than the Duplicate Point Tolerance of 2.5 cm.

**Note:** The *Cadastral Measurement Tolerance* of 8.6 cm is the maximum acceptable distance for M1– M2 inverse. It should be accepted only under extremely poor GPS conditions due to tree cover, multipath, etc. This worst-case condition should only be encountered in the most marginal field conditions for RTK surveys.



The Cadastral Measurement Tolerance value of 8.6 cm is derived from standard error propagation relationships. It is based on the following formula, the square root of the sum of the squares of the Cadastral Measurement Tolerance (8.6 cm) and the maximum allowable error of the Cadastral Project Control (5cm) should approximately equal the maximum allowable error budget of the Cadastral Measurements (10cm).

The baseline measurements (i.e., M1/M2) to the found corner locations or temporary points shall be verified by at least one of the following methods (i.e., static, fast-static, PPK or RTK).

Perform a check measurement (M3) from the same Cadastral Project Control station at a time at least 15 minutes after the M1 and M2 measurements are taken.

#### 10.6.7.2 RTK CALIBRATIONS

A calibration or site registration is needed in real-time surveying (RTS) in order to relate GPS positions that are measured in terms of the World Geodetic System 1984 (WGS-84) to local grid coordinate projections such as UTM, State Plane Coordinates, or a local North- East- Elevation (NEE) system. Calibrations are not applicable to static or fast-static surveys. A calibration should be used on a project whenever new points are to be staked out. The accuracy of points to be staked out will depend on the accuracy of the calibration.

A calibration is based on a set of points that have 3D coordinates in both WGS-84 and local grid coordinate projection system. The quality of the calibration will be affected by the accuracy and consistency of the GPS coordinates of the points. The Cadastral Project Control points tied to the NSRS should be used as the basis of any calibration.

The number of points that can be used in a calibration is manufacturer and software dependent. Smaller section sized projects may be calibrated with one 3D point. However, for larger several sections to township-sized projects, four 3D points are recommended. Calibration points should be well distributed around the project exterior.

Projects may be calibrated by two methods: 1) In the field in the data collectors or 2) In the network adjustment and uploaded to the data collector. The later procedure is recommended for large projects. The calibration computation summary should be examined for reasonable results in the horizontal scale, maximum vertical adjustment inclination, and the maximum horizontal and vertical residuals. The RTK System Check can be used to verify the accuracy of the calibration.



#### 10.6.7.3 RTK CORNER MOVES (STAKEOUT)

RTK technology allows the surveyor to make a corner move or stakeout from a known position to an unknown (calculated) position relative to the controlling corners for a PLSS survey or resurvey.

The system check may be done at any time during the survey to detect for blunders and the initialization quality of the survey prior to making any RTK observation for Cadastral Measurements and prior to making any corner moves.

**Note:** Caution should be exercised when using grid coordinates for stakeout. It is important to insure the appropriate corrections for convergence, elevation, and distance are accounted for relative to the rules of the PLSS.

To make a corner move using RTK, we recommend the following procedure:

1. Navigate to the calculated corner location (e.g., 140700CP) using coordinates. For example, navigate "from" station number (100700) and "to" station number (140700CP).
2. Take a measurement (e.g., 140700M1), inverse between M1 and compare to the calculated position (e.g., 140700CP) and move the remaining distance and direction to the true (calculated) location as necessary.
3. Repeat as required until satisfied you are at the position; then store M1 and overwrite previously stored point.
4. Force loss of satellite lock and initialization by inverting the rover antenna. Reinitialize and take another measurement (e.g., 140700M2) and store.
5. Inverse between the measured one (140700M1) and the measured (140700M2). If the measured positions (M1 and M2) are within the duplicate point tolerance of the calculated position, then the initializations and measurements are correct. Note, these M1 and M2 measurements are of a shorter duration (30 seconds).
6. Set the monument at the true corner location.
7. Take a measurement on the set monument (e.g., for 180 seconds) and store the position with a different name (e.g., 140700). Optionally, set the receiver or data collector to store data for subsequent post-processing.



8. As a check, inverse from the stored position (e.g., 140700) to the calculated corner position to determine the set true corner location; next inverse to the controlling corners and check the bearing and distance to insure the correct procedures were followed. The established corner location should be within the defined local spatial accuracy standards required of the survey.

## 10.7 REPORTING BEARINGS AND DISTANCES

A Basis of Bearing for a Government Cadastral Survey, when using GPS technology shall be expressed as "Geodetic Bearing or Azimuth." This bearing or azimuth shall be determined at the midpoint of the observed line as the "mean" between the Normal Section Forward Azimuth (NSFA) and the Normal Section Back Azimuth (NSBA) between points.

All ground distances shall be determined at ground elevation, except where the requirements are for sea level, using the appropriate geoid model to determine the geoid separation. For a cadastral survey, the height above the geoid and the orthometric height shall be considered the same.

## 10.8 SINGLE BASE: ONLINE POSITIONING USER SERVICE (OPUS)

OPUS is a simplified quality-assured service used to process static GPS data, and is well supported by the NGS ([www.ngs.noaa.gov/OPUS/about.html/](http://www.ngs.noaa.gov/OPUS/about.html/)). The NGS has provided OPUS to process single-base GNSS data since 2002. The online service allows surveyors to collect static GNSS data at a known or unknown location, submit the data to NGS through an online interface, and receive quality processed positional coordinates through email minutes later.

OPUS processes GPS data using CORS, which are maintained by NGS. The user submits a static GPS data set collected at a 1-, 2-, 3-, 5-, 10-, 15-, or 30-second interval spanning from 15 minutes to 48 hours. The user must also define the correct receiver antenna type that was used to collect the data, the receiver antenna height relative to the NGS defined antenna reference point (ARP), and a valid email address.

OPUS accepts many file types that are automatically converted into RINEX. Traditional OPUS-Static (OPUS-S) processes the user's file against three CORS using the Program for the Adjustment of GPS Ephemerides (PAGES) software. PAGES is a NGS program that performs vector reduction to process GNSS base lines. PAGES processes the GNSS file using individual CORS and determines a position. The final coordinates reported are an average of the three CORS independent single-baseline solutions.



Peak-to-peak errors are reported with the final solution. Peak-to-peak errors represent the difference between the maximum and the minimum value of the coordinates obtained from the three baseline solutions.

In addition, the final report describes the percent of observations recorded in the data file that were used in processing, percentage of ambiguities fixed, and the overall RMS. The percent of observations used indicates how many of the recorded observations were of sufficient quality to include in the analysis. This number will be lower if the sky view at the benchmark was not clear, multipath errors were recorded in a number of the observations, there was movement of the tripod, or there were other error sources that might make the observations poor.

It is important to understand that OPUS-S attempts to fix phase ambiguities to their integer value (fix integers), identifies the percentage of ambiguities that OPUS-S “thinks” it fixed correctly, and reports that as a percentage of all ambiguities. The overall RMS represents the precision of a solution and it is calculated as the square root of the average mean squared error from the final coordinate to each of the single baseline coordinates. Because all processing of the GNSS data is performed through the OPUS website using CORS as control points, the user can benefit from time savings in a number of areas:

- No field trips for reconnaissance and “ground truthing” benchmarks.
- No time spent in the office designing a network survey.
- No additional survey data collected on benchmarks.
- No data processing using proprietary software.

Traditional OPUS-S required a minimum of 2 hours of static data to ensure most effective results. NGS has expanded OPUS capabilities to include sessions as short as 15 minutes by developing OPUS Rapid Static, or OPUS-RS, which will process data sets from 15 minutes to 2 hours .

OPUS-RS solutions are computed differently than described above for OPUS-S. OPUS-RS takes six steps to resolve coordinates for a user’s data file, and the primary processing is completed using Rapid Static GPS (RSGPS) software. Before running RSGPS, improved positional coordinates are determined for the location of the GNSS receiver by incorporating the nearest CORS. Once this is accomplished, RSGPS is run to determine integer ambiguities, tropospheric refraction parameters, and double difference ionospheric delays at the chosen CORS. Ionospheric delays are interpolated to the GNSS receiver position before a least squares adjustment is used to solve for the positional coordinates.



## 10.9 QUALITY ASSURANCE

Whether using OPUS-S or OPUS-RS, the user must consider solution quality requirements of the project. Typically, OPUS-S can resolve centimeter-level positions as indicated primarily by the peak-to-peak differences. The percent of observations used and ambiguities fixed, coupled with overall RMS, should be evaluated to assess the solution quality. Quality solutions from OPUS-S should have:

- Less than 5 cm peak-to-peak errors.
- Greater than 90 percent observations used.
- Greater than 50 percent fixed ambiguities.
- RMS less than 3 cm.

None of these quality checks are associated with systematic errors, such as the incorrect receiver antenna type or the wrong receiver antenna height being entered. The solution report created in OPUS-RS looks similar to the OPUS-S solution report; however, the OPUS-RS report has a few different quality checks that the user needs to evaluate. Instead of a peak-to-peak error associated with each coordinate dimension, an uncertainty is calculated from the single baseline estimates from 3 to 9 CORS individually, and the final coordinate is computed from a least squares adjustment utilizing all CORS simultaneously. This uncertainty represents the square root of the differences between the single baseline estimates using CORS individually, and the final coordinate using least squares and all CORS. OPUS-RS produces a warning if the spread of the single baseline estimates are greater than 5 cm when comparing horizontal coordinates, or greater than 10 cm when comparing vertical coordinates. OPUS-RS also provides the normalized RMS for the final adjustment, which is a unitless measure of the scatter in the data misfits.

The final quality-control value that is provided on an OPUS-RS solution is a quality indicator that is based on a ratio (W-ratio) expressed as a measure of certainty that correct values for all integer ambiguities have been found. A general rule of thumb dictates that an indicator that is above 3 represents favorable geodetic quality solutions in which correct ambiguities are located, and those below 1 should be used with caution. In summary, a quality OPUS-RS solution should have a low uncertainty for each coordinate, a normalized RMS of 1 or less, and a quality indicator greater than 1. Predicted solution qualities from 15-minute and 1-hour sessions across the country are provided at the following URL ([http://geodesy.noaa.gov/OPUSI/Plots/Gmap/OPUSRS\\_sigmap.shtml](http://geodesy.noaa.gov/OPUSI/Plots/Gmap/OPUSRS_sigmap.shtml)) and might be a useful tool when planning a survey.



To improve positional quality, a surveyor should collect longer observations, observe at several different satellite geometries and average OPUS solutions from all observations, and wait to submit the data until rapid or precise orbits are available. Precise orbits are the evaluation of a complete Sunday through Saturday orbit and are available 10 to 14 days after the end of the GPS week. Before release of the precise orbit, satellite positions are described using the rapid orbit, which is available every 17 hours; the ultra-rapid orbit, available every 6 hours; or the broadcast orbits, which are the predicted satellite locations. Precise and rapid orbits are similar in quality such that users are typically not able to detect any differences.

For greater positional quality, CORS data can be downloaded by the user and post processed manually using software that performs baseline processing and network adjustment.

OPUS solutions can also be checked and verified by including benchmarks. The verification of an OPUS solution can be done by collecting static data on a confident benchmark while other GPS receivers are collecting static data. Static data collected on the benchmark can be processed through OPUS and compared to the known coordinates to verify that OPUS-derived orthometric heights were accurate when compared to benchmark elevations during the survey.



## 11 GIS SURVEYS

A geographic information system (GIS) is a computer system comprising both hardware and software that handle the collection, storage, manipulation, analysis, and display of geographic information. It is an analysis and problem-solving tool for answering questions relating to spatial phenomena. Its function is facilitated by computer hardware and GIS software. When performing GIS surveys and products, remember the definition of the Practice of Land Surveying.

NDCC Chapter 43-19.1-02(8) describes Practice of Land Surveying as “providing professional services using such sciences as mathematics, geodesy, and photogrammetry and involving the making of geometric measurements and gathering related information pertaining to the physical or legal features of the Earth; improvements on the earth; and improvements on the space above, on, or below the Earth and providing, using, or developing the same into land survey products such as graphics, data, maps, plans, reports, descriptions, or projects.”

These professional services include acts of consultation, investigation, testimony evaluation, expert technical testimony, planning, mapping, assembling, and interpreting gathered measurements and information. This also includes determining by performing geodetic land surveys the size and shape of the Earth or the position of any point on the Earth; locating or laying out alignments, positions, or elevations for construction of fixed works; and creating, preparing, or modifying electronic or computerized or other data.



## 12 OIL AND GAS WELL SURVEYS

### 12.1 MAPS AND PLATS

The North Dakota Industrial Commission (NDIC) has few of its own rules and requirements. Instead, the commission relies on the NDSPLS to provide standards, which the NDIC then incorporates into its own guidelines.

However, note that our standards don't stray far from NDSPLS's original rules, written at a time when horizontal drilling was not the norm nor even a concept. With all North Dakota sites now being horizontal wells, these standards will need to be addressed in the future.

Until then, the only requirements from the NDIC for horizontal well location is a location plat, horizontal plat for drilling unit (section breakdown into 40 acre aliquot parts or original lots), a diagram showing the pad layout with cut/fills, and location of any cutting or drilling storage pits.

Under Raymond Rutten plaintiff v. State of North Dakota Garrison Diversion Conservancy District and State Water Conservation Commission defendants No. 7786 Supreme Court of ND 12/31/1958. Cite as 93 N.W.2d 796 Oil and Gas well siting plats require filing of Corner Records under Chapter 47-20.1 NDCC Attorney General's Opinion 81-43.

See Definitions 3.18 and 3.19 near the beginning of this manual.

#### 12.1.1 Plat Requirements

When submitting a plat to the NDIC, provide information as follows:  
See EXHIBITS #10, #11, and #12.

1. If using the old standard, submit on an 8 ½ x11 sheet with a scale of 1"=1000'. With larger drilling units, and the requirements of some operating companies, **this guideline should be treated as a suggestion**. The NDIC accepts all sizes and scales as long as the information is readable. Please see examples in the Exhibits at the end of this manual. Sheet size often depends on the oil companies. A variety of scales is currently being used.
2. Applicants name and address.
3. The well name and/or number designation.



4. Distances measured along parallel lines to the section lines controlling the position of the well. These distances shall be drafted on the plat as well as noted at the top of the plat near the well name or number.
5. Section, Township, Range, Meridian, County and State in which the well is located.
6. A description of all monuments found, established, reestablished, monumented, remonumented, restored, rehabilitated, perpetuated, and/or used as control and notation of all distances and bearings measured between the corners used in establishing the section boundaries in which the well is located, and the filing of these corners according to NDCC Chapter 47-20.1 entitled SURVEY AND CORNER RECORDATION ACT.
7. On horizontal well locations, all the section corners of the spacing unit need to be recovered, found, set and monumented. Lost quarter corners do not need to be reset and can be calculated by appropriate controlling corner methods. If it is impossible to monument the section corner due to some terrain feature, like Lake Sakakawea, it should be shown how it was determined and witness corners or reference corners monumented and set.
8. The basis of bearing further described on the plats. The NDIC requires the basis of bearing to be "True North." We all know there are many true north. It should be stated on the plat which "north" was the basis, how it was derived, and where (location) it was derived. Many practitioners of GPS do not understand how their bearings or azimuths are being calculated and what type of projection and coordinate system they are using and working in. If their projection was centered on a point multiple miles from the well location, the bearing or azimuths could be many minutes from "true." Some of us suggest the center of the projection based on the section corner controlling the well calls, or located at least within the drilling unit. Such as: "The azimuths/bearings on this plat are grid, based upon Geodetic North derived by GPS measurements at the center of the project origin, located at the southwest corner of Sec 21, T155N, R102W, Latitude 47°53'01.117" North, Longitude 103°00'17.547" West. Azimuths/bearings represent the calculated value from the central meridian using the forward bearing."



9. Ungraded ground elevation at the staked location: This provides a basis for the determining of the subsurface structures.
10. Description of the datum, how it was derived, and the location of where it was derived.
11. North Arrow.
12. A certification by a North Dakota Registered Land Surveyor: This certification must indicate that the work was performed by the Land Surveyor or under his or her responsible charge.
13. A stamp or seal and signature of the North Dakota Registered Land Surveyor. If an impression-type seal is used, shading of the stamped area shall be done to accommodate visibility on reproduced copies.
14. Date the location was staked in the field.
15. Certificate of Authorization Number on the face of the plat. This is the number assigned by the State Board of Registration for Professional Engineers and Professional Land Surveyors authorizing Partnerships and/or Corporations to work in North Dakota. NDCC 43-19.1-27 (4).

As a suggestion, the Land Surveyor may include a statement on the well plat stating; the well stake reflects a proposed/preconstructed site and may differ from the completed drill bore; and any other statement or proposed/as-built check off block on the plat, which would indicate the proposed state of the well.

In addition to these requirements on horizontal well locations the following are required:

1. The latitude and longitude of the surface location to .001."
2. The datum on which the latitudes and longitudes are based (and time tag).
3. How the latitudes and longitudes were derived.
4. The landowner at the surface location.



5. A breakdown for each of the sections comprising the drilling or spacing unit into 40 acre aliquot parts, and/or GLO lots showing measured and/or calculated distances and bearings/azimuths along the exterior lines of each aliquot part or lot and for the section the surface location is located if located outside the drilling or spacing unit. One section per sheet.
6. Labeling of the 1/4 and 1/16 lines and/or lot lines.
7. A drawing showing all sections of the drilling unit on one sheet.
8. A drawing showing the contours of the original ground, the locations of the well(s), drilling, or cuttings storage pit along with the dimensions of the proposed pad laid out over it.
9. A cut/fill diagram showing the cut/fill at the corners of the past, well bore, and any storage pit.
10. A general map of the proposed location and existing roads to the nearest town.
11. A quad map depicting the location and proposed road.

## 12.2 ATTORNEY GENERAL'S OPINION

A surveyor who prepares oil and gas well siting plats pursuant to Section 43-02-03-16, N.D.A.C., must comply with the requirements of Chapter 47-20.1, NDCC relating to the filing of corner records.

No.7786 Supreme Court of ND 12/31/1958. Cite as 93 N.W.2d 796 Oil and Gas well siting plats require filing of Corner Records under Chapter 47-20.1 NDCC Attorney General's Opinion 81-43.

AG Opinion 2009-L-01 dated January 5, 2009 addressing the North Dakota section line rights of way.

## 12.3 GENERAL PROCEDURES

The Land Surveyor must be fully aware of private, state, and federal rules and regulations pertaining to the surveying of the sectionalized land system and oil and gas well locations in North Dakota.

The Land Surveyor should secure a copy of the "Summary of North Dakota Oil and Gas Field Rules" from the North Dakota Industrial Commission to more fully understand what is required in a given area.



The Land Surveyor should investigate and know the possibility of coming in contact with H<sub>2</sub>S (hydrogen sulfide gas) and its safety hazards. A number of safety firms can provide an education program to protect Surveyors working around gaseous wells.

The requirements of oil and gas well location surveys vary with different oil company requirements and with the surface and mineral ownership. There should be close communications on all scope of work orders. We further recommend that the Land Surveyor should request that the company confirm telephone orders in writing.

The oil and gas companies normally make necessary contacts and obtain permits required to perform the survey. However, the Land Surveyor should know these requirements and make sure these details have been performed before the field survey begins.

The Land Surveyor should normally secure the following information before proceeding with any oil or gas well location survey:

- Name of surface owner or surface lease owner.
- Permission to enter upon property if this has not been obtained by a representative of the oil or gas company.
- Instructions for possible alternate drilling locations if original location falls on bad terrain or is too close to existing improvements.
- Complete instructions for stakeout of drilling location area, including approximate size and orientation of drilling pad, if applicable (depending on size of rig and features of terrain), proposed location of access road, flow line and power line if necessary, preferred location of reference stakes (if desired), and other special instructions, such as grid layout and topography survey.
- 

#### 12.4 SEE ALSO

Exhibits #10, #11, #12 at the back of this manual show location examples.



## 13 TECHNICAL SPECIFICATIONS

### 13.1 SURVEYOR'S REPORT

#### 13.1.1 Notekeeping

Field notes should be recorded in such a manner as to be readily interpreted by another Surveyor in retracement or evaluation of the survey. In the notes it is suggested a list the following items:

- Date.
- Weather including temperature.
- Survey crew chief and survey members on the job.
- Control used.
- Type of coordinates used.
- Sketch of control.
- Sketch and description of monuments used or recovered in the survey.
- Page numbers in the field book.
- Instruments and equipment used for work and accuracy.
- Type, serial numbers, make, model, and accuracy statement of equipment.
- Names, testimony, oaths and statements of land owners



## 14 HELPFUL CASE LAW REFERENCES AND NDCC REFERENCES

### 14.1 ORDINARY HIGH WATER MARK

The North Dakota Supreme Court has defined "high water mark" in a case (Rutten vs. N.Dak - 1958) involving property line between state property and riparian landowners around Devils Lake. The definition cited by the Supreme Court is as follows:

"High water mark" means what its language imports - a water mark. It is coordinated with the limits of the bed of the water, and that only is to be considered the bed which the water occupies significantly long and continuously to wrest it from vegetation and destroy its value for agricultural purposes. In some places however, where the banks are low and flat, the water does not impress on the soil a well-defined line of demarcation between the bed and the banks. In such cases, the effect of the water upon vegetation must be the principal test in determining the location of the high water mark as a line between riparian owner and the public. It is the point up to which the presence and action of the water is so continuous as to destroy the value of the land for agricultural purposes by preventing the growth of vegetation constituting what may be termed an ordinary agricultural crop.

### 14.2 NAVIGABLE WATERS

Under the Equal Footing Doctrine, waterways are navigable if they were navigable in fact at statehood: And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. The susceptibility test requires that a water body need only be capable of supporting commerce in its natural state, and that it need not ever have supported navigation for commerce, as long as its characteristics and location could lend itself to those types of activities. Additional information on this can be found on North Dakota Sovereign Land Management

<http://www.swc.nd.gov/4dlink9/4dcgi/GetContentpdf/PB-868/>.

#### 14.2.1 WATERS

All waters within the limits of the state from the sources of water supply belong to the public and are subject to appropriation for beneficial use and the right to the use of these waters for such use must be acquired



pursuant to NDCC Chapter 61-01. Read this chapter in its entirety for all of the details of these rights involving Title 61 Waters in North Dakota.

### 14.3 SECTION LINES

This section addresses some of the questions that arise about public access to undeveloped section line right of way easements in rural North Dakota, for example, a section line that has perhaps no more than an unimproved path for vehicles. Common questions include the following:

- Can the adjacent landowner construct a fence *along* the section line?
- Can the landowner construct a fence or gate *across* the section line?
- Can the landowner till *across* the section line?
- Can the landowner be required by local government to remove obstacles from the section line, such as a fence, trees, or large rocks?
- Must someone driving along a section line close a gate that crosses the section line?

The general rule is that section lines are considered public roadways open for public travel. However, local government (that is, the board of county commissioners or township supervisors) can take action to close a section line roadway.

NDCC Chapter 24-07-03 lists congressional section line information. At the time of statehood under former Chapter 40-50 section lines were considered public roads open for public travel to the width of 33 feet on each side of the section lines, this is a Congressional right of way given to the Public.

There is a ND AG opinion 2009-L-01 in January 5, 2009 addressing the ND section line rights of way. There are two primary sources for the public's right to travel section lines and that is the state statute and the 1866 federal statute where Congress allowed roads on the Public Domain. As a good rule of thumb the NDSPLS believes it is a good idea to notify land owners adjacent to the section lines of your intent to work along these lines to investigate the public land system corners controlling those section lines, and also gives you an opportunity to question those land owners of their knowledge of existing corners and monuments.

The following provides a brief overview of North Dakota laws for section lines. The material includes references to and excerpts from several North Dakota statutes.



#### 14.3.1 Section Lines are Public Roads

North Dakota considers section lines as public roads open for public travel and are defined as being 66 feet wide.

In all townships in this state, "...the congressional section lines are considered public roads open for public travel to the width of thirty-three feet on each side of the section lines..." (see [NDCC 24-07-03](#)).

For the January 2009 opinion of the North Dakota Attorney General addressing several legal issues pertaining to section lines as public roadways, see <http://www.ag.nd.gov/Opinions/2009/Letter/2009-L-01.pdf>.

#### 14.3.2 Public Ways Cannot Be Obstructed

The status of a public road offers section lines some legal protections, primarily the roadway cannot be obstructed. For example, North Dakota law specifies that "No person may:

1. Obstruct any public highway in any manner with intent to prevent the free use thereof by the public;
2. Willfully and knowingly obstruct or plow up ... any public highway or right of way ...
3. Build or place a barbed wire fence across any well-traveled trail which has been the usual and common route of travel for not less than one year without placing on the outside of the top tier of barbed wire ... a board, pole, or other suitable protection, to be at least sixteen feet ... in length; or
4. Plow up a section line in a manner so as to obstruct usual travel on the section line.

([N.D.C.C. §24-12-02](#)).

Any person who intentionally obstructs a public way is subject to a penalty ([N.D.C.C. §24-12-05](#)).

North Dakota law also has several statutes that specifically prohibit section lines from being obstructed; but note that the statute also provides an exception, that is, an obstruction can be placed in a section line if the board of county commissioners or township supervisors grants permission.

No person may place ... any permanent obstruction [including a fence], stones, trees, or rubbish within thirty-three feet of any section line, unless written permission is first secured from the board of county commissioners



or the board of township supervisors ... ([N.D.C.C. §24-06-28\(1\)](#)).

The **permission [to place a permanent obstruction]**, such as a fence, within thirty-three feet of a section line] **must be granted** where the section line has been closed ... or where the topography of the land along the section line is such that in the opinion of the board of county commissioners or board of township supervisors, ... the construction of a road on the section line is impracticable ([N.D.C.C. §24-06-28\(1\)](#)).

Thus one alternative is for the landowner to **request that the section line be closed**. This statute also makes it clear that the authority to close a section line lies with the county commissioners or the township board of supervisors. Consider the following state statutes.

#### 14.3.3 Closing a Section Line

The board of county commissioners, if petitioned by a person having an interest in the adjoining land or a portion thereof, after public hearing and a finding by the commissioners of public benefit, **may close section lines** or portions thereof which

- are not used for ten years,
- are not traveled due to natural obstacles or difficulty of terrain,
- are not required due to readily accessible alternate routes of travel, or
- are intersected by interstate highways causing the section line to be a deadend, providing the closing of the dead-end section line does not deprive adjacent landowners access to the landowners' property.

After the section lines are closed, they may be used to the benefit of the adjacent landowners. However, survey or property reference monuments may not be disturbed, removed, or destroyed ... ([N.D.C.C. §24-07-03](#)).

The board having jurisdiction ... may alter or discontinue any road ... upon the petition of not less than six qualified electors who have an ownership interest in real estate in the vicinity of the road to be altered, discontinued ... Said petition must set forth in writing a description of the road and what part thereof is to be altered or discontinued ... ([N.D.C.C. §24-07-05](#)).

... all proceedings for ... vacating, or changing of a highway outside of the limits of an incorporated city ... must be [made by] ... 1. The board of county commissioners, if the road is in territory not organized into a civil township.



2. The board of township supervisors of an organized township ... ([N.D.C.C. §24-07-04](#)).

The status of a section line (that is, whether it has been closed) should be a matter of public record. Interested persons should contact the board of county commissioners or township supervisors. There is nothing in the statute that requires a fence crossing a closed section line must contain a gate.

#### 14.3.4 Building a Fence Within 33 Feet or Across a Section Line

As already described, the statutes define an exception to the general rule that section lines are open for public travel; that is, the exception allows for section lines to be closed. This exception confirms that there are situations when a fence can be built across or within 33 feet of a section line. The following statute clarifies and expands the exception to include allowing cattle guards to be placed across a section line.

[The prohibition against placing a permanent obstruction within a section line (N.D.C.C. §24-06-28(1))] may not be construed to prohibit construction of fences:

- a. Along or across section lines which have been closed ... or which have not been opened because construction of a road is impracticable due to the topography of the land along the section line...
- b. Across section lines which have not been closed ... if cattle guards are provided in accordance with chapter 24-10... ([N.D.C.C. §24-06-28\(2\)](#)).

#### 14.3.5 Cattle Guard Across Section Line

Whenever the erection of cattle guards is necessary to ... cross a section line pursuant to section 24-06-28, the board of county commissioners ... or the board of township supervisors ... may issue permission ... to erect a cattle guard and gateway across the ... section line upon the conditions hereinafter prescribed ([N.D.C.C. §24-10-01](#)).

Before any cattle guard and gateway may be erected across any highway or section line, ... the board of county commissioners or board of township supervisors ... shall approve written specifications of the cattle guard and gateway. Specifications approved by the board of county commissioners must be filed with the county auditor and specifications approved by the board of township supervisors must be filed with the township clerk. The specifications must include requirements for warning signs to be placed approximately three hundred feet from and plainly visible to persons approaching the cattle guard upon the ... section line. A cattle guard must be



so constructed as to permit the passage of motor vehicles through and over the same. No cattle guard may be erected upon any ... section line unless there also is provided adjacent thereto an ample gateway in which must be erected a gate which may be opened easily and closed by the public. The person who applied for permission to erect the cattle guard shall maintain the cattle guard and gateway ... Within the limits of an enclosure so completed by authorized cattle guards erected in accordance with such specifications, livestock must be permitted to run at large without liability for being upon the ... section line ([N.D.C.C. §24-10-02](#)).

Other than these exceptions, the general rule prohibits fences from being constructed within 33 feet or across section lines.

#### 14.3.6 Is There an Alternative to Having the Section Line Closed?

A board [or commission] ... may designate a road ... as a minimum maintenance road ... The designation may be made only if the board or governing body determines that the road ... is used only occasionally or intermittently for passenger and commercial travel. Further, the designation cannot be made if the road is used as a schoolbus route, mail route, or as the only access to any existing residence. In its action designating the minimum maintenance road, the board or governing body shall identify the beginning and end of the road ... ([N.D.C.C. §24-07-35](#)).

The body making a designation of a minimum maintenance road shall post signs at the beginning of the road and at regular intervals along the road. The signs must conform to standards adopted by the director by rule. If the signs are properly posted, that fact is *prima facie* evidence that adequate notice of the road's status as a minimum maintenance road has been given to the public ([N.D.C.C. §24-07-36](#)).

But a minimum maintenance designation does not authorize the landowner to construct a fence across a section line; it simply reduces the obligation of the county to maintain the path. Having the road designated as minimum maintenance does not offer the landowner a viable alternative to having the section line closed.

#### 14.3.7 Enforcement

We know the general rule and we know several exceptions, but how is the law enforced?

If any person places or causes to be placed any stones, trees, or rubbish within thirty-three feet ... of any section line, the board of county



commissioners or board of township supervisors ... shall notify the owners of adjacent property to remove the stones, trees, or rubbish. Written notice by registered mail to the record owner of the adjacent property mailed to the owner's last-known address and to any other persons in possession of the property constitutes valid notice. If the owners fail to remove the stones, trees, or rubbish within thirty days after the notice is mailed, the board of county commissioners or the board of township supervisors ... shall remove the stones, trees, or rubbish. The cost of removal must be entered the same as taxes against the adjacent property and paid in the same manner as taxes ([N.D.C.C. §24-06-29](#)).

#### 14.3.8 Notice and Removal of Fences

When a public highway is opened along any section line, the board of county commissioners or the board of township supervisors ... shall notify the owner of adjacent property [by registered mail sent to the last-known address of the record owner and to any other persons in possession of the property] to remove any fences not constructed pursuant to subsection 2 of section 24-06-28 within thirty-three feet of the section line ... If the owner of adjacent property fails to remove the fences within thirty days after the notice is given, the board of county commissioners or the board of township supervisors, as the case may be, shall remove the fences. The cost of removal must be entered the same as taxes against the adjacent property and paid in the same manner as taxes ([N.D.C.C. §24-06-30](#)).

Similarly, a landowner cannot encroach on any county roadway. A landowner who encroaches upon a county road or its ditches or approaches must be given notice by the board of commissioners for that county that the encroachment has been discovered. If the landowner fails to remedy the encroachment within twenty days after receiving the notice, that landowner is liable to the county for damages resulting from the encroachment. The board of commissioners for that county shall issue to the landowner written notice of the amount of damages determined to be a result of the encroachment. If the landowner fails to pay the county for the damages, the expense of the repair must be charged to the land of the landowner. The expenses charged become a part of the taxes to be levied against the land for the ensuing year and must be collected in the same manner as other real estate taxes are collected and placed to the credit of the county that incurred the expense of the repair ([N.D.C.C. §24-05-23](#)).

The governing body having authority over the right of way of a county or township road may develop and implement rules governing the disposal of any stored hay or other obstruction placed on the right of way ([N.D.C.C. §24-05-24](#)).



#### 14.3.9 Fence and Gate Cannot Be Destroyed; Gate Must Be Closed

The discussion has addressed the rules for the landowner, but are there any rules for the traveling public?

... any person who damages any fence or who opens and fails to close any gate constructed under [N.D.C.C. §24-06-28(2)] is guilty of an infraction (N.D.C.C. §24-06-28(3)).

This statute does not answer the question of whether someone can destroy a fence or gate that is improperly placed along or across a section line. The best solution is for the aggrieved person to assume the fence and gate are valid, that is, do not destroy them or leave the gate open. However, the person should then contact the county or township to assure the local government is aware of the situation and to have the local authority pursue the issue. If necessary, the person can take formal legal action against the county or township. For example, see *Ames v. Rose Township Board of Township Supervisors*, 502 N.W.2d 845 (N.D. 1993).

Similar North Dakota statutes state

A person who opens a gate ... enclosing farm premises shall not leave such gate ... open unless that person is in lawful possession of the premises ([N.D.C.C. §47-27-01](#)). Anyone who [violates this statute] shall be guilty of a class B misdemeanor and, in addition, shall be civilly liable for any damages that may result, directly or indirectly ([N.D.C.C. §47-27-03](#)).

#### 14.3.10 Court Cases

It is also helpful to review court decisions that have addressed similar legal issues. For example:

Unless closed by board action, congressional section lines outside platted subdivisions are public roads, open to a width of thirty-three feet on each side. NDCC 24-07-03; *State v. Silseth*, 399 N.W.2d 868, 869 (N.D. 1987). Obstruction of a public highway without written permission is prohibited, and may result in criminal liability. NDCC 24-12-02; *Silseth* at 869-70. The placement of permanent obstructions, stones, or rubbish on a section line easement, without permission from the county commissioners, is also prohibited. NDCC 24-06-28. Still, not every obstruction jeopardizes the



public's right of travel.

A landowner abutting an open section line retains ownership of the property within the easement, subject to the public's right to travel. Small v. Burleigh County, 225 N.W.2d at 297 ... The public's easement is limited to the right to travel, and does not include an absolute right to an object-free zone for the complete length and width of the section line. In Hjelle, we held that a highway right of way is not "obstructed" when a placement did not impede the public's right of passage. 133 N.W.2d at 630. We recently held that cattle guards or gateways do not have to be sixty-six feet wide to comply with NDCC 24-07-03, when approved by the board. Ames v. Rose Township Board of Township Supervisors, 502 N.W.2d 845, 850 (N.D. 1993). Only when an obstruction effectively deprives the public of the ability to travel on an open section line is their right to travel violated.

Burleigh Co. Water Resource Dist. v. Burleigh Co., 510 N.W.2d 624 (N.D. 1994)

Also see Ames v. Rose Township Board of Township Supervisors, 502 N.W.2d 845 (N.D. 1993)

[W]e held in Saetz that "the Legislature did not intend to violate its trust [to hold section lines open for the public] by tolerating fencing in any form which would effectively deprive the public of its right to free passage over section lines."

#### 14.3.11 Conclusion

Landowners who want to place a fence within 33 feet of a section line, or place a fence, gate, or cattle guard across a section line, should work with their county commissioners or township supervisors.



## 15 SURVEY TYPES AND REFERENCES, NDCC AND THE LAW DIGEST

### 15.1 HISTORY OF SUBLOTS

The 1987 North Dakota Legislature passed HB 1342 (now NDCC 40-50.1) to reduce the number of metes and bounds descriptions that describe tracts of land in deeds. Metes and bounds descriptions lead to lengthy worded statements that usually follow and describe the perimeter of a tract of land being described. A **plat** is a graphic depiction (drawing) with the individual tracts identified by simply a letter or number. Using a platted description for a lot reduces the cost of preparing deeds, abstracts, mortgages, title opinions, etc., because the descriptions are less complicated and require less proofreading. Mistakes can be made when transferring the Surveyor's metes and bounds descriptions to deeds and other documents. It therefore is in the best interest of everyone, to plat subdivided tracts of land rather than using metes and bounds descriptions.

**Intended Use:** The North Dakota Society of Professional Land Surveyors on December 7, 1987 prepared a draft Policy Statement on the procedures for identifying property not described by aliquot parts outside of the corporate limits of towns, cities, and existing platted subdivisions and a proposed method of indexing their recordation.

All new subdivision, rural or urban, tracts are required to be surveyed and platted according to NDCC 40-50.1. Existing tracts with metes and bounds descriptions should also be platted when boundaries are recovered, surveyed, or transfer of ownership is taking place.

The recommended plat size shall be a standard drawing size 11" X 17" or 8-1/2 X 14" on single or multiple sheets of Mylar, vellum or a book grade of rag paper.

Lots should be designated as "Sublots" beginning with Sub Lot One within each Government Section. Existing Outlots, Sublots, and Auditors Lots or Parcel numbers should be retained and treated as Sublots for Indexing purposes. That is to say, new lots should be numbered as a Sub Lot with the next available sequential number. Indexing should be a "S.L.Plat" in the tract index for that aliquot part of the Section in which it falls. If there is a question as to whether or not a Sub Lot encroaches into an adjacent aliquot part of a Section, the tract should be indexed also in the adjacent aliquot part rather than extending the survey to determine the aliquot part division line. If an existing Sub Lot is further subdivided, the original designation will be retained and new Sub Lot designations given to the new parcels. No existing number should be repeated within a Section even though the tract it identifies no longer exists. Sub Lot numbers for new tracts need to be issued



by the Recorder's office after searching that office's records. Occasionally Sub Lot numbers may be issued for tracts that do not become a part of the public record. All subdivisions which have public dedications need to be endorsed by the controlling governmental agency in order to complete the dedication. It appears that if a plat does not have public dedication it needs to be endorsed only by the owners and the Surveyor. This included Lots abutting Section Lines where the existing 33 foot public right of way exists. If a parcel or tract of land abuts, touches, or is in anyway contiguous to any part of an already described or platted parcel or tract, then that Sub Lot number or description book-page will be shown on the face of the new plat as to its proximity of the new property. This will help clear up gap and overlap problems with bearing differences and typo errors in dimension or bearing.

Urban subdivisions with multiple lots and blocks should continue to be subdivided utilizing single plats as has been done in the past.

## 15.2 PLATTING IRREGULARITIES

### 15.2.1 Auditors Plat

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**The NDSPLS has adopted the following as stated in NDCC 57-02-39.**

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**Irregularities of land to be platted into lots if required.** If any tract or lot of land is divided into irregular shapes which can be described only by metes and bounds, or if any addition or subdivision which already has been platted into blocks and lots and subsequently sold into parts of blocks or lots which can be described only by metes and bounds, or if the courses, distances, and sizes of each lot or fractional lot are not given or marked upon the plat so that the precise location of each lot and fractional lot can be ascertained accurately, surveyed, or laid out, the owner of such tract or tracts, upon the request of the county auditor, shall have such land platted or replatted, as the case may be, into lots or blocks according to deeds on record. If such plat cannot be made without an actual survey of the land, the same must be surveyed and platted and the plat thereof recorded. If the owners of any such tract refuse or neglect to cause such plat and survey, when necessary, to be made and recorded within thirty days after such request, the county surveyor, or some other competent surveyor, upon the request of the county auditor, shall make out such plat from the records of the recorder if practicable, but if it cannot be made from such records, then the surveyor shall make the necessary survey and plat thereof, and the county auditor shall have the same recorded, but no such plat may be recorded until approved by the city engineer of the city affected thereby, and if there is no city engineer, then by the county surveyor. A certificate of the approval of such plat must be made by the officer making the same endorsed on the plat or map. Such certificate also must be recorded and forms a part



of the record. When such plat has been duly certified and recorded, any description of the property in accordance with the number and description set forth in such plat must be deemed a good and valid description of the lots or parcels of land so described. No such plat or description may bear the name or number which already has been applied to any plat or description previously made and recorded as a part of any such city. When the owner of such land fails to comply with the provisions of this section, the cost of surveying, platting, and recording must be paid by the county, upon allowance by the board of county commissioners, and the amount thereof must be added to the taxes upon such tracts or lots the ensuing year. Such taxes, when collected, must be credited to the county general fund. The surveyor making such survey or plat is entitled to receive for services in making the same the compensation allowed by law for doing other county surveying or platting, and such fees become a legal charge upon such tracts of land.

#### 15.2.2 Auditors Lot

History: ND Supreme Court Opinion Frandsen v. Mayer 155N.W.2d 294 (N.D. 1967) attached. It states that Auditors Lots are for tax purposes only and not for the conveyance of land.

#### 15.2.3 Platting Irregularities (Auditor's Lots, Irregular Tracts, Outlots, Sublots, etc.)

Purpose:

Per NDCC 57-02-39, the county auditor has the authority to request a survey to be made and a plat of said survey to be placed on record for any tract of land that is divided into irregular shapes that can only be described by a metes and bounds description. Often times a surveyor is requested to perform surveys in accordance with NDCC 57-02-39. There are several reasons for these types of surveys. They are, but are not limited to the sale of a portion of the property, mortgaging purposes, an administrative tool for land use management (zone changes, conditional use permits, building permits, etc.), and for retracing and documenting ambiguous land descriptions of record at the auditor's request. Although the reason that these surveys are needed is often times the same, each county and municipal government may have adopted a different approach in regards to the format and the approval of said surveys. As individual counties are able to adopt their own review process, surveyors are likely to encounter several formats that are acceptable for recording. The purpose of this chapter is to alert surveyors to the potential differences in county requirements and to give practicing surveyors a guide to completing these types of surveys in accordance with the applicable laws and acceptable practice amongst the practitioners in North Dakota.



**Procedure:**

Typically a potential client will need a survey either for a division of land, a zone change, or to only finance a portion of their property. Potential clients will have varying levels of understanding as to this process.

The next step in this process would be to inquire with the county as to the requirements and approval for these surveys. Each county may appoint a different individual in regards to platting, but typically initial contact can be made with the recorder's office, the tax equalization office, the county engineer's office, city engineer's office and/or the county or city planner's office to get a better understanding as to the requirements in a particular jurisdiction. Some of the initial inquiries are listed below:

- What format does the county require? (Outlots, Sublots, Irregular Tracts, Auditor's Lots, etc.)
- How are these surveys filed/indexed? (Do they use an alpha or a numeric sequencing for the surveys? Do they index and file surveys separate or are the surveys attached to the deed or mortgage? Are the surveys sequenced per each section, quarter, quarter-quarter, or are they sequenced throughout the entire county?)
- Knowing the clients intentions for the proposed parcel, are there any potential issues with zoning? (building setbacks, building permits, allowable uses, acreage requirements, etc.)
- Will this division of land need approval from the county commission?
- Will the project be subject to local subdivision regulations?
- Is there enough area for septic and water systems on the proposed property?

If the property is to be financed, it is also beneficial to talk with the mortgage broker. Often lending agencies have criteria for the types and sizes of properties they finance. Working with the owner and the lending agency to make the property fit the parameters the lending agency prefers can ease the process by which the loan gets approved and has potential to reduce the owner's interest rate.



1. From there, proper research should be conducted to determine who the owners of record are (deeds, abstracts of title, title commitments, attorney's title opinions, etc.), what the description of the property is, and to find pertinent survey information (GLO plats and field notes, previous surveys, corner recordations, highway right of way information, railroad plats, private survey records, and all other sources of information the surveyor deems necessary).
2. Once the surveyor has a clear understanding of the client's desires, the jurisdiction's requirements, and all of the available survey data, the field survey can commence. A thorough recovery of controlling monuments and evidence of senior lines should be conducted to determine the controlling lines.
3. After locating controlling monuments and lines, the surveyor can establish the new parcel. Considerations in establishing this include:
  - Can the property be accessed? Will the city/county/state provide the owner with an approach permit? Does said approach meet sight distance requirements and is it located in a generally safe location? Will an easement or right of way need to be described to access the property?
  - If the buildings are intended to be built, are there flood plain issues that may affect the property?
  - What are the acreage requirements set forth in the zoning ordinance and by the local health district in terms of acreage?
4. The drawing can now be produced. Per 28-02.1-13 of North Dakota's Administrative Code, the preparation of any document to convey real property must conform to NDCC 40-50.1-01 and 40-50.1-02. Please refer to said laws for the requirements of these chapters.
5. It is advised that once the final copy of the drawing is prepared that a draft copy be sent to the jurisdiction to ensure that the format of the drawing matches what typically gets submitted in that particular jurisdiction.
6. After all of this has been achieved, the final survey can be plotted on durable paper. The survey and description can be certified by the supervising surveyor and delivered to the client. It is advisable that the surveyor ensures that the survey gets recorded.



### 15.3 CADASTRAL SURVEY STRUCTURE

Cadastral surveys should include the following:

- I. Research
  1. Title Opinion
  2. Abstract
  3. County Offices
    - a. Recorder
    - b. Auditor
    - c. Clerk of Court
    - d. Engineer
    - e. Water Board
  4. Online Research
    - a. GLO Plat/Notes
    - b. GLO Retracement Surveys or ReSurveys
    - c. ND DOT Plats
    - d. Other as Available
  5. Other Possible Sources.
    - a. US Fish and Wildlife Service. (Denver)
    - b. Bureau Indian Land Surveyor (BILS)
- II. Field Survey
  1. Compute points from research when possible for field crew.
  2. Have data with:
    - a. GLO Plat/Notes.
    - b. Recordation's in area previously filed.
    - c. Survey's recovered by others.
  3. Gather all evidence at each PLSS location.
    - a. Monuments found.
      - i. Type of iron.
      - ii. Type of cap/color.
      - iii. Number on cap.
      - iv. Depth from surface.
      - v. Sketch of area showing evidence/improvements.
- III. Analysis
  1. Determine found corners that are to be accepted and why.
  2. Compute restoration in the manner the corners were originally established;



- a. Exterior of Township.
  - b. Subdivisions
  - c. Meanders.
  - d. Look for indexing corrections.
  - e. Uniformity to GLO Record.
  - f. Look for dropped chains in GLO Survey.
  - g. Compare GLO Plat to Notes so values are the same if something does not look correct.
3. Contact persons who may have knowledge of corner and take testimony.

#### IV. Final Survey

1. Stake out computed position.
  - a. Look again for corner. Note new evidence and recomputed if found

#### V. Certificate of Survey

- Identify surveyed area down to 40 acre parcel or larger if needed.
- Vicinity Map.
- Special Surveyor's Notes or Report if needed.
- Due to insufficient field evidence, ambiguous legal descriptions, or other errors and or omissions in available research material, the physical location for the boundary lines may be uncertain. The Land Surveyor should clearly indicate the nature of the discrepancy of his Certificate of Survey, and may include a written report offering his professional opinion as to the nature of the problem and the probable cause and effect. The Land Surveyor may want to recommend that his client seek legal assistance on all points that are a matter of law.

#### VI. Recordations

- Identify corner by North and East only if possible. This makes it uniform and should have been done years ago. Possibly too late now?
- Original Monument/Retracement/Resurvey in first part.
- Describe all evidence found.
- Describe how you restored the corner and why evidence found was discarded as reliable evidence.
- 3 ties to each corner.
- If corner cannot be set an on line WC should be set for the corner within 10 chains of true point and tied out. Follow BLM manual.
- Good sketch showing corner and local evidence.



- Description of monument set, depth, general location.
- Other Ties.
- Latitude/Longitude/Projection.
- State Plane Coordinates/Projection.

Under other ties above State Plane Coordinates in NAD27 are to use US feet, but in NAD83 the International foot must be used. As long as the projection is identified the proper shifts in coordinates can be made, with equipment today conversions to different datum's can be made so all coordinates could be used providing the projection is identified.

- UTM zones and coordinates are to be surveyed in US feet.

#### 15.4 PHOTOGRAMMETRY

The science or art of surveying concerned with taking photographs, especially aerial photographs, using sensors mounted on different platforms. The science or art of deducing the physical dimensions of objects from measurements on photographs. Aerial photogrammetry uses photographs of the Earth taken from aircraft or satellites, while terrestrial photogrammetry works with ground photographs. Stereo photogrammetry works with the aid of stereoscopic equipment and methods. This is a specialty field and generally not exercised by a land surveyor, although the surveyor must have some knowledge and training in how these systems work and if they can be used for projects he/she is contracted to do such as setting control points for aerial mapping and bridging topographic sites.

#### 15.5 EXAMPLE PRELIMINARY CITY PLAT SUBMITTAL CHECKLIST

##### *EXAMPLE OF CITY PLAT SUBMITTAL CHECKLIST FOR INFORMATIONAL PURPOSES ONLY*

##### EXHIBIT #2

I. PRELIMINARY PLATS	Applicant Checklist	City Staff Checklist
<b>General Information</b>		
1. Proposed name of the plat (if in City use "addition", if in ETA use "subdivision")		
2. Location of plat by section, township and range (to nearest quarter section)		
3. Name and address of registered land surveyor		
4. Name and address of property owner		
5. Scale of 1" = 100' or less, shown graphically (A different scale may be used only if it has previously been approved by the Director of Planning & Development)		
6. Date		
7. North point indication (arrow or compass rose)		



8. Boundary line of plat indicated by a solid heavy line		
9. Total acreage within the plat		
10. A location map inset showing the boundary of the proposed plat and covering an area within a one mile radius of the plat		
<b>Existing</b>		
11. Existing access points along public right-of-way within or adjacent to the plat		
12. For plats within the ETA, all access points within $\frac{1}{4}$ mile of the plat		
13. Name, location, and width of all existing or previously platted streets, including the type and width of surfacing, within or adjacent to the plat		
14. Name, dimensions and location of any railroad right-of-way within or adjacent to the plat		
15. Name, dimensions and location of any utility easements within or adjacent to the plat		
16. Name, dimensions and location of any parks or public land within or adjacent to the plat		
17. Name, dimensions and location of any permanent buildings or structures within the plat		
18. Existing water mains, storm sewers, sanitary sewers, culverts, bridges, poles, pipelines and other utility structures within or adjacent to the plat, indicating pipe sizes, grades, and exact locations		
19. Existing zoning of proposed plat		
20. Boundary lines of adjacent parcels		
21. Location of the City's corporate boundary if within or adjacent to the plat		
22. Location of section lines within or adjacent to the plat		
23. Topographic contours with a minimum contour interval of 2 feet, with indication of datum used (NGVD29 or NAVD88)		
24. 100-year floodplain and floodway elevations if any portion of the plat is within the floodplain, with indication of datum used (NGVD29 or NAVD88)		
25. Location of streams, water courses and marshy or swampy areas within or adjacent to the plat, including federally designated wetlands (must be labeled)		
26. Airport noise contours within or adjacent to plat as established by the latest available data		
27. Boundaries of any existing underlying lot(s) being replatted, if any		
<b>Proposed</b>		
28. Layout, numbers and dimensions of lots		
29. Layout of proposed streets, alleys, crosswalks and easements, showing all widths and proposed street names		
30. Location and dimensions of non-access lines		
31. Identification of parcels of land intended to be dedicated or reserved for public uses, or set aside for use of property owners within the plat		
32. Fencing notes if required, in accordance with local governing authority.		
33. Designation of all undevelopable land within the boundary of the plat, such as steep slopes and drainageways		

II. FINAL & MINOR PLATS	Applicant Checklist	City Staff Checklist
1. Minimum sheet size of 30" x 36". If more than one sheet is required, an index sheet showing the entire plat on one sheet must submitted, all sheets must be numbered, of the same size, and include matchlines. A border of $\frac{1}{2}$ inch shall be proved on the top, bottom, and right sides of the plat and a border of 2 inches shall be provided on the left side		



2. Name of the plat (if in City use "addition", if in ETA use "subdivision")		
3. Location of plat by section, township and range (to nearest quarter section)		
4. Name and address of registered land surveyor		
5. Name and address of property owner		
6. Scale of 1" = 100' or less, shown graphically		
7. Basis of bearings		
8. Date		
9. North point indication (arrow or compass rose)		
10. Boundary line of plat based on an accurate traverse, with angular and linear dimensions		
11. Legal description of property being platted		
12. Accurate locations of all monuments. One monument shall be noted at each corner and at each change of direction in the boundary line of the plat; one monument shall be noted at each block corner; one monument shall be noted at each point of deflection in the interior lot lines; and one monument shall be noted at the point of curvature and point of tangency of each curve in a street line on both sides of the street		
13. True angles and distances to the nearest established street lines or official monuments, not less than 2 need to be accurately described on the plat. For plats adjacent to or within the current corporate limits, a tie to at least one official monument is required. For plats within the ETA, ties to two official monuments are required. For purposes of this requirement, an official monument is an official government monument, such as a section corner or quarter section corner		
14. Ties to a minimum of two accepted State Plane Coordinate monuments based on NAD 83 ND and appropriate Zones		
15. Exact location, width and name of all streets within and adjoining the plat and exact location of all alleys and crosswalks within the plat		
16. Accurate outlines and legal descriptions of any areas (not including streets, alleys or public utility easements) to be dedicated or reserved for public use, with the purposes indicated; and of any area to be reserved for common use of all property owners within the plat		
17. All easements for rights-of-way provided for public services and utilities		
18. All lot numbers and lot lines, with accurate dimensions in feet and hundredths		
19. Square footage or acreage of land within the plat, each individual lot, each subplot created by ghost platting, and the total area in streets		
20. Location and dimensions of non-access lines		
21. Fencing note, if required.		
22. 100-year floodplain and floodway elevations and topographic contours with a minimum contour interval of 2 feet for any portion of the plat within a designated floodplain, with indication of datum used (NGVD29 or NAVD88)		
23. All airport noise, clear zone and approach zone elevations within or adjacent to plat as established by the latest available data, with indication of datum used (NGVD29 or NAVD88)		
24. Present shoreline locations and water elevations shown and dated for any waterways or bodies of water within the plat		
25. For plats adjacent to the Missouri River, the 33,000 cfs flow elevation should be shown		
26. Certification by a registered surveyor that the plat represents a survey made by him/her, the monuments shown are accurate, and all dimensional and geodetic details are correct		
27. Notarized certification by all owners of the land of adoption of the plat and dedication of sewers, water distribution lines, streets, public areas and other improvements		
28. Proper form for approval of the Planning & Zoning Commission		



29. Proper form for acceptance of the plat and amendment of the master plan by the Board of City Commissioners		
30. Proper form for approval by the local governing authority		
31. For plats within the ETA, proper form for acceptance of the rights-of-way by the local governing authority.		
32. A storm water management note shall be shown in accordance with Title 14.1		

### 15.6 CERTIFICATE OF SURVEY (COS)

A certificate of survey within the purpose and intent of this document is defined as a graphic representation of any parcel or tract of real property whose primary purpose is to show the results of a boundary survey.

Certificates of survey shall be neatly drawn to a convenient scale; contain proper linear and angular dimensions; show the method of orientation; correctly designate lines; contain pertinent physical features (natural, artificial or both); and include other data and information developed by and during the survey that is pertinent, relevant, or important to the boundary surveyed.

Recommendations for **Certificates of Survey**. To Comply with North Dakota Century Code.

- a. The size of the certificate should conform to the requirements of the project. A minimum size of eight and one-half inches by eleven inches to a maximum of 24 inches by 36 inches is recommended. Check with local County Recorder's Office for local specifications.
- b. Prints of the certificate should be reproductions of the original tracing that produce clear and lasting results.
- c. The Surveyor should be cautious and exercise good judgment to reasonably protect the interest and records of the client for whom the survey was prepared.
- d. The certificate of survey shall be signed and stamped by a Registered Land Surveyor.
- e. All certificates of survey shall contain the following information:
  - 1. Title (Certificate of Survey). Section, Township, Range, Principal Meridian and County.
  - 2. A north arrow accurately correlated to the courses shown on the property lines.
  - 3. Indication of basis of bearings or azimuths to the nearest second, when used.
  - 4. A numerical scale and bar graph.
  - 5. Date of survey.



6. Horizontal length of each boundary line to the nearest hundredth of a foot.
  7. Direction of each line or angle between intersecting lines. Under certain circumstances, such as a simple rectangular lot or tract, only one angle may be appropriate and acceptable.
  8. The central angle, arc length of curve and radius for each curved boundary line. Additional curve functions may be shown.
  9. Visible encroachments.
  10. Land description of the property.
  11. Land Surveyor's Certification
  12. Known boundary or description gaps or overlaps. Gaps and overlaps should be dimensioned whenever possible.
- f. Certificates of Survey may also contain the following information:
1. Name of owner of the property or the name of the person who requested the survey.
  2. A location map and/or a descriptive location of the property by township, city, or county, in addition to the land description.
  3. Legend
  4. Easements located in accordance with descriptions furnished, or as shown on a plat of record.
  5. Measurements to the nearest foot from a traverse or off-set line to the waters edge.
  6. Lot and block numbers; names of thoroughfares and waterways.
  7. Dimensions of structures showing size and location together with the type of construction, obvious use, and street address, if any.
  8. Area of parcel surveyed. On small city lots, square footage may be preferable.
  9. All property corner monuments found or set with a notation indicating which were found and which were set, and identified as to character.
  10. Survey report. (History)
  11. Boundaries formed by water courses; located by traverse or off-set lines and defined with bearing and distance.

#### 15.6.1 Surveyor Statements

These statements are to guarantee the client that the surveyor has performed his/her job completely and according to existing federal, state, tribal, county, and city rules and regulations and codes and laws to the best of his ability and knowledge. Sometimes these statements must certify the work being performed, and sometimes it is stated that the work was performed properly according to the rules and laws of the State of North Dakota. There can be various Surveyor Statements according to the type of



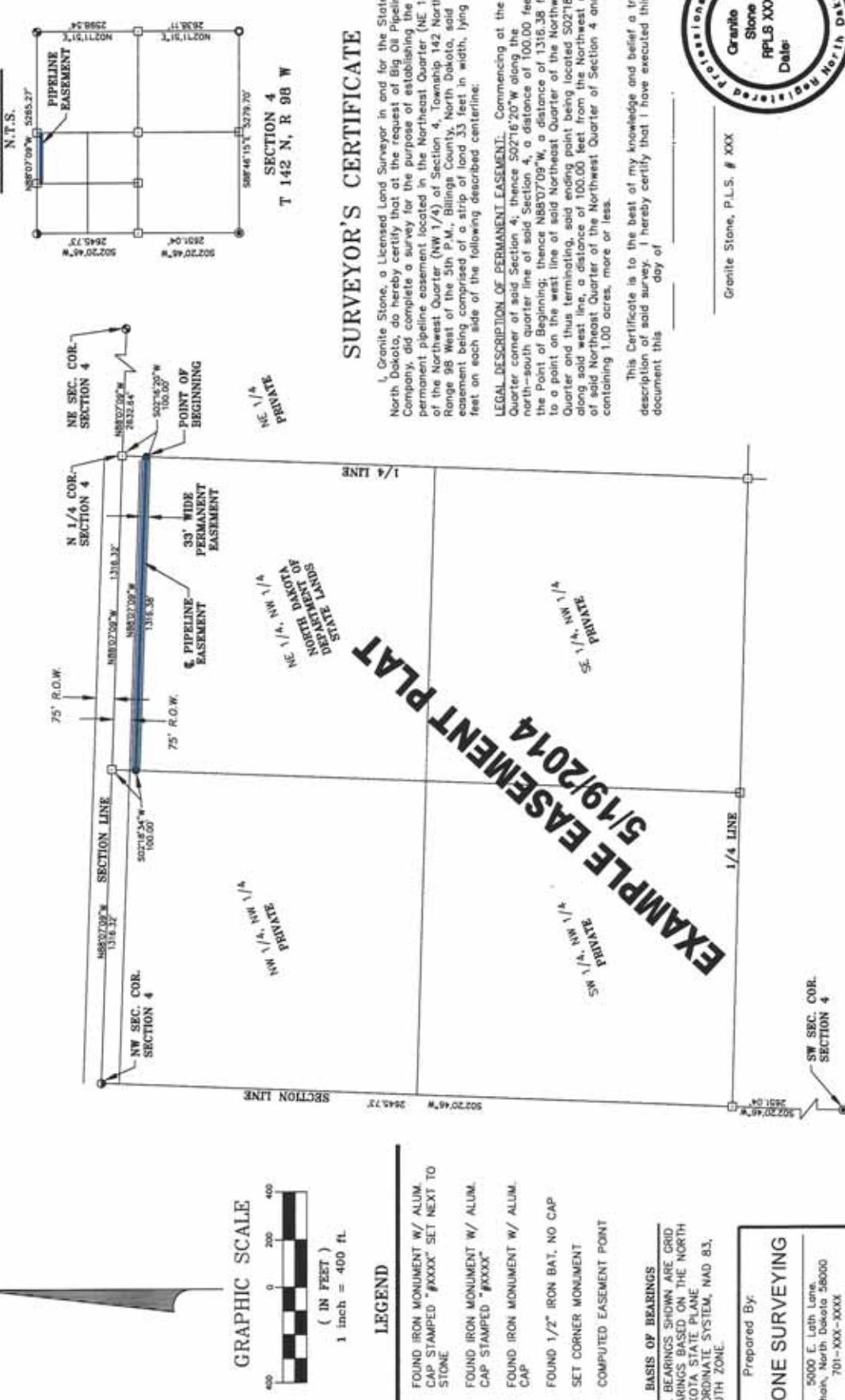
work being completed. The primary rule in a Surveyors Statement is that he/she is accepting the responsibility of the work being performed for the client, and that he/she is held to the highest standard to assure this was done.

If there is not a certification, statement, or narrative describing what the surveyor has done on the face of the survey or plat, and the surveyor has stamped, signed, dated and sealed the document, it is understood that everything on the face of that document is correct and to the surveyors satisfaction, and the surveyor has now accepted responsibility for all of that information.



**EXHIBIT #1**

PIPELINE EASEMENT FOR BIG OIL PIPELINE COMPANY PROJECT (X.X.X.) IN NORTH DAKOTA LYING IN THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 4, T 142 N., R 98 W OF THE 5TH P.M., BILLINGS COUNTY, NORTH DAKOTA



ANSI/ESD-SI-2012-01 Standard for Static Control Workstation Examples for Line Equipment

**Plats As-built for pipelines, cables, powerlines, and roads****EXHIBIT #3**

As-builts upon completion of all roads and pipelines, should be prepared as follows:

**Note:** SIZE OF PLAT: 8 1/2" x 11". If larger size is necessary, holder will be responsible for providing full size and/or reduced copies. Multiple page plats are preferred over reduced sheets.

Minimum requirements for Linear R-O-Ws including road, pipeline, powerline and underground cable plats. Items listed for as-built are as follows:

Item	requested	complete
<b>Size of Plat</b> 8 1/2 X 11 Inches		
<b>Title Block</b>		
Name of Project		
Kind of Use		
Size & Type of R-O-W (example 2" gas pipeline)		
Material (steel, plastic with tracer wire, etc.)		
Origin and Destination (for pipelines)		
Depth of Line		
Name of Applicant/Holder		
Name of Preparer		
Date		
Bar Scale (1" = 2000' minimum)		
Drawn by (name)		
Signed, sealed & dated by Licensed Engineer or Surveyor in the State of ND		
<b>Approval Block: See Below</b>		
<b>Vicinity Map: minimum 1/2"=1 mile</b>		
<b>Plat Shall Show</b>		
Basis of Bearing		
Legend explaining any symbol		
Sections, Township, Range, Meridian, North Arrow		
R-O-W centerline description and stations and stations at P.I.s (metes and bounds, etc.)		
Property boundaries & land ownership along the R-O-W (Private, State, Forest Service & other Federal Agencies)		
Adjacent existing improvements within 50' of centerline. Parallel R-O-Ws need only be shown every 1/4 mile. (i.e. fences, pipelines, trails, roads, etc.)		
R-O-W width and length		
Length of line on Forest Service by Section		
Total Acres by Section		
Corner ties at ownership changes and at point of either or both the beginning and ending. Identify the corner monument being tied to (stone, brass cap, etc.)		
Road Locations		

**Note: APPROVAL BLOCK:**

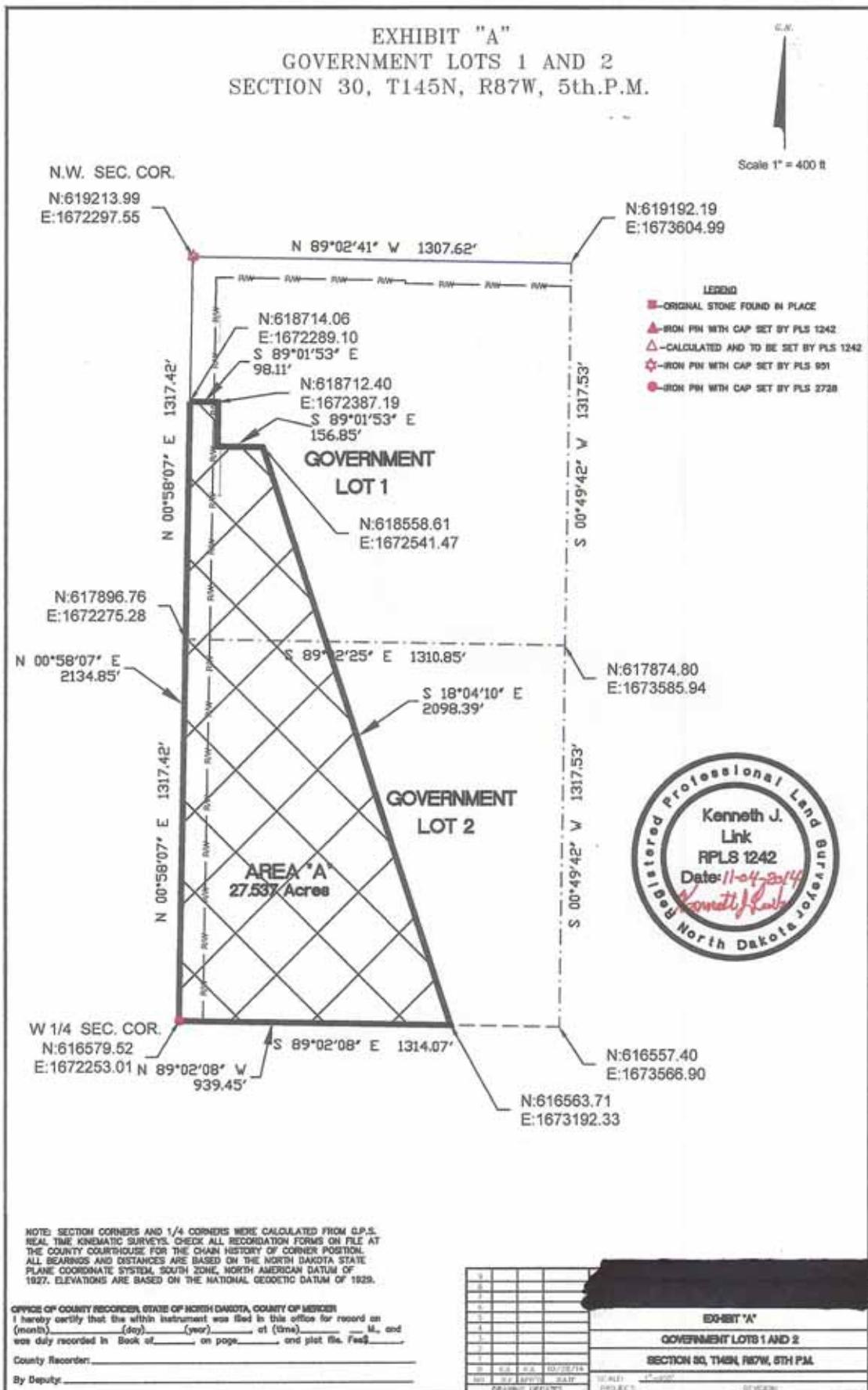
Reviewed by: \_\_\_\_\_

Date: \_\_\_\_\_

Approved by: \_\_\_\_\_

Date: \_\_\_\_\_

# EXHIBIT #4



# EXHIBIT #5

## ROUGHRIDER ELECTRIC LINE EASEMENT SW 1/4 SECTION 23, T146N-R88W, 5th.P.M.

### LOCATION MAP N.T.S.



**Permanent Under-Ground Electric Line Easement**

A strip of land for a Roughrider Electric Cooperative underground electric line easement, 2000 feet wide 1000 feet on each side of the described center line, being in the southwest 1/4 of Section 23, T146N, R88W, of the 5th P.M., Mercer County, North Dakota. This legal description was prepared by Kenneth J. Link, NPLS 1242, Corneau Properties Company, 204 County Road 15, Beulah, North Dakota 58018.

All bearings and distances are based on the North Dakota State Plane Coordinate System, South Zone, NAD 27, All bound calls supersede any notes within this description.

**Described as follows:**

Commencing at the southwest corner of said Section, thence N01°02'57" E, 11000 feet on the west line of the southwest 1/4 of said Section to the true point of beginning, thence S89°01'48" E, 1316.47', N653635.57 E16649561.50 to the south line of the southwest 1/4 of said Section and terminating bearing N01°07'10" E, 11000 feet on the north-south 1/4 line from the south 1/4 corner of said Section. The sidelines of said strip are to be lengthened or shortened to intersect with the 1/4 lines and section lines.



EXHIBIT #9

ROUGHRIDER ELECTRIC LINE EASEMENT  
SE 1/4 SECTION 22, T146N-R88W, 5th.P.M.

A strip of land for a Roughrider Electric Cooperative underground electric line easement, 2000 feet wide 10.00 feet on each side of the described center line, being in the southeast 1/4 of Section 22, T14S, R88W, of the 5th P.M., Mercer County, North Dakota.

This legal description was prepared by Kenneth J. Link, NDPLS 1242, The Coateral Properties Company, 204 County Road 15, Bismarck, North Dakota 58503.

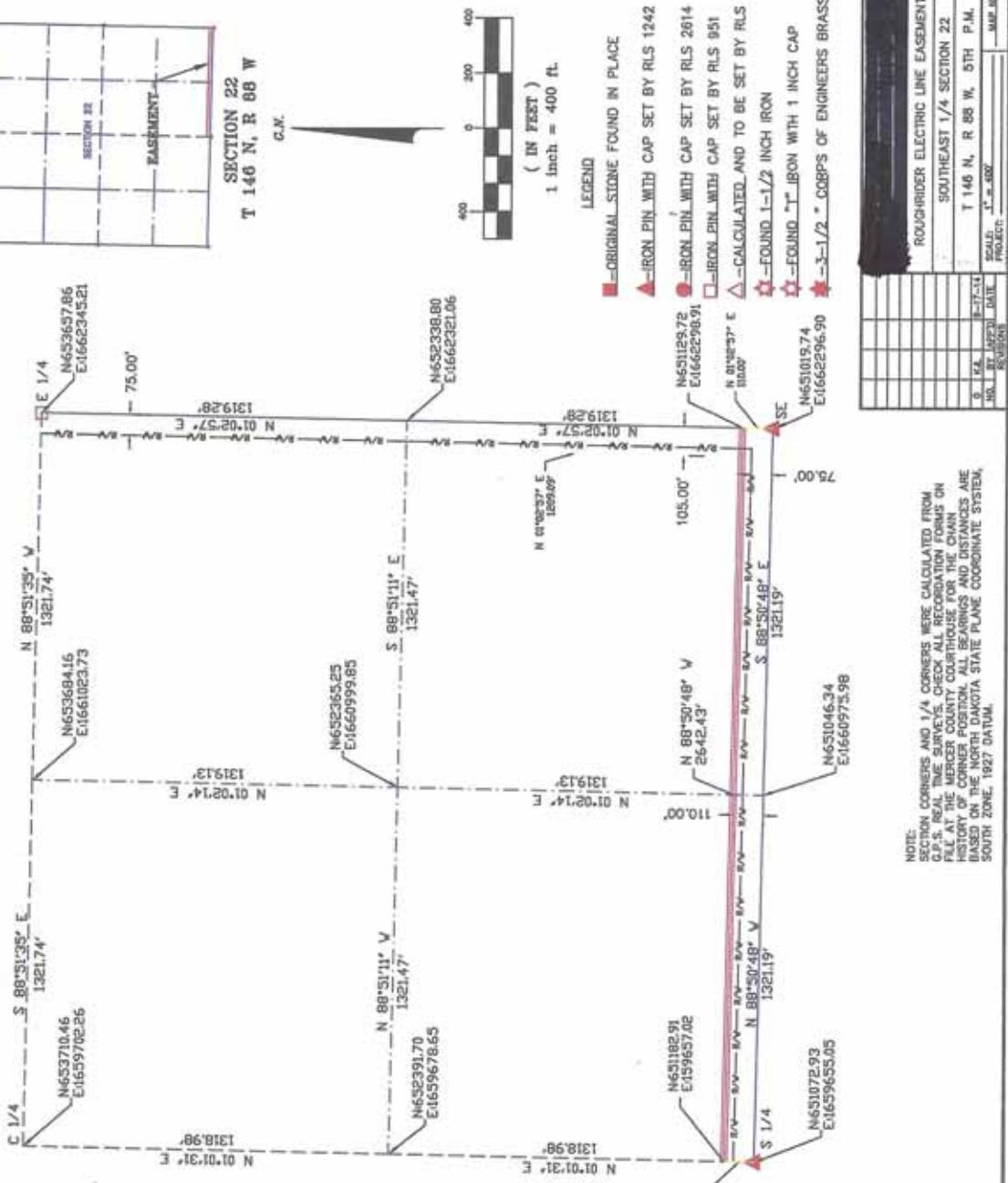
All bearings and distances are based on the North Decline

All bound coils super-

Described as follows:

Commencing at the southeast corner of said Section; thence N 01-02-57 E, 11000 Feet on the west line of the southeast 1/4 of said Section to the True Point of Beginning; thence N 88-50-48 W, 262-43 Feet, 110 Feet north and paralleled with the south line of the southeast 1/4 of said Section and terminating bearing N 01-01-31 E, 110.00 Feet from the south 1/4 corner of said Section.

The sides of said lines are to be lengthened or shortened to intersect with the 1/4 lines and section lines.



**NOTE:** SECTION CORNERS AND 1/4 CORNERS WERE CALCULATED FROM G.P.S. REAL TIME SURVEYS. CHECK ALL RECORDATION FORMS ON FILE AT THE MERCER COUNTY COURTHOUSE FOR THE CHAIN HISTORY OF CORNER POSITION, ALL BEARINGS AND DISTANCES ARE BASED ON THE NORTH DAKOTA STATE PLANE COORDINATE SYSTEM SOUTH ZONE, 1927 DATUM.

PROJECT \_\_\_\_\_

RIGHT-OF-WAY CHECKLIST

## EXHIBIT #7

Project \_\_\_\_\_ Number: \_\_\_\_\_

Ownership

**INSTRUCTIONS:** Use this form as an aid in preparation and checking of right-of-way plats. All questions should be answered by placing an "X" in the box, or if the question is not applicable, indicate by drawing a line through the box.

1. Is the following information shown in the title block of the plat?  
Name of State  
Name and Number of Project  
Name of Surveyor  
Date of Survey  
Right-of-Way Plat  
Scale of Plat (Use Bar Scale)  
Description of Land Crossed  
Date of Plat  
Name of County  
 YES
2. If there is more than one sheet, is there an index map showing the relation of the right-of-way to the found corners and PLS subdivisions, mineral survey, or homestead entry survey? Is each sheet numbered?  YES
3. Is a north arrow shown on each sheet of the plat?  YES
4. Is the origin of bearing shown?  YES
5. Has the survey been closed?  YES
6. Are the legal corners labeled as found and tied or, if not found, as projected? Are the found corners adequately described?  YES
7. Are the property lines marked projected where corners are not found, or if only one corner along a line is found?  YES
8. Are the property lines correctly labeled with PLS record bearings and distances in record dimensions, and found government bearings and distances?  YES
9. Are all pertinent occupancy lines including existing right-of-way lines correctly labeled?  YES
10. Is the number of corner ties shown commensurate with the value of the land and ROW improvements?  YES
11. Are ties to found corners shown and properly labeled at each change of ownership?  YES
12. Is the station and the bearing of the tangent to the P.O.C. shown where there is a change of ownership on a curve?  YES

- |   |                              |
|---|------------------------------|
| 13. Are the L and P lines properly labeled?   | <input type="checkbox"/> YES |
| 14. Are existing natural monuments and cultural improvements shown, with ties when appropriate?   | <input type="checkbox"/> YES |
| 15. Are appropriate subdivisions and/or Government lots shown and correctly labeled?  | <input type="checkbox"/> YES |
| 16. Are the full names of the property owners shown on all subdivisions and other parcels of land crossed or closely approached by the right-of-way? Are corporate landowner's names legally correct? | <input type="checkbox"/> YES |
| 17. Is the right-of-way width dimensioned on each sheet and at each change of width, and do the dimensions tie the right-of-way to the centerline.  | <input type="checkbox"/> YES |
| 18. Is the right-of-way acreage properly shown?   | <input type="checkbox"/> YES |
| 19. Have all the survey data and survey computations been checked?  | <input type="checkbox"/> YES |
| 20. Has all plotting been checked?  | <input type="checkbox"/> YES |
| 21. Is the ROW plat approved and sealed by an RLS of the jurisdiction?  | <input type="checkbox"/> YES |
| 22. Is the ROW plat approved by the owner?  | <input type="checkbox"/> YES |
| 23. Has the plat been checked for copying errors and omissions and have all bearings and distances been checked with protractors and scale?   | <input type="checkbox"/> YES |
| 24. Is the plat legible, neat, and can it be readily folded to 8-1/2 x 11 inch size for filing? Have you considered reducing the plat photographically to letter size?                                | <input type="checkbox"/> YES |
| 25. Is the Beginning and Ending ROW shown?  | <input type="checkbox"/> YES |

CHECKED BY:

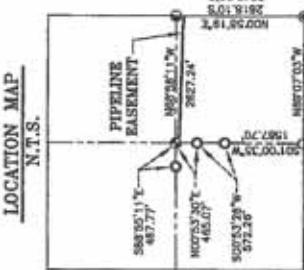
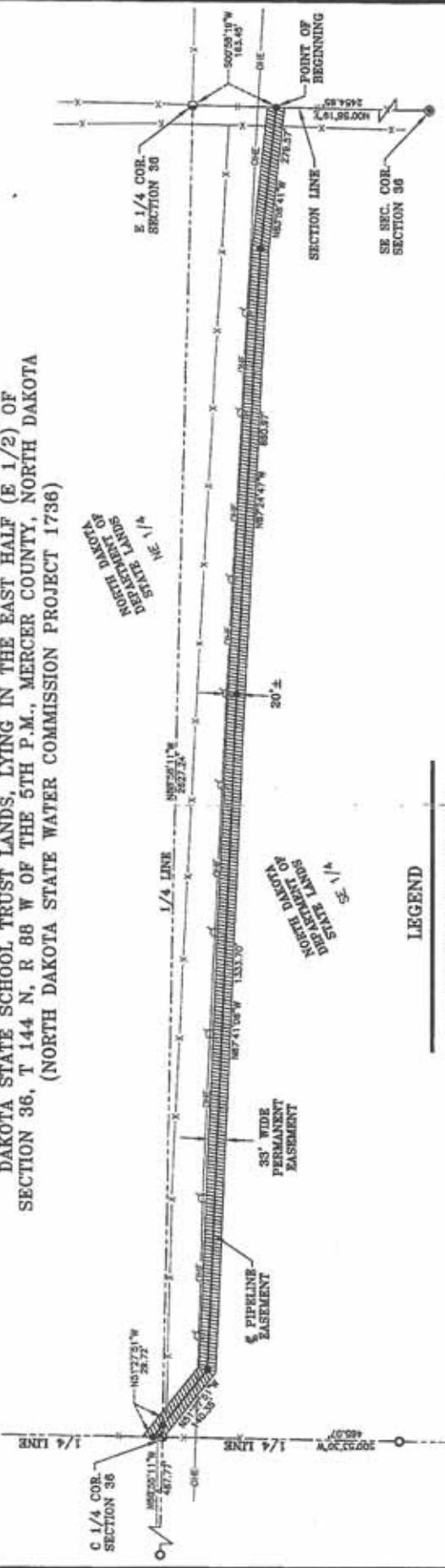
Signature \_\_\_\_\_  
Date \_\_\_\_\_

APPROVED BY:

Signature \_\_\_\_\_  
Date \_\_\_\_\_

## -EXHIBIT #8

PIPELINE EASEMENT FOR SOUTHWEST PIPELINE PROJECT (S.W.P.P.) ON NORTH  
DAKOTA STATE SCHOOL TRUST LANDS, LYING IN THE EAST HALF (E 1/2) OF  
SECTION 36, T 144 N, R 88 W OF THE 5TH P.M., MERCER COUNTY, NORTH DAKOTA  
(NORTH DAKOTA STATE WATER COMMISSION PROJECT 1736)



**SURVEYOR'S CERTIFICATE**

[REDACTED] a Licensed Land Surveyor in and for the State of North Dakota do hereby certify that at the request of the North Dakota Department of State Lands and through the North Dakota State Water Commission, did complete a survey for the purpose of establishing the permanent pipeline easement located in the East Half (E 1/2) of Section 36, Township 144 North, Range 88 West of the 5th P.M., Mercer County, North Dakota, said easement being comprised of a strip of land 33 feet in width lying 16.5 feet on each side of the following described centerline:

**LEGAL DESCRIPTION OF PERMANENT EASEMENT:** Commencing at the East Quarter corner of said Section 36; thence S0058'19" W along the east section line of said Section 36, a distance of 163.45 feet to the Point of Beginning; thence N4558'41" W, a distance of 279.57 feet; thence N8724'47" N, a distance of 890.97 feet; thence N8724'41"06" W, a distance of 133.70 feet; thence N5122'51" N, a distance of 140.35 feet to the east-west quarter line of said Section 36; thence N5122'51" N, a distance of 29.72 feet to the north-south quarter line of said Section 36 and thus terminating, said ending point being located N0053'30" E along solid north-south quarter line, a distance of 18.10 feet from the Center Quarter corner of said Section 36 and containing 2.02 acres, more or less.

This Certificate is to the best of my knowledge and belief a true description of said survey. I hereby certify that I have executed this document this 17<sup>th</sup> day of July, 2006.

QUARTER SECTION	ACRES
NE 1/4	0.02
SE 1/4	2.00



BASIS OF BEARINGS	
BEARINGS SHOWN ARE GRID BEARINGS BASED ON THE NORTH DAKOTA STATE PLANE COORDINATE SYSTEM, NAD 83, SOUTH ZONE.	

EXHIBIT A  
 PARCEL NO. MO-0360  
 SECTION 25, T139N, R82W  
 MORTON COUNTY  
 STATE OF NORTH DAKOTA

OWNER: KNIFE RIVER CORPORATION—  
 NORTH CENTRAL, f/k/a BAUERLY  
 BROTHERS, INC.

Legal Description of Permanent Easement:

A permanent easement for pipeline utility purposes over, under and across the Southwest Quarter of Section 25, Township 139 North, Range 82 West of the Fifth Principal Meridian, Morton County, North Dakota, being a strip of land 70.00 feet wide, centered on the following described line:

Commencing at the southwest corner of the Southwest Quarter of said Section 25; thence North 00°47'31" West, along the easterly line of the Southwest Quarter of said Section 25, for a distance of 906.33 feet to the true point of beginning of the centerline to be described; thence North 44°23'23" West, for a distance of 545.84 feet, thence North 21°10'56" West, for a distance of 1436.78 feet; thence North 02°59'26" East, for a distance of 2.28 feet to the northerly line of the Southwest Quarter of said Section 25, said line there terminating. The sidelines of said easement shall be lengthened or shortened as necessary to intersect the northerly and easterly lines of the Southwest Quarter of said Section 25.

Said tract of land contains 3.18 acres, more or less.

Legal Description of Temporary Construction Easement:

A temporary easement for construction purposes over, under and across the Southwest Quarter of Section 25, Township 139 North, Range 82 West of the Fifth Principal Meridian, Morton County, North Dakota, being a strip of land 15.00 feet wide, lying easterly of, as measured perpendicular to and being coincident with the easterly line of the above described 70.00 foot wide permanent easement. The sidelines of said easement shall be lengthened or shortened as necessary to intersect the northerly and easterly lines of the Southwest Quarter of said Section 25.

Said tract of land contains 0.65 acres, more or less.

Note: All bearings given are based on the North Dakota State Plane Coordinate System, South Zone, NAD 83, US Survey Foot, with measured ground distances.

This description was prepared by [REDACTED]



## PIPELINE EASEMENT

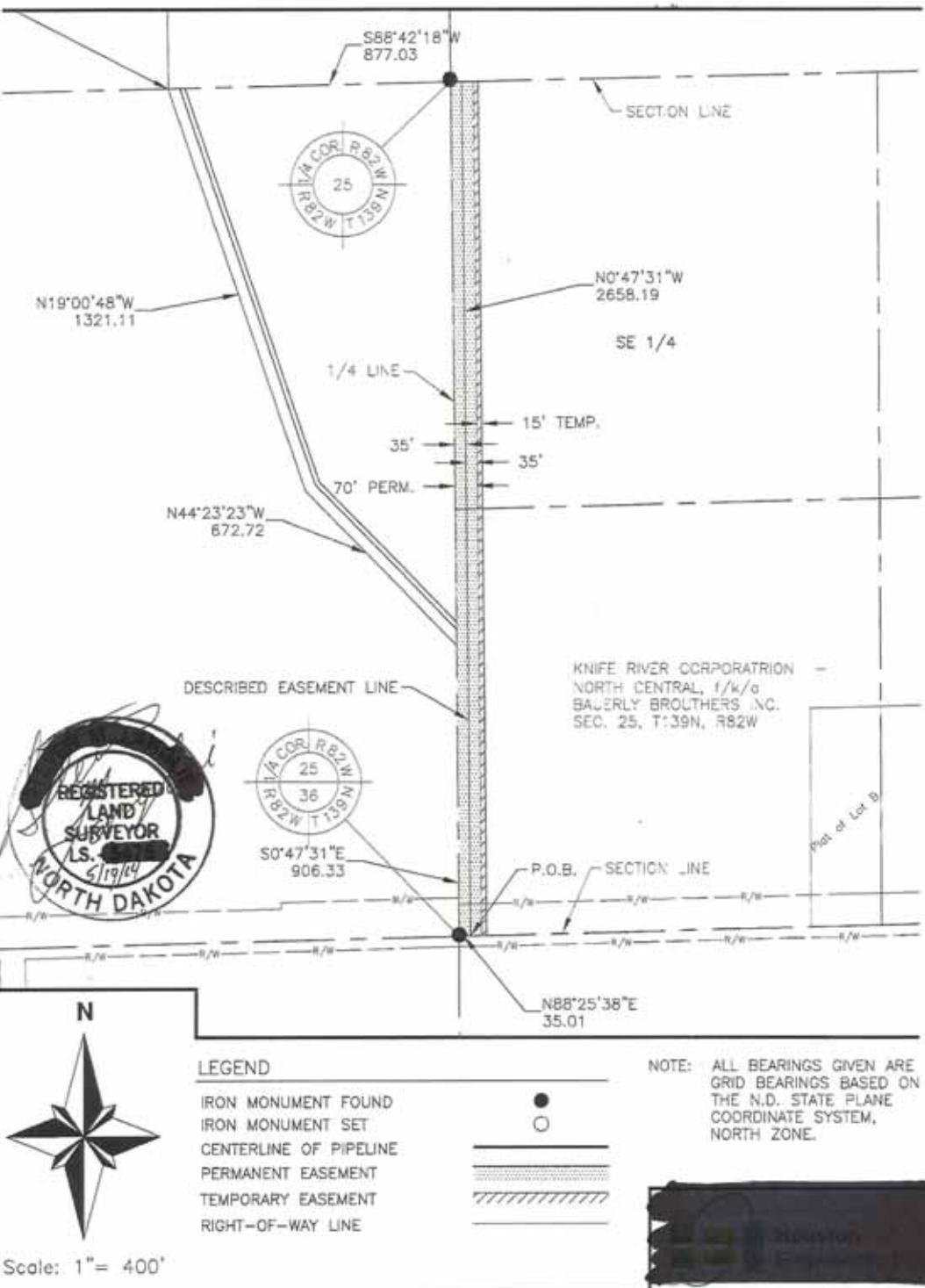
PROJ NO.  
 6125-011

PIPELINE FROM ST. ANTHONY TO HESKETT PLANT  
 MONTANA DAKOTA UTILITIES COMPANY

SHEET  
 1 OF 2

EXHIBIT A  
PARCEL NO. MO-0295  
SECTION 25, T139N, R82W  
MORTON COUNTY  
STATE OF NORTH DAKOTA

OWNER: KNIFE RIVER CORPORATION -  
NORTH CENTRAL, f/k/a BAUERLY  
BROTHERS INC.



## PIPELINE EASEMENT

PROJ NO.  
6125-011

PIPELINE FROM ST. ANTHONY TO HESKETT PLANT  
MONTANA DAKOTA UTILITIES COMPANY

SHEET  
2 OF 2

## WELL LOCATION PLAT

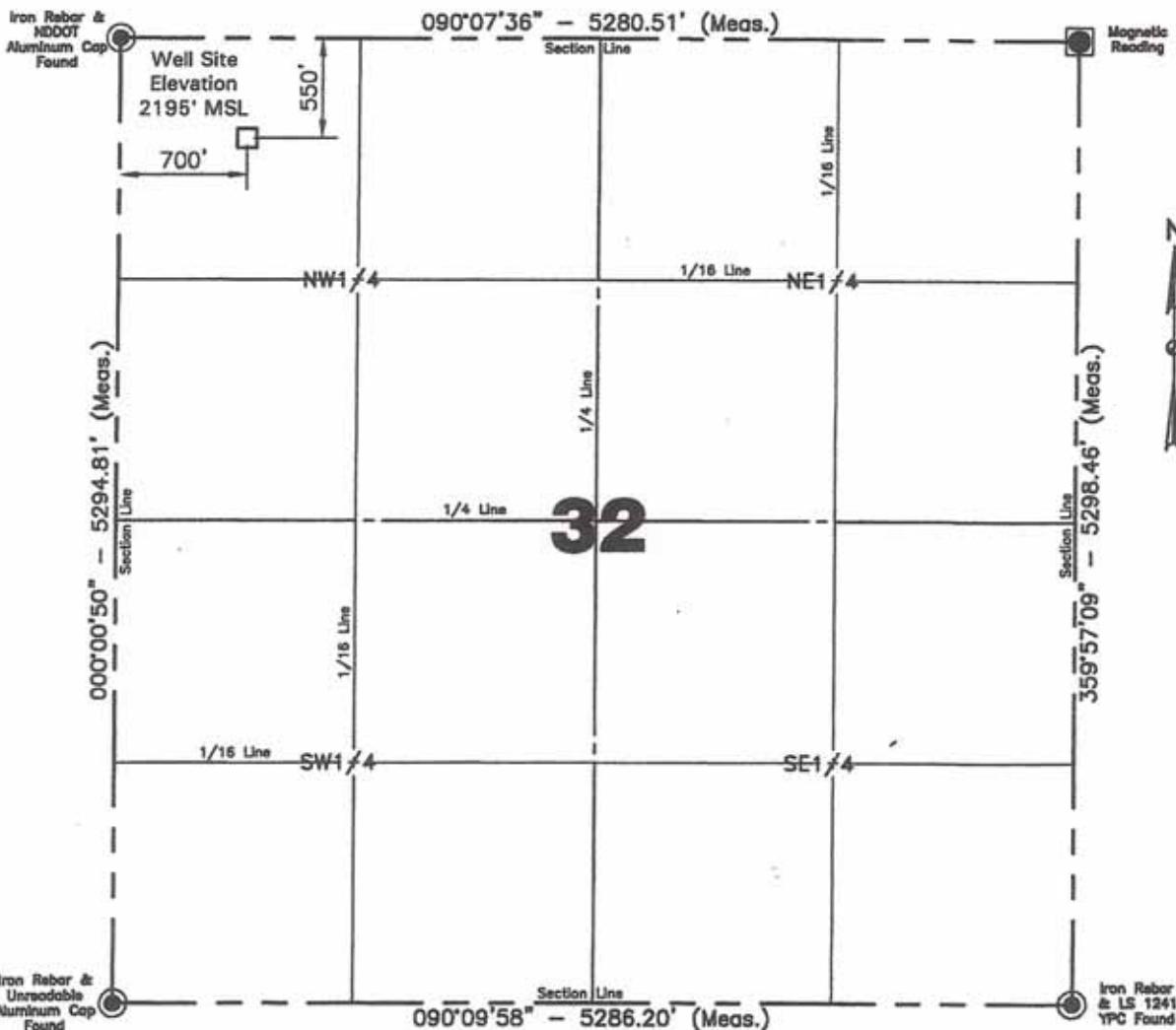
Missouri Basin Well Service  
12980 35 R St. SW Belfield, North Dakota 58622

Jeglum 32 #12 SWD  
550 feet from the north line and 700 feet from the west line  
Section 32, T. 163 N., R. 100 W., 5th P.M.

Divide County, North Dakota

Surface owner @ well site - Lyle & Pauline Jeglum

Latitude  $48^{\circ}54'27.708''$  North; Longitude  $103^{\circ}42'12.785''$  West  
[Derived from OPUS Solution NAD-83(CORS96)]



Scale 1"=1000'

Confidentiality Notice: The information contained on this plat is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.

NOTE: All land corners are assumed unless otherwise noted.

The well location shown hereon is not an as-built location.

Roger Kubischa  
Steve Wood

7/17/2012  
12/28/2011

Surveyed By

Date

Vertical Control Datum Used  
North American Vertical Datum 1988 (NAVD 88)  
Based on elevation derived from OPUS Solution on  
GPS-KLJ CP (Aluminum Cap) Located a distance of  
40.23' on an azimuth of  $000^{\circ}31'42''$  from the NW  
corner of Section 31 T.163N., R.100W., 5th P.M.  
being at 2246.24' Elevation MSL.

Project No. 37111177  
Book Q-120/OW-300 Pg. 34-37/34-35 Staking

Professional Consulting Engineers  
and Surveyors  
Registered in  
North Dakota, South Dakota  
Montana, Wyoming & Minnesota  
Tele-Fax No. 701-483-2795  
Bus. Phone No. 701-483-1284  
P.O. Box 290  
677 27th Ave. East  
Dickinson, North Dakota 58602  
Certificate of Authorization #C-061



Revised: 7/19/2012



# HORIZONTAL SECTION PLAT

Missouri Basin Well Service  
12980 35 R St. SW Belfield, North Dakota 58622

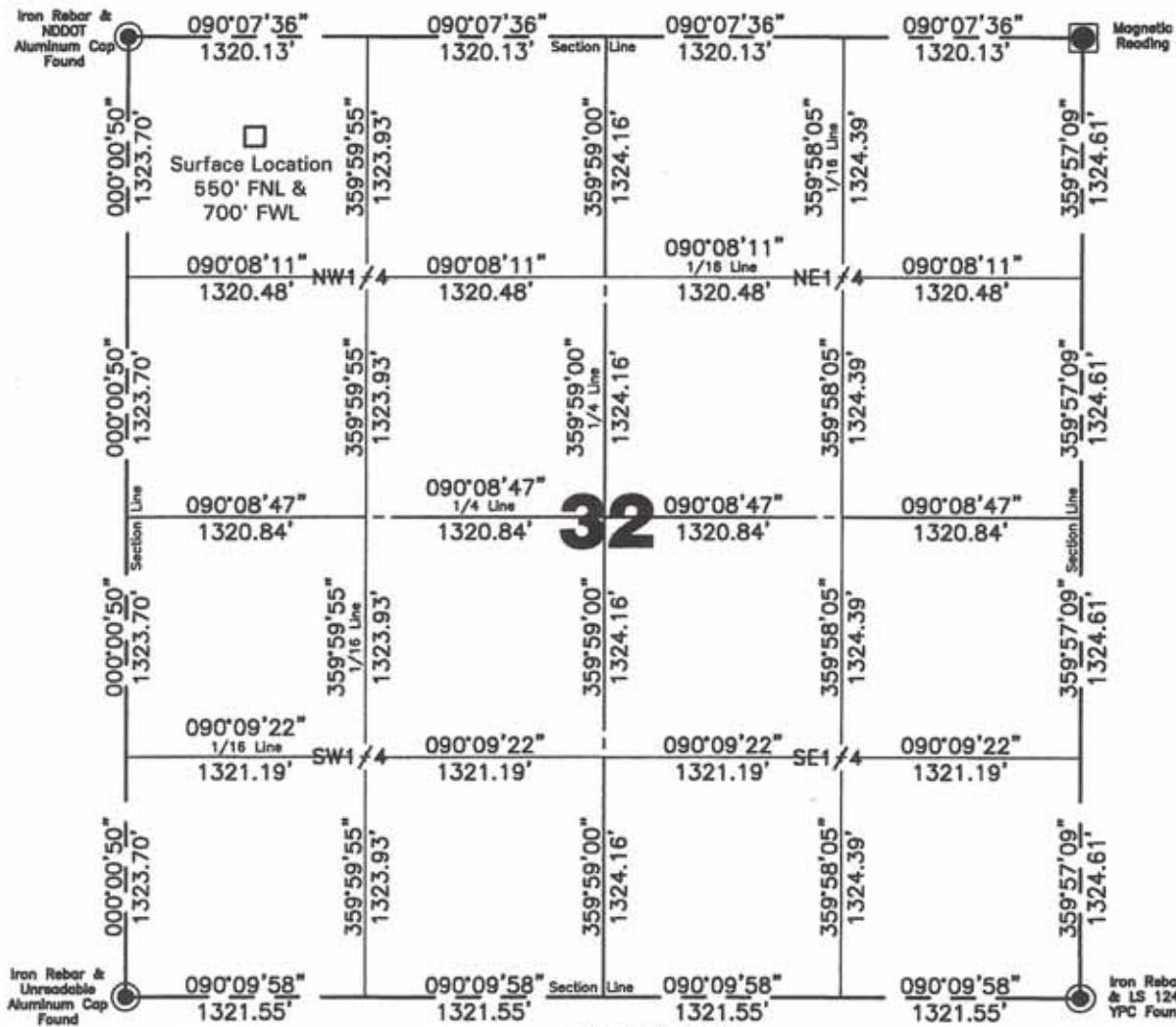
Jeglum 32 #12 SWD

550 feet from the north line and 700 feet from the west line  
Section 32, T. 163 N., R. 100 W., 5th P.M.

Divide County, North Dakota

Surface owner @ well site - Lyle & Pauline Jeglum

Latitude 48°54'27.708" North; Longitude 103°42'12.785" West  
[Derived from OPUS Solution NAD-83(CORS96)]



Scale 1"=1000'

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I, Quentin Obrigewitsch, Professional Land Surveyor, N.D. No. 5999, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.



Surveyed By S.W./R.K.	Field Book 0-120/OW-300
Computed & Drawn By Z.T./C.W.	Project No. 37111177

Revised: 7/19/2012

**Missouri Basin Well Service**  
**Jeglum 32 #12 SWD**  
**Section 32, T 163 N, R 100 W, 5th P.M.**  
**Divide County, North Dakota**

Well Site Elevation	2194.6' MSL
Well Pad Elevation	2193.5' MSL
Excavation	4,675 C.Y.
Plus Pit	795 C.Y.
	<hr/>
	5,470 C.Y.
Embankment	635 C.Y.
Plus Shrinkage (+30%)	190 C.Y.
	<hr/>
	825 C.Y.
Stockpile Pit	795 C.Y.
Stockpile Top Soil (6")	3,215 C.Y.
Production Rehabilitation	0 C.Y.
Road Embankment & Stockpile from Pad	635 C.Y.
Disturbed Area From Pad	3.98 Acres

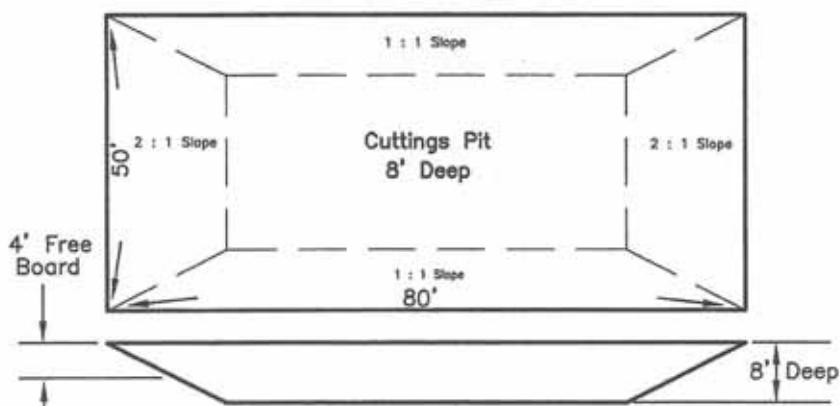
**NOTE:**

All cut end slopes are designed at 1:1 slopes &  
All fill end slopes are designed at 1 1/2:1 slopes

Well Site Location

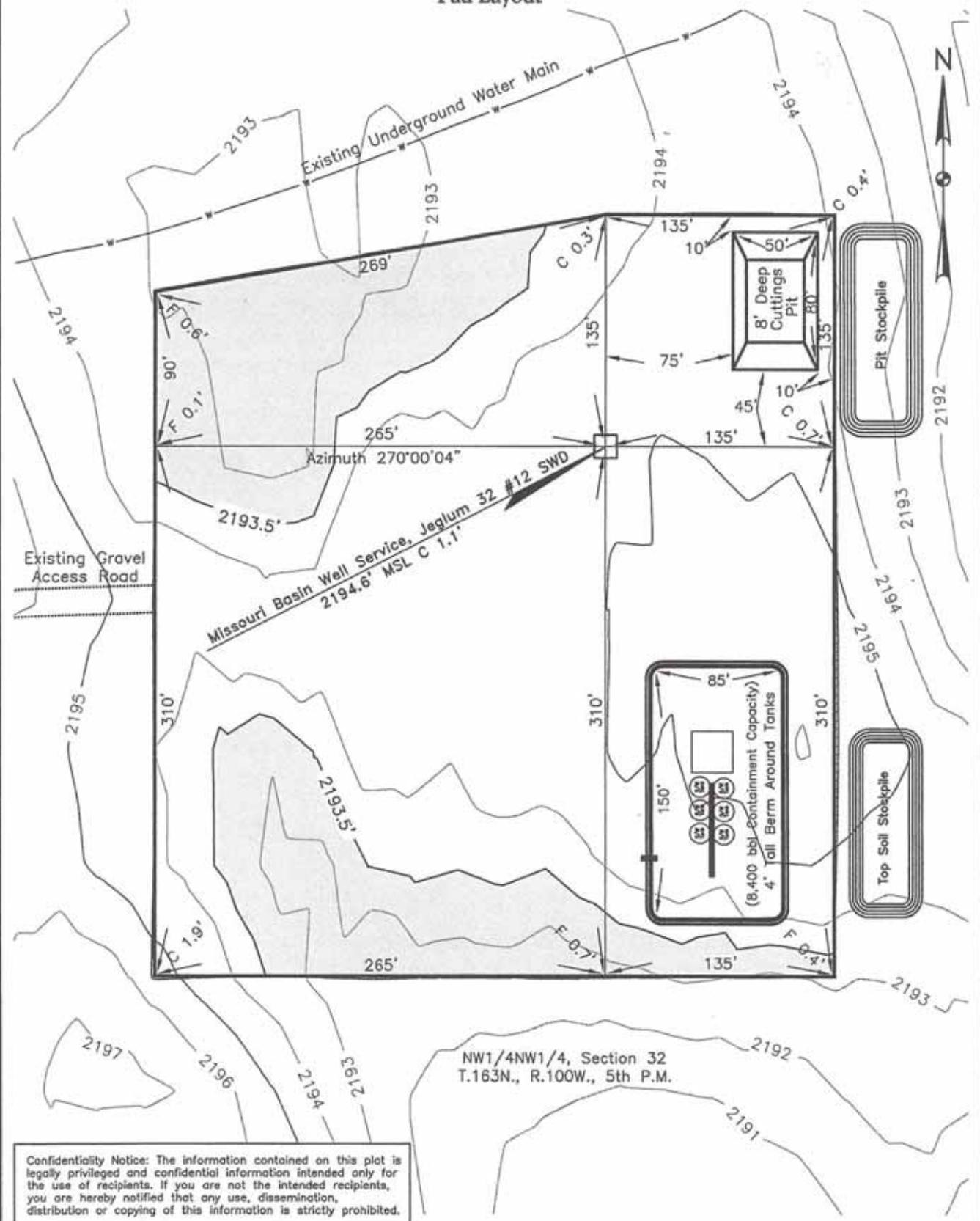
550' FNL

700' FWL



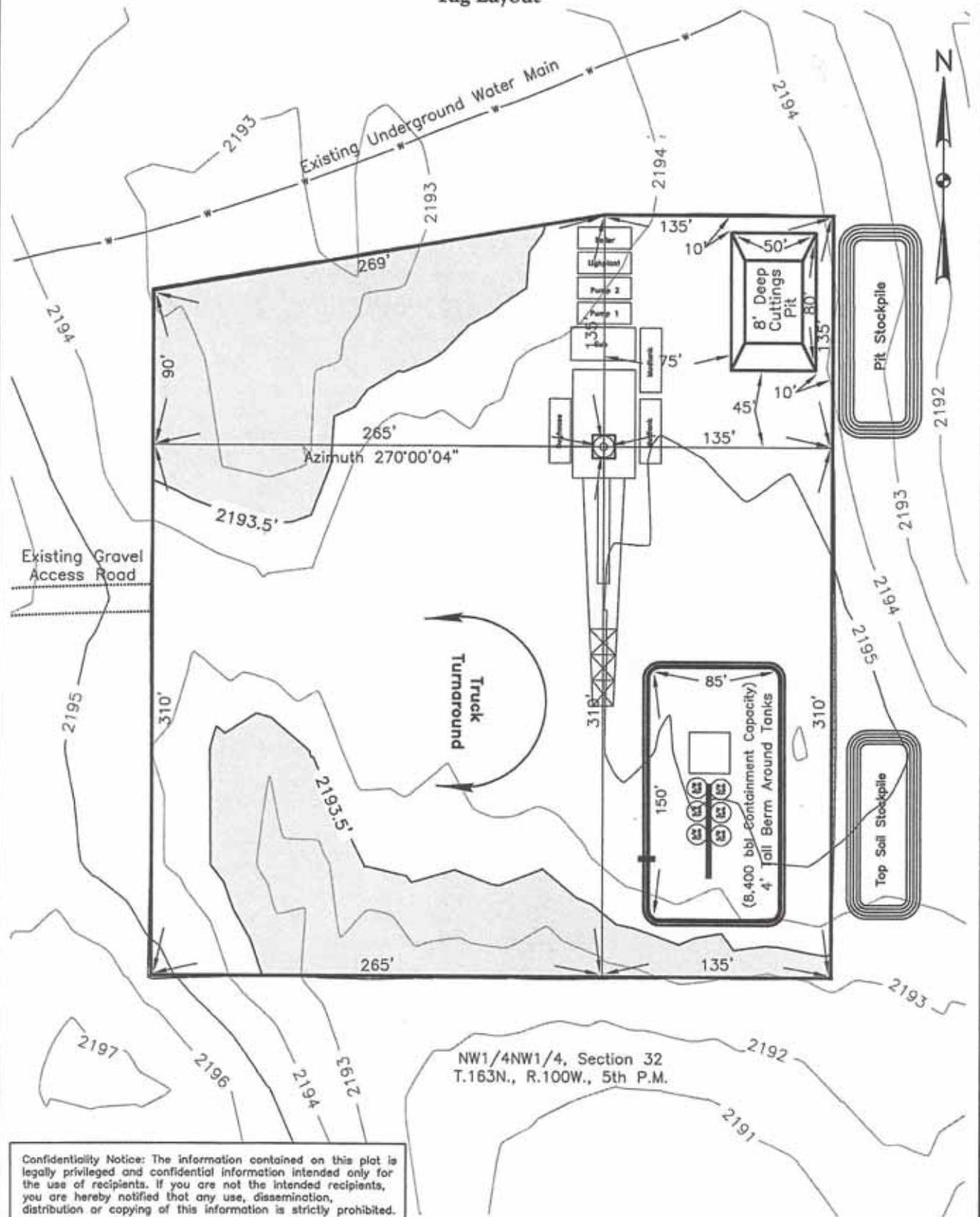
Drawn By Z.T./C.W./J.K.	Surveyed By S.W./R.K.	Approved By Q. Obrigewitsch	Scale None	Date 1/7/2012
Field Book 0-120/OW-300	Material Quantities	Revised 1/30/2013	Project No. 37111177	Drawing No. 3

# Jeglum 32 #12 SWD Pad Layout



Drawn By Z.T./C.W./J.K.	Surveyed By S.W./R.K.	Approved By Q. Obrigewitsch	Scale 1"=80'	Date 1/7/2012
Field Book 0-120/OW-300	Material Pad Layout	Revised 1/30/2013	Project No. 37111177	Drawing No. 4

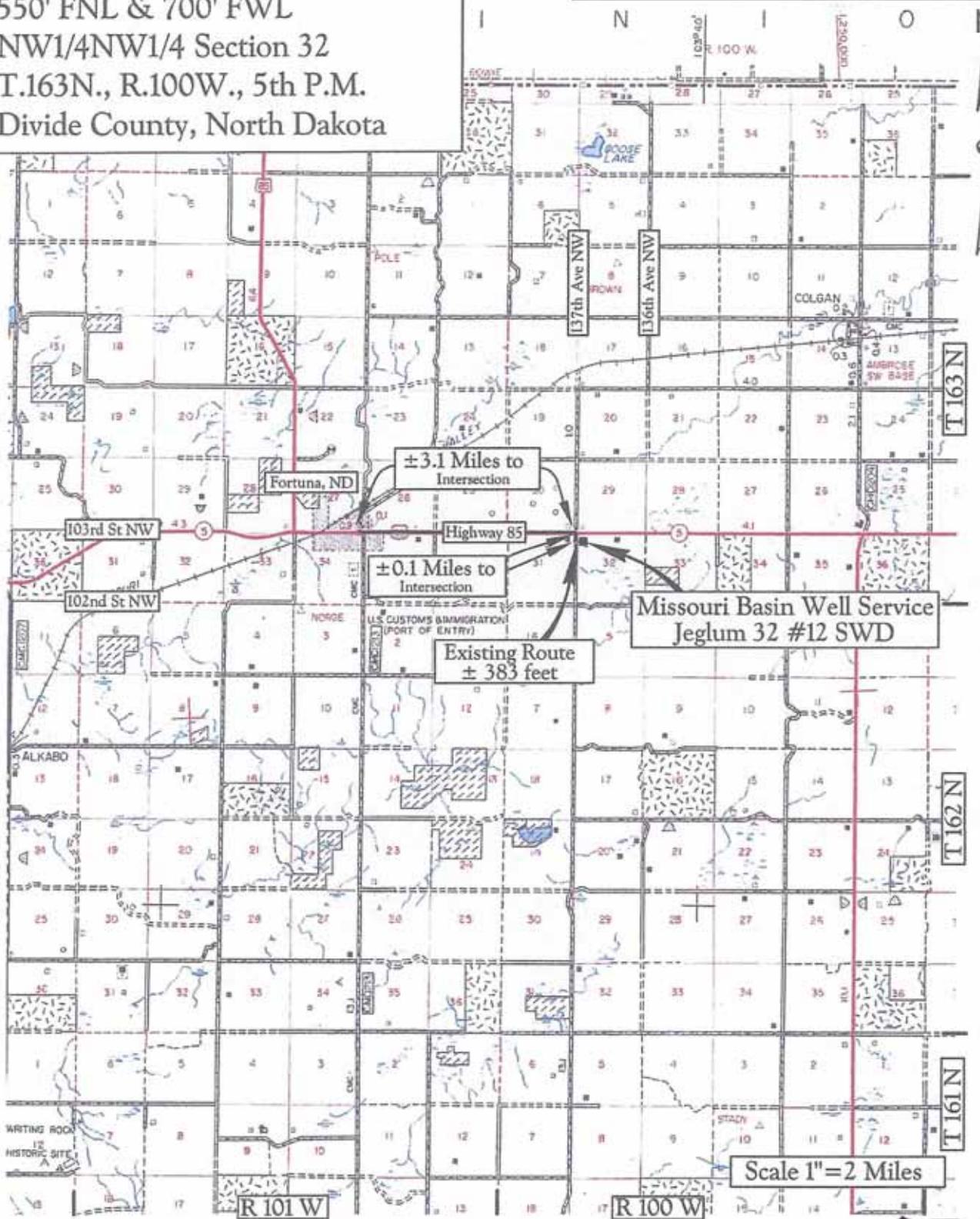
# Jeglum 32 #12 SWD Rig Layout



Drawn By J Kress	Surveyed By S.W./R.K.	Approved By Q. Obrigewitsch	Scale 1"=80'	Date 1/30/2013
Field Book 0-120/OW-300	Material Rig Layout	Revised -	Project No. 37111177	Drawing No. 5

Missouri Basin Well Service  
 Jeglum 32 #12 SWD  
 550' FNL & 700' FWL  
 NW1/4NW1/4 Section 32  
 T.163N., R.100W., 5th P.M.  
 Divide County, North Dakota

Confidentiality Notice: The information contained on this plot is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.



Map "A"  
 County Access Route

Legend

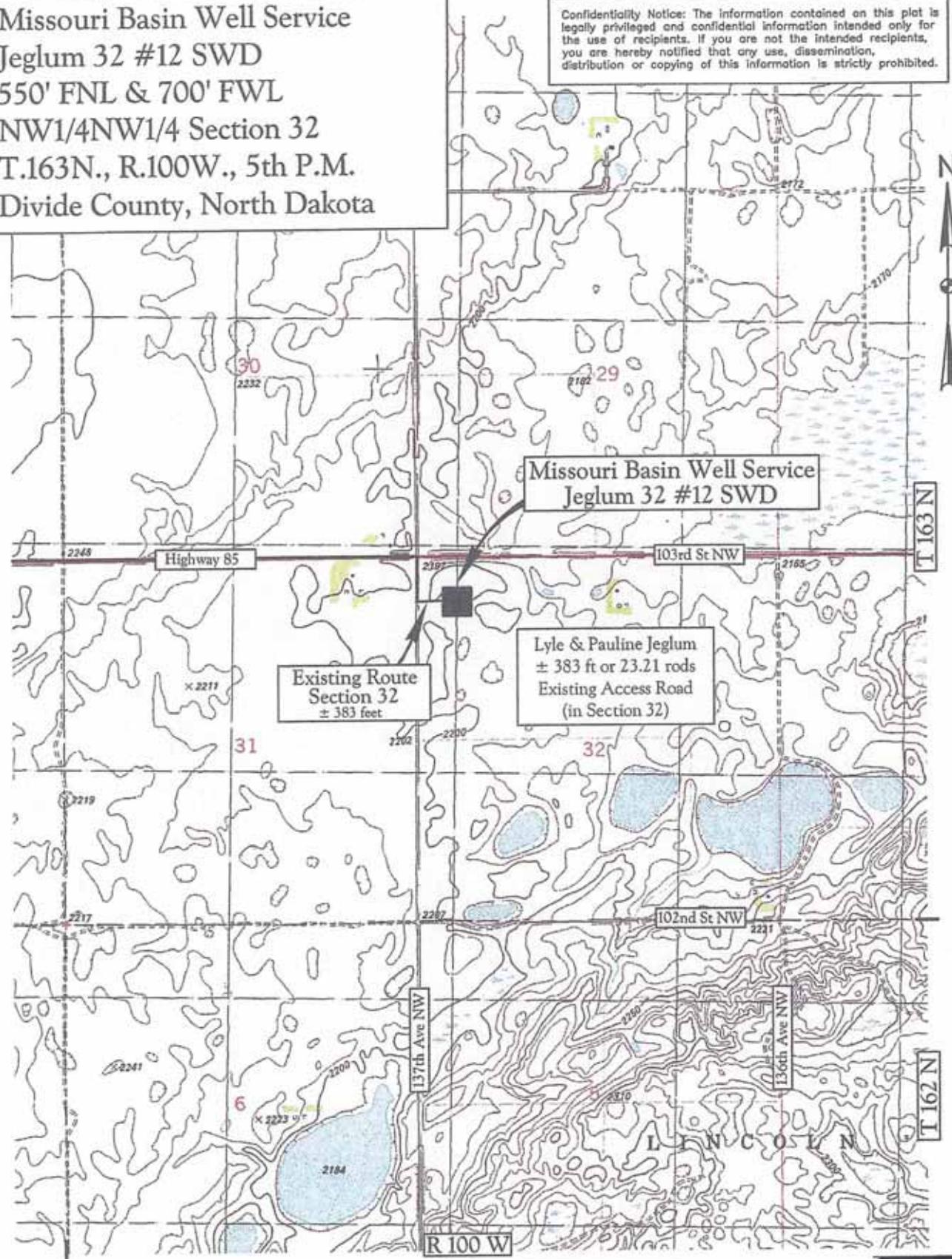
Existing Roads —  
 Proposed Roads - - -

Revised: 7/19/2012

Reddick Surveyors  
 Planners

Missouri Basin Well Service  
Jeglum 32 #12 SWD  
550' FNL & 700' FWL  
NW1/4NW1/4 Section 32  
T.163N., R.100W., 5th P.M.  
Divide County, North Dakota

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Map "B"  
Quad Access Route

Legend  
Existing Roads \_\_\_\_\_  
Proposed Roads - - - - -

Revised: 7/19/2012

Scale 1"=2000'

Engineers Surveyors  
Planners

## WELL LOCATION PLAT

Murex Petroleum Corporation  
515 N. Sam Houston Pkwy. E., Suite 485 Houston, TX 77060

Cheryl Kim 24-13H

380 feet from the south line and 2000 feet from the west line (surface location)

Section 24, T. 151 N., R. 102 W., 5th P.M.

210 feet from the north line and 2500 feet from the west line (bottom location)

Section 13, T. 151 N., R. 102 W., 5th P.M.

McKenzie County, North Dakota

Surface owner @ well site - Tim Dwyer Jr.

Latitude 47°52'42.055" North; Longitude 103°40'55.896" West (surface location)

Latitude 47°54'20.488" North; Longitude 103°40'48.684" West (bottom location)

[Derived from OPUS Solution NAD-83(CORS96)]



## Confidentiality Notice:

The information contained on this plat is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.

## Note:

All land corners are assumed unless otherwise noted. The well location shown hereon is not an as-built location.

Mathias A. Krebs

05/23/2012

Surveyed By N.D.P.L.S. # 3214

Date

## Vertical Control Datum Used

North American Vertical Datum 1988 (NAVD 88)

Based on elevation derived from OPUS Solution on BASE\*Flat I. Pin (iron rebar) Located a distance of 5249.83' on an azimuth of 091°17'25" from the SW corner of Section 24, T.151N., R.102W., 5th P.M. being at 2140.18' Elevation MSL.

Project No.

3712689

Book OW-285 Pg. 19-23 Staking

Professional Consulting Engineers  
and Surveyors  
Registered in

North Dakota, South Dakota

Montana, Wyoming & Minnesota

Tele-Fax No. 701-483-2795

Bus. Phone No. 701-483-1284

P.O. Box 290

677 27th Ave. East

Dickinson, North Dakota 58602

Certificate of Authorization #C-061



Engineers Surveyors  
Planners

# HORIZONTAL SECTION PLAT

Murex Petroleum Corporation  
515 N. Sam Houston Pkwy. E., Suite 485 Houston, TX 77060

Cheryl Kim 24-13H

380 feet from the south line and 2000 feet from the west line (surface location)

Section 24, T. 151 N., R. 102 W., 5th P.M.

210 feet from the north line and 2500 feet from the west line (bottom location)

Section 13, T. 151 N., R. 102 W., 5th P.M.

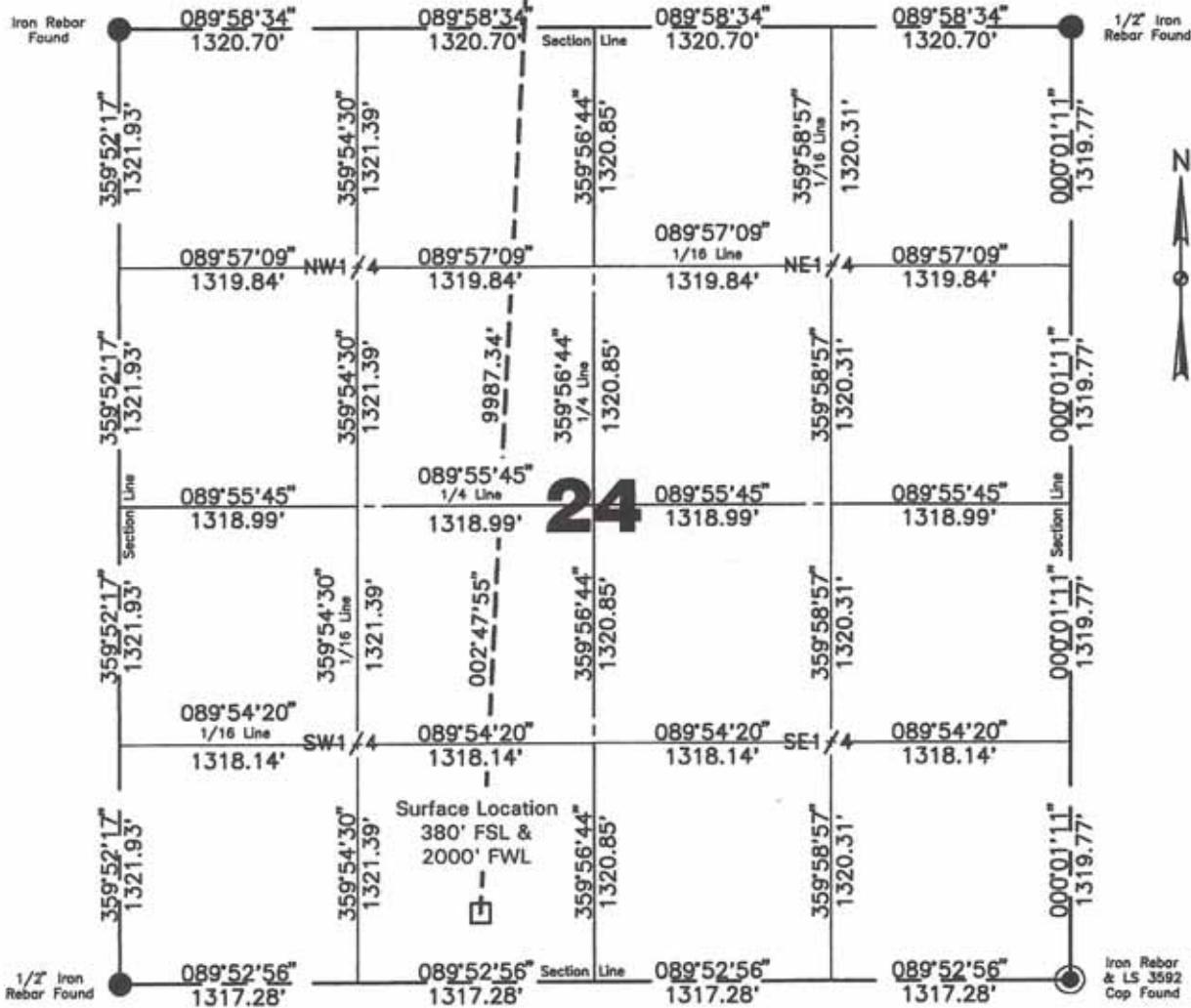
McKenzie County, North Dakota

Surface owner @ well site - Tim Dwyer Jr.

Latitude 47°52'42.055" North; Longitude 103°40'55.896" West (surface location)

Latitude 47°54'20.488" North; Longitude 103°40'48.684" West (bottom location)

[Derived from OPUS Solution NAD-83(CORS96)]



Scale 1"=1000'

I, Quentin Obrigewitsch, Professional Land Surveyor, N.D. No. 5999, do hereby certify that the survey plat shown herein was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.



Engelke Surveyors  
Planners

**Confidentiality Notice:** The information contained on this plat is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.

**Note:**  
All corners shown on this plat were found in the field during Murex Petroleum Corporation, Cheryl Kim 24-13H oil well survey on May 23, 2012. Distances to all others are calculated. All azimuths are based on the south line of Section 24, being on an azimuth of 089°52'56".

Surveyed By	Field Book
M. A. Krebs	OW-285
Computed & Drawn By	Project No.
A. Romann	3712689

# HORIZONTAL SECTION PLAT

Murex Petroleum Corporation  
515 N. Sam Houston Pkwy. E., Suite 485 Houston, TX 77060

Cheryl Kim 24-13H

380 feet from the south line and 2000 feet from the west line (surface location)

Section 24, T. 151 N., R. 102 W., 5th P.M.

210 feet from the north line and 2500 feet from the west line (bottom location)

Section 13, T. 151 N., R. 102 W., 5th P.M.

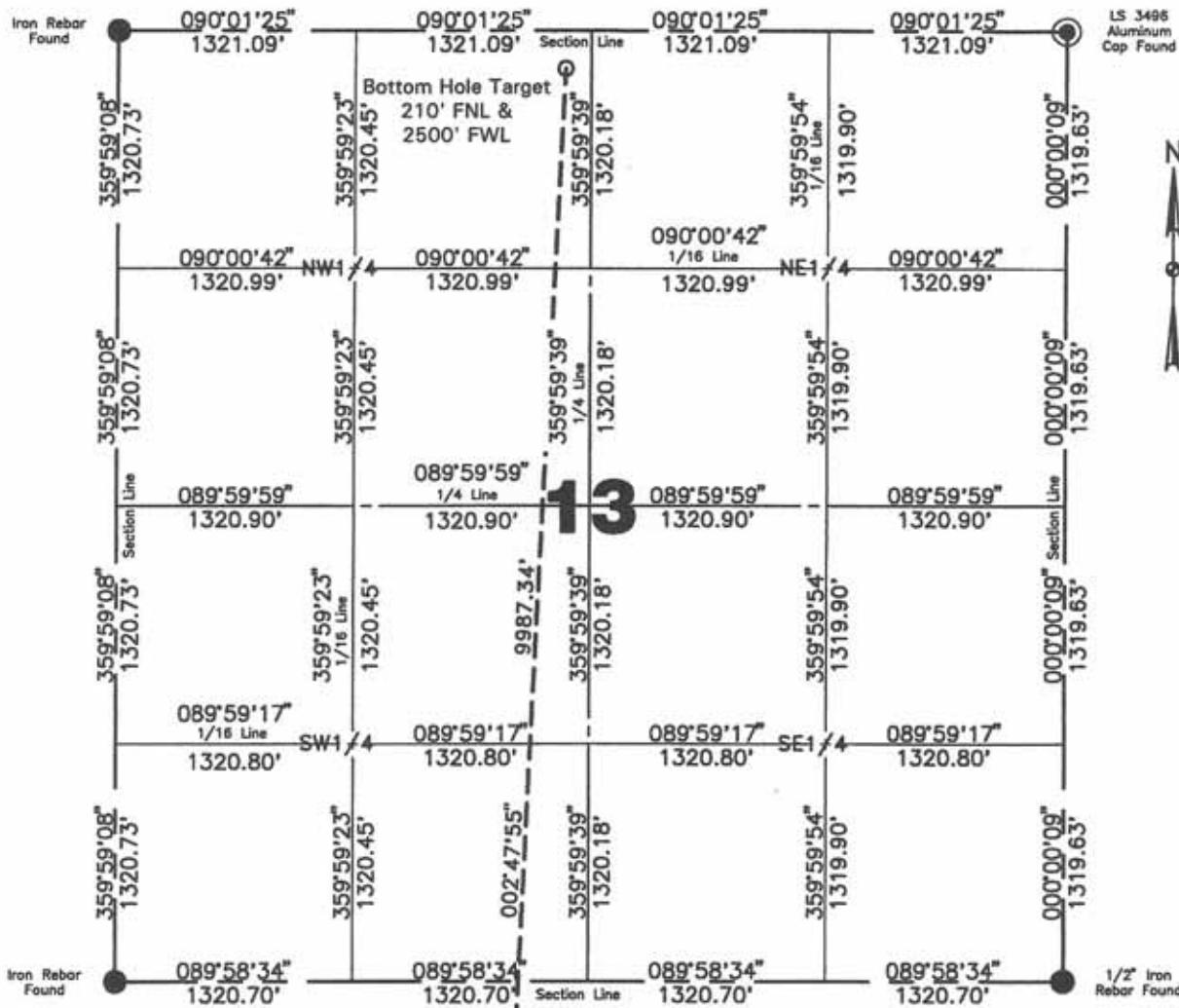
McKenzie County, North Dakota

Surface owner @ well site - Tim Dwyer Jr.

Latitude 47°52'42.055" North; Longitude 103°40'55.896" West (surface location)

Latitude 47°54'20.488" North; Longitude 103°40'48.684" West (bottom location)

[Derived from OPUS Solution NAD-83(CORS96)]



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Scale 1"=1000'

I, Quentin Obrigwitsch, Professional Land Surveyor, N.D. No. 5999, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.



Engineers Surveyors  
Planners

Surveyed By M. A. Krebs	Field Book OW-285
Computed & Drawn By A. Romann	Project No. 3712689

## BOTTOM HOLE LOCATION PLAT

**Murex Petroleum Corporation**  
515 N. Sam Houston Pkwy. E., Suite 485 Houston, TX 77060

Cheryl Kim 24-13H

380 feet from the south line and 2000 feet from the west line (surface location)

Section 24, T. 151 N., R. 102 W., 5th P.M.

210 feet from the north line and 2500 feet from the west line (bottom location)

Section 13, T. 151 N., R. 102 W., 5th P.M.

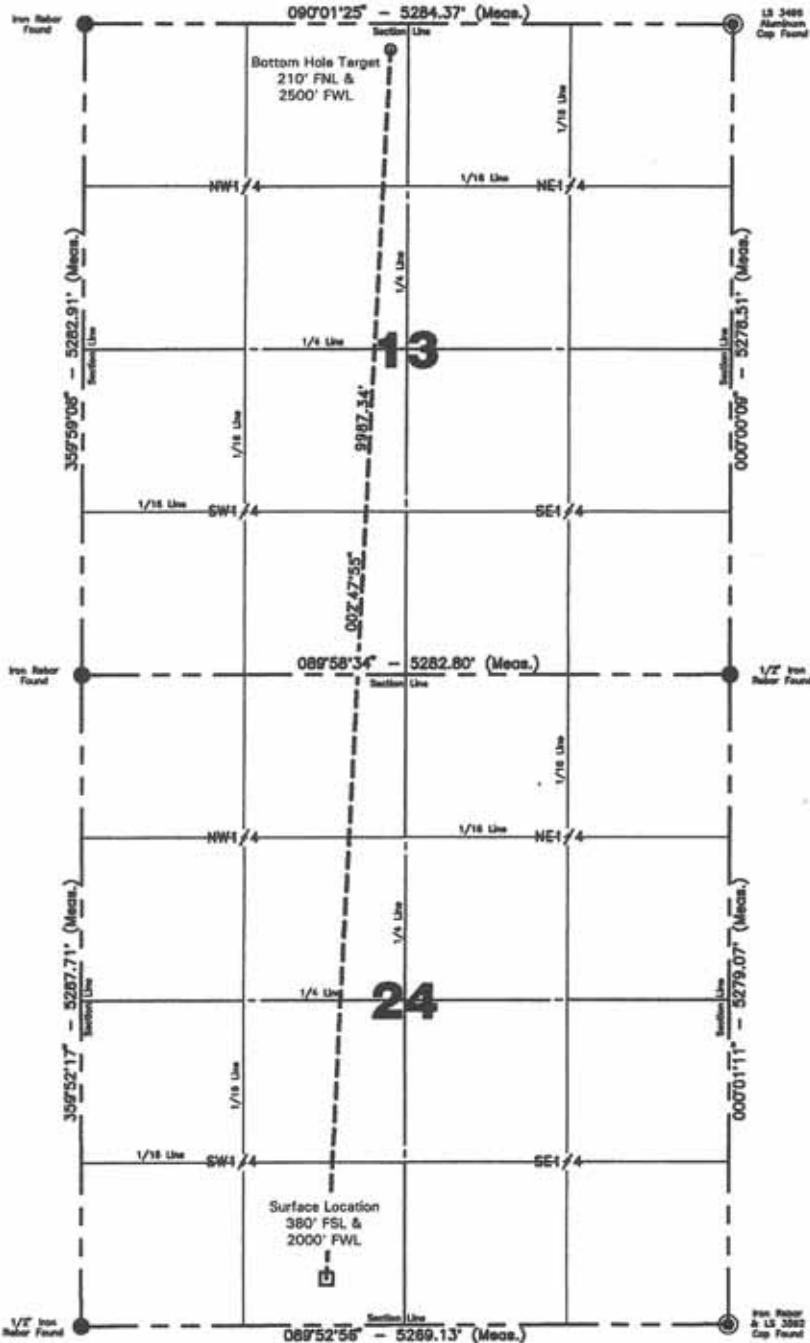
### **McKenzie County, North Dakota**

Surface owner @ well site - Tim Dwyer Jr.  
255 N. Main, Wyo. 107-1055-0001

**Latitude** 47°52'42.055" **North:** **Longitude** 103°40'55.896" **West (surface location)**

Latitude 47°54'20.488" North; Longitude 103°40'48.684" West (bottom location)  
[Derived from OPIS Solution NAD 83(crspp93)]

[Derived from OPUS Solution NAD-83(CORS95)]



**Note:**

All corners shown on this plat were found in the field during Munex Petroleum Corporation, Cheryl Kim 24-13H oil well survey on May 23, 2012. Distances to all others are calculated. All azimuths are based on the south line of Section 24, being on an azimuth of 089°52'56".

**Confidentiality Notice:** The information contained on this plat is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.



Scale 1"=1500'

I, Quentin Obrigewitsch, Professional Land Surveyor, N.D. No. 5999, do hereby certify that the survey plat shown hereon was made by me, or under my direction, from notes made in the field, and the same is true and correct to the best of my knowledge and belief.



Computed & Drawn By A. Romann	Surveyed By M. A. Krebs	Approved By Q. Obriegwitsch	Scale 1"=1500'	Date 05/24/2012
Field Book OW-285	Material B.H. Layout	Revised —	Project No. 3712689	Drawing No. 4

**Murex Petroleum Corporation**  
**Cheryl Kim 24-13H**  
**Section 24, T. 151 N., R. 102 W., 5th P.M.**  
**McKenzie County, North Dakota**

Well Site Elevation	2203.6' MSL
Well Pad Elevation	2201.3' MSL
Excavation	12,115 C.Y.
Plus Pit	1,720 C.Y.
	<hr/>
	13,835 C.Y.
Embankment	5,435 C.Y.
Plus Shrinkage (+30%)	1,630 C.Y.
	<hr/>
	7,065 C.Y.
Stockpile Pit	1,720 C.Y.
Stockpile Top Soil (6")	3,090 C.Y.
Production Rehabilitation	0 C.Y.
Road Embankment & Stockpile from Pad	1,960 C.Y.
Disturbed Area From Pad	3.83 Acres

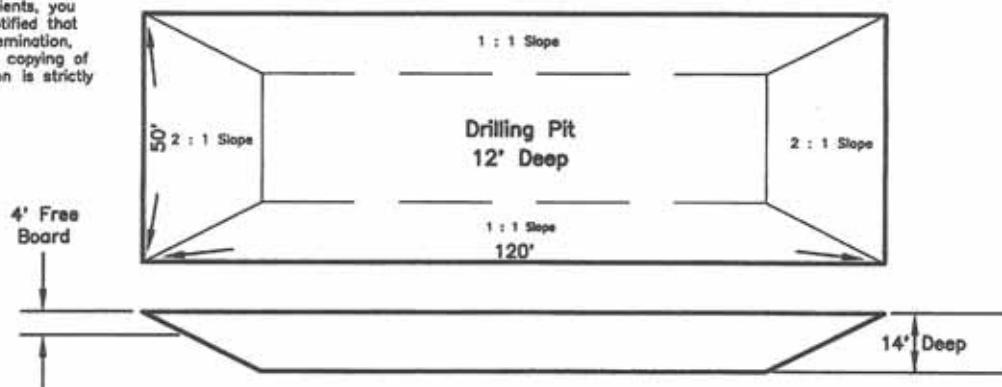
**NOTE :**

All cut end slopes are designed at 1:1 slopes &  
All fill end slopes are designed at 1 1/2:1 slopes

Well Site Location

380' FSL  
2000' FWL

**Confidentiality Notice:**  
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for the use of recipients.  
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intended recipients, you  
are hereby notified that  
any use, dissemination,  
distribution or copying of  
this information is strictly  
prohibited.

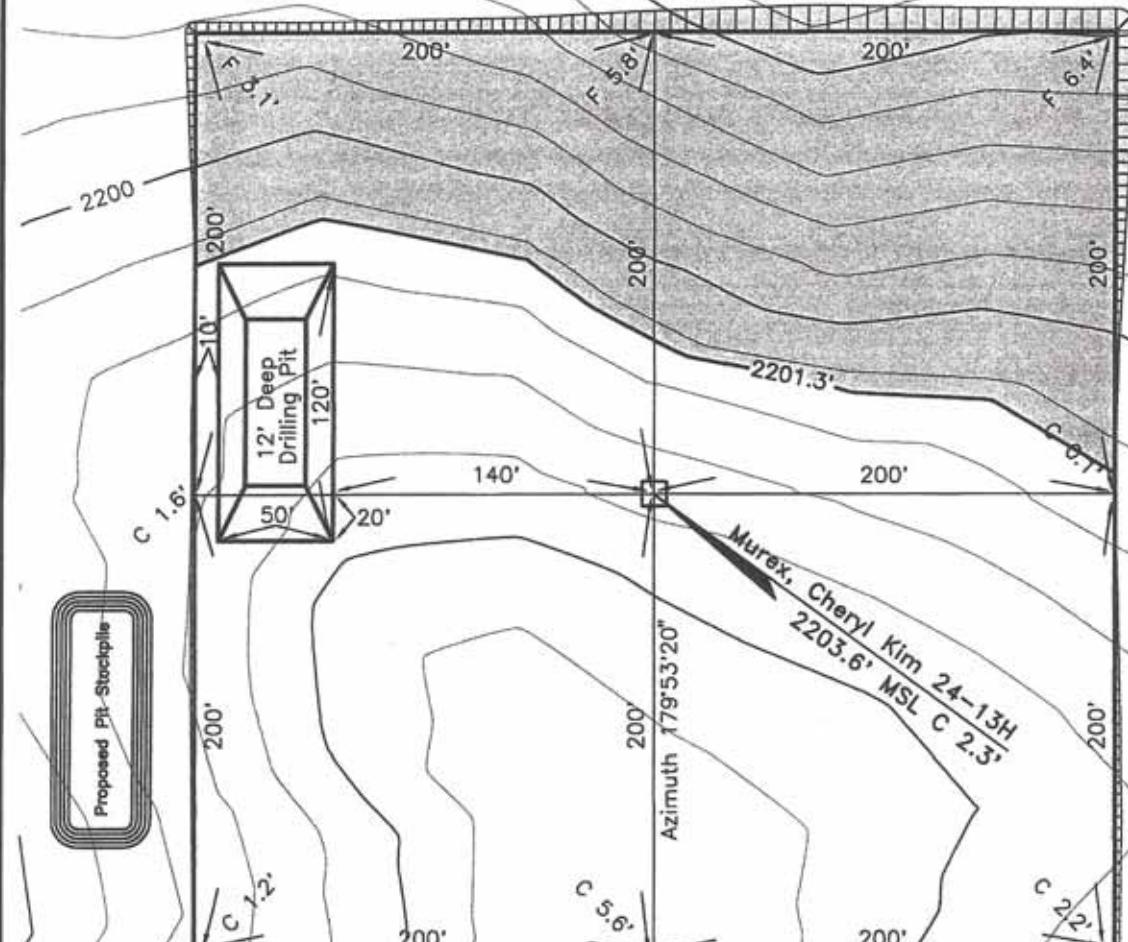


Drawn By A. Romann	Surveyed By M. A. Krebs	Approved By Q. Obrigewitsch	Scale None	Date 05/24/2012
Field Book OW-285	Material Quantities	Revised -	Project No. 3712689	Drawing No. 5

# Cheryl Kim 24-13H

## Pad Layout

N



Murex, Cheryl Kim 24-13H  
2203.6' MSL C 2.3'

Azimuth 179°53'20"

SE1/4SW1/4, Section 24  
T.151N., R.102W., 5th P.M.

Section Line

Highway 200

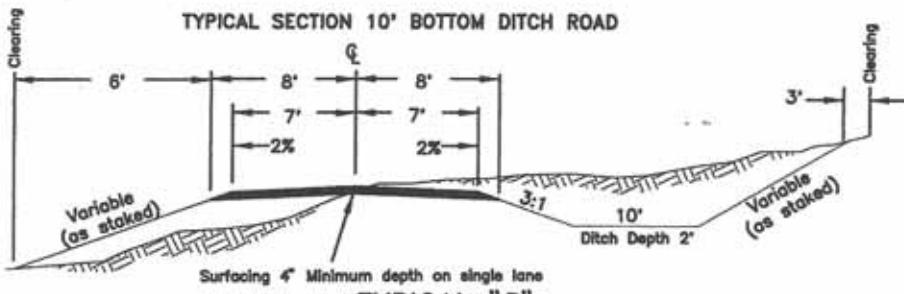
**Confidentiality Notice:** The information contained on this plot is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.

NE1/4NW1/4, Section 25  
T.151N., R.102W., 5th P.M.

Drawn By	Surveyed By	Approved By	Scale	Date
A. Romann	M. A. Krebs	Q. Obrigewitsch	1" = 80'	05/24/2012
Field Book OW-285	Material Pad Layout	Revised -	Project No. 3712689	Drawing No. 6



**Cheryl Kim 24-13H**  
Roadway Typical Sections



**TYPICAL "B"**

No Scale

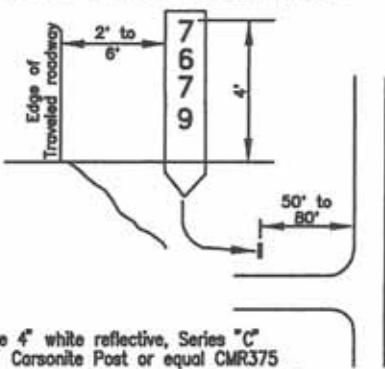
**FILL SLOPES**  
 3:1 Under 4' Height  
 2:1 Over 4' Height  
 (-) Slopes steeper than 2:1 will be subject to FS approval

**FILL WIDENING**  
 2' to 5' high/add 1'  
 Over 5' high/add 2'

**CURVE WIDENING**  
 130 / R

**CUT SLOPES**  
 3:1 Under 10' height  
 2:1 10' to 20' height  
 (-) Variable over 20' height W/FS approval

**TYPICAL SECTION VERTICAL ROUTE MARKER**

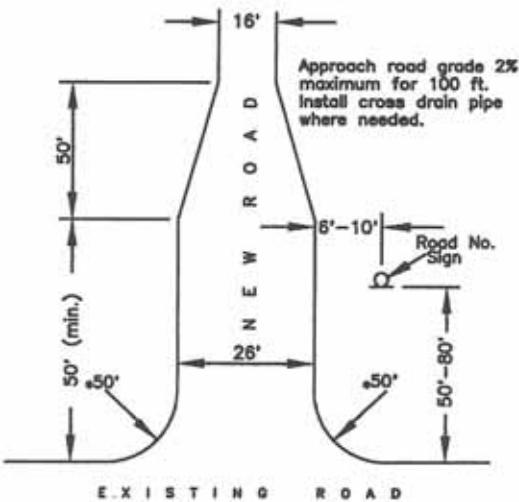


Letters shall be 4" white reflective, Series "C" on Brown 6' 6" Carsonite Post or equal CMR375  
 Figure 11-28.- Typical Signage for Vertical Route Markers

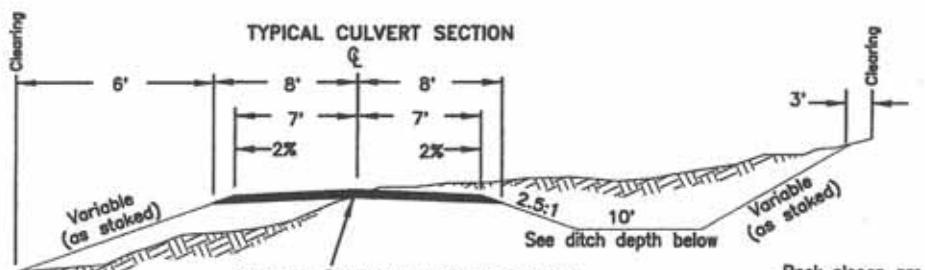
**TYPICAL "F"**

No Scale

**TYPICAL APPROACH ROAD CONNECTION**



\*As noted on road sheets



Fill slopes are V1 H1.5 (1.5:1) or as staked

Ditch width shall be the larger of the following:

- A. Standard ditch width
- B. 2 times the pipe diameter
- C. 4.25'

Ditch depth shall be:

CMP diameter	Ditch depth
18"	2.5'
24"	3.0'
36"	4.0'
48"	5.0'

Back slopes are V1 H1 (1:1) or as staked

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**TYPICAL "A"**

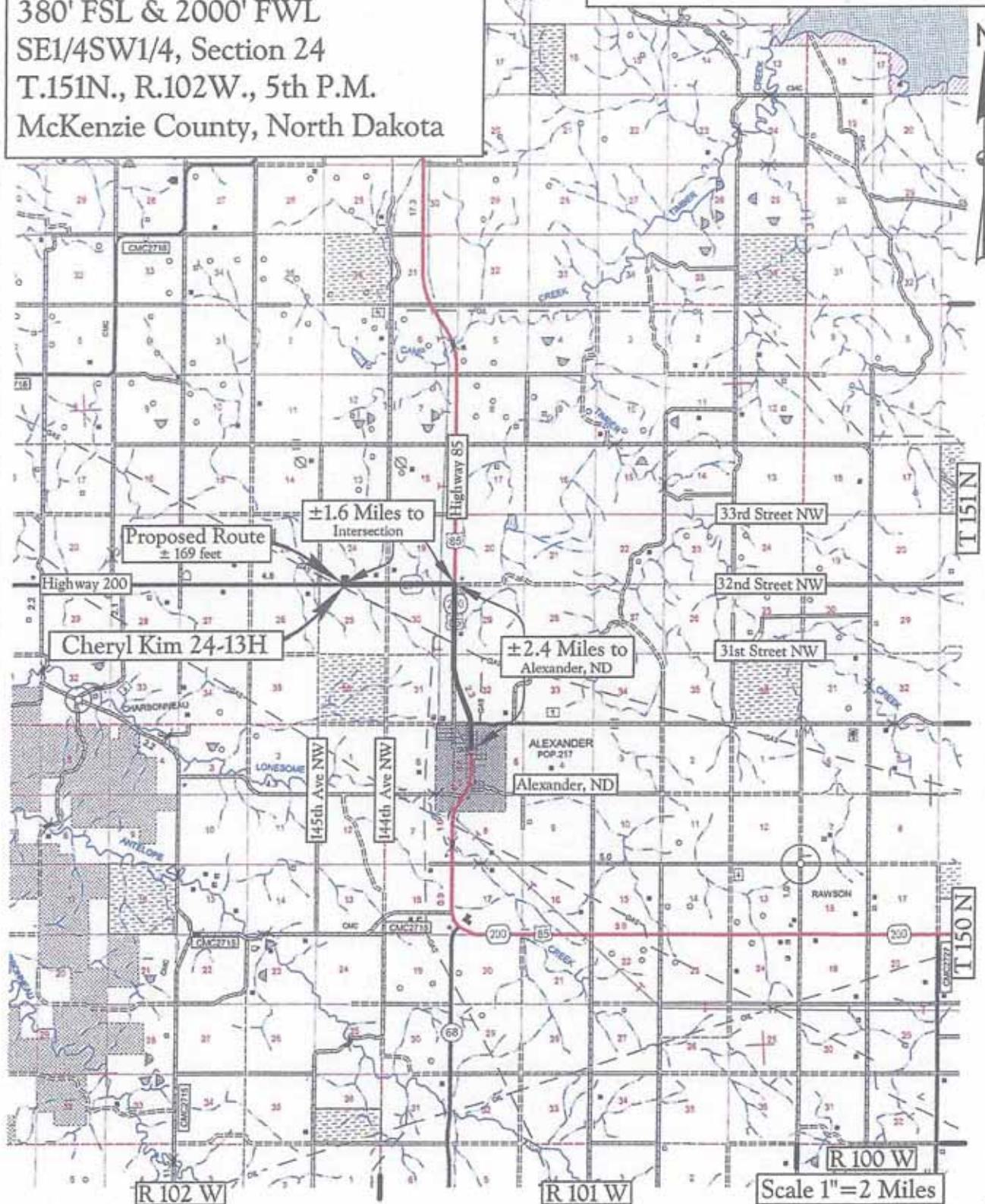
No Scale

Drawn By A. Romann	Surveyed By M. A. Krebs	Approved By Q. Obrigewitsch	Scale None	Date 05/24/2012
Field Book OW-285	Material Road Typical	Revised -	Project No. 3712689	Drawing No. 7



Murex Petroleum Corporation  
 Cheryl Kim 24-13H  
 380' FSL & 2000' FWL  
 SE1/4SW1/4, Section 24  
 T.151N., R.102W., 5th P.M.  
 McKenzie County, North Dakota

Confidentiality Notice: The information contained on this plot is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.



Map "A"

County Access Route

Legend

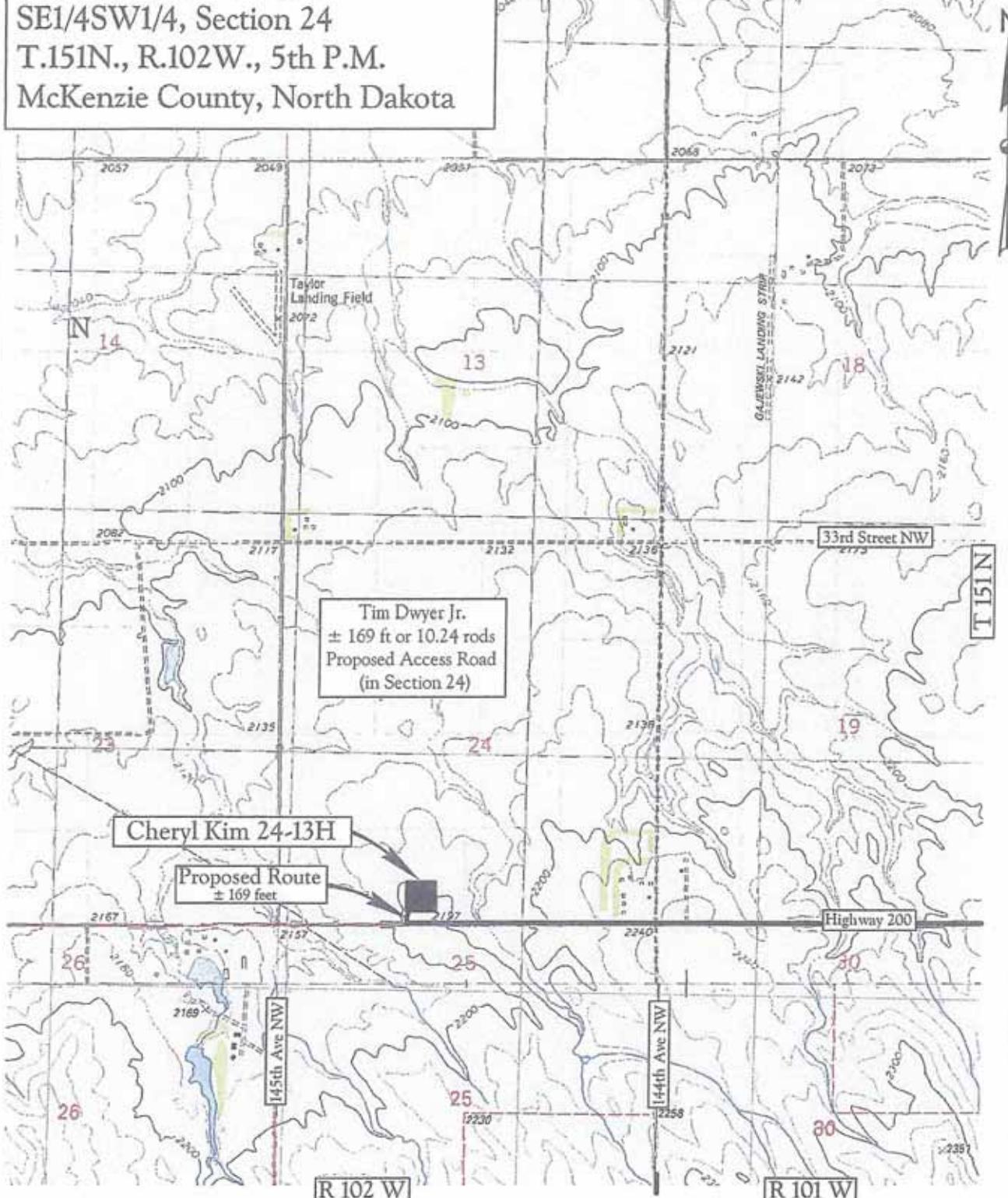
Existing Roads

Proposed Roads

Engineers Surveyors  
Planners

Murex Petroleum Corporation  
Cheryl Kim 24-13H  
380' FSL & 2000' FWL  
SE1/4SW1/4, Section 24  
T.151N., R.102W., 5th P.M.  
McKenzie County, North Dakota

Confidentiality Notice: The information contained on this plot is legally privileged and confidential information intended only for the use of recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.



Map "B"  
Quad Access Route

Legend

Existing Roads —

Proposed Roads - - -

Scale 1"=2000'

Laser Surveyors  
Planners

# WELL LOCATION PLAT

WHITING OIL & GAS CORPORATION  
1700 BROADWAY, SUITE #2300 DENVER, CO 80290

**EXHIBIT #12**

## FAIMAN 34-33PH

**390 feet from the south line and 1980 feet from the east line**

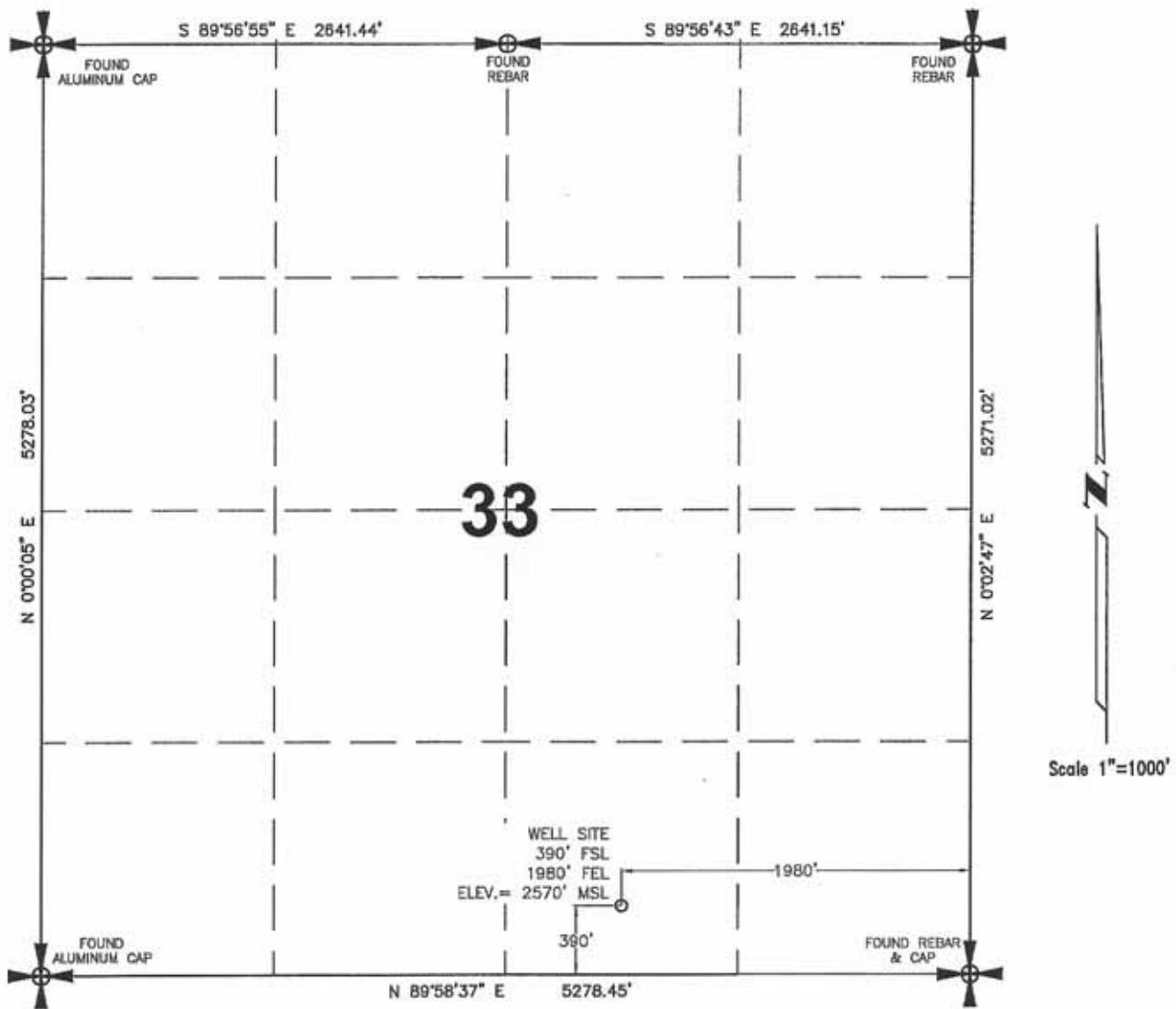
Section 33, T141N, R97W - 5th Principal Meridian

Dunn County, North Dakota

Surface Owner at well site - Charles & Gladys Faiman

**Latitude 46°58'54.08" North - Longitude 102°58'36.82" West**

[derived from N.G.S. O.P.U.S. Solution REF FRAME: NAD\_83 (CORS96)(EPOCH:2002.0000)]



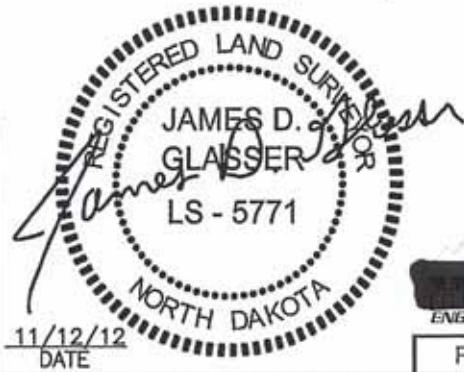
**NOTE:** All land corners are assumed unless otherwise noted.  
Location shown hereon is a preliminary staked location and  
is not an as-built.

I, James D. Glasser, Registered Land Surveyor, N.D. No. 5771, do hereby certify  
that the well plat shown hereon was made by me, or under my direction, and is  
true and correct to the best of my knowledge and belief.

**JAMES D. GLASSER      9/25/12**

Surveyed by N.D.R.L.S. #5771      Date

Vertical Control Datum Used  
Sea-Level Datum of NAVD 88  
Based on elevation derived from OPUS Solution  
on GPS Base Station (Base) in the SE $\frac{1}{4}$ SE $\frac{1}{4}$  of  
Section 22, T139N, R97W, 5th P.M. located  
N88°38'02"E a distance of 2059.66' from the  
south quarter corner of said Section 22 being at  
2544.35 elevation MSL.



# HORIZONTAL SECTION PLAT

WHITING OIL & GAS CORPORATION  
1700 BROADWAY, SUITE #2300 DENVER, CO 80290

## FAIMAN 34-33PH

390 feet from the south line and 1980 feet from the east line

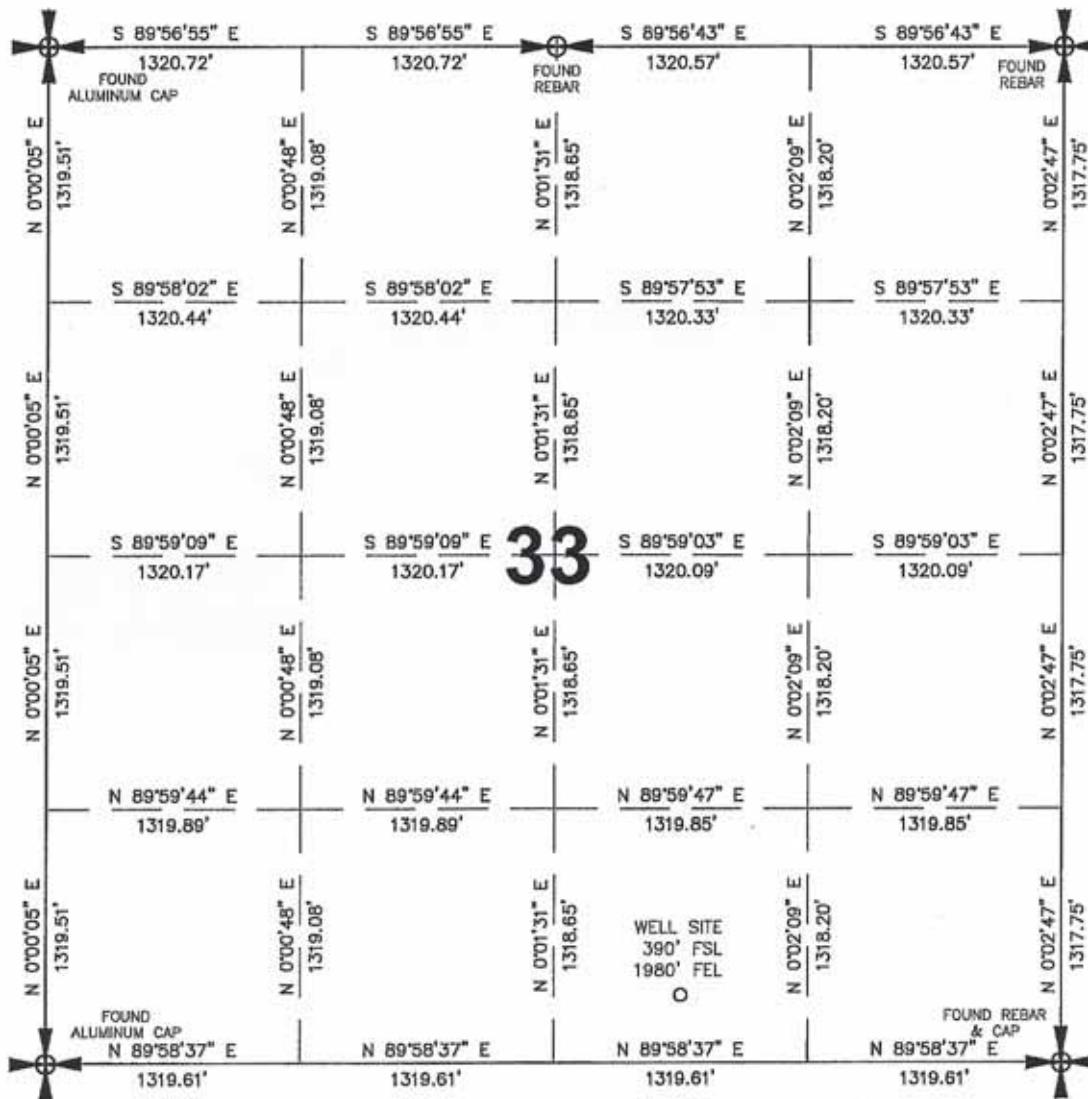
Section 33, T141N, R97W - 5th Principal Meridian

Dunn County, North Dakota

Surface Owner at well site - Charles & Gladys Faiman

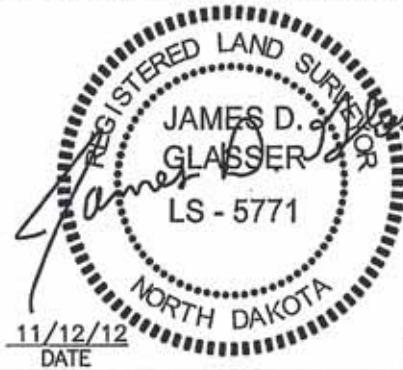
Latitude 46°58'54.08" North - Longitude 102°58'36.82" West

[derived from N.G.S. O.P.U.S. Solution REF FRAME: NAD\_83 (CORS96)(EPOCH:2002.0000)]

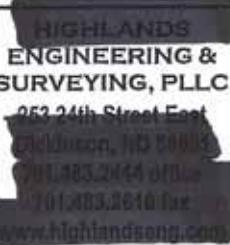


Scale 1"=1000'

I, James D. Glasser, Registered Land Surveyor, N.D. No. 5771, do hereby certify that the horizontal plat shown hereon was made by me, or under my direction, and is true and correct to the best of my knowledge and belief.



All corners shown on this plat were found in the field during Whiting Oil & Gas Corporation Faiman 34-33PH oil well survey on May 10 & September 25, 2012. Distances to all others are calculated.



# HORIZONTAL SECTION PLAT

WHITING OIL & GAS CORPORATION  
1700 BROADWAY, SUITE #2300 DENVER, CO 80290

## FAIMAN 34-33PH

390 feet from the south line and 1980 feet from the east line

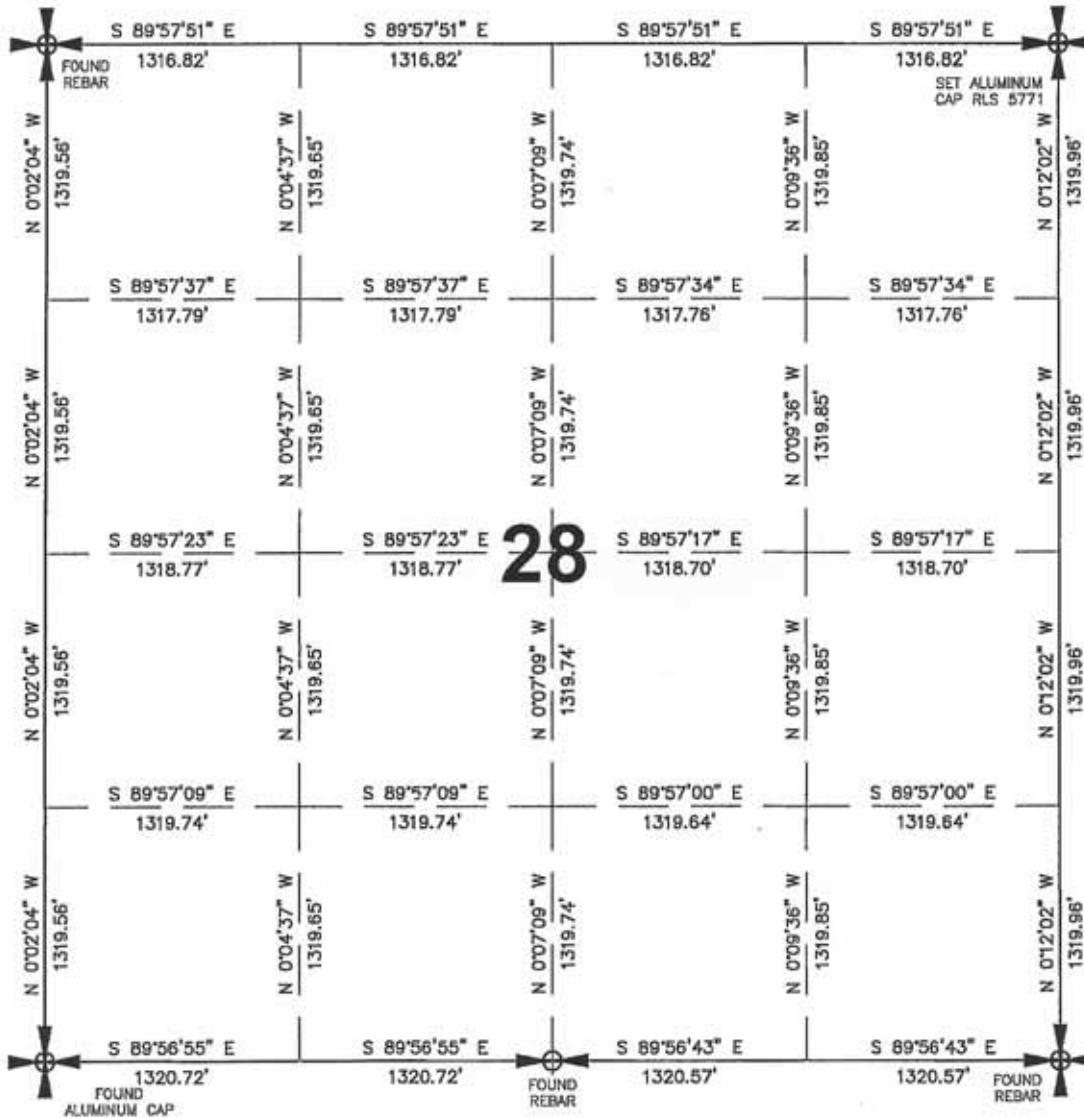
Section 33, T141N, R97W - 5th Principal Meridian

Dunn County, North Dakota

Surface Owner at well site - Charles & Gladys Faiman

Latitude 46°58'54.08" North - Longitude 102°58'36.82" West

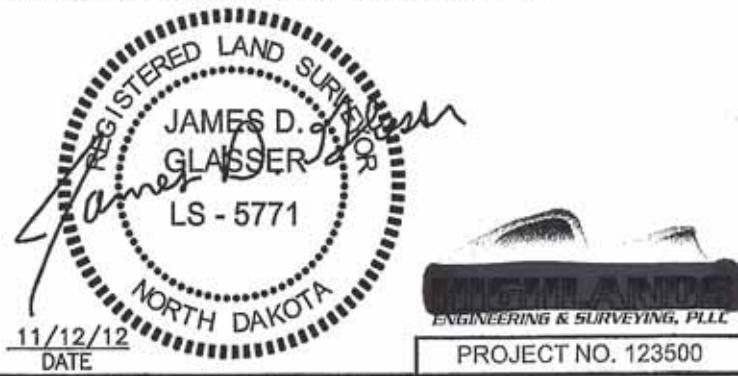
[derived from N.G.S. O.P.U.S. Solution REF FRAME: NAD\_83 (CORS96)(EPOCH:2002.0000)]



Scale 1"=1000'

I, James D. Glasser, Registered Land Surveyor, N.D. No. 5771, do hereby certify that the horizontal plat shown hereon was made by me, or under my direction, and is true and correct to the best of my knowledge and belief.

All corners shown on this plat were found in the field during Whiting Oil & Gas Corporation Faiman 34-33PH oil well survey on May 10 & September 25, 2012. Distances to all others are calculated.



ENGINEERING & SURVEYING, PLLC

PROJECT NO. 123500

# WELL LOCATION PLAT

WHITING OIL & GAS CORPORATION  
1700 BROADWAY, SUITE #2300 DENVER, CO 80290

## FAIMAN 34-33PH

390 feet from the south line and 1980 feet from the east line

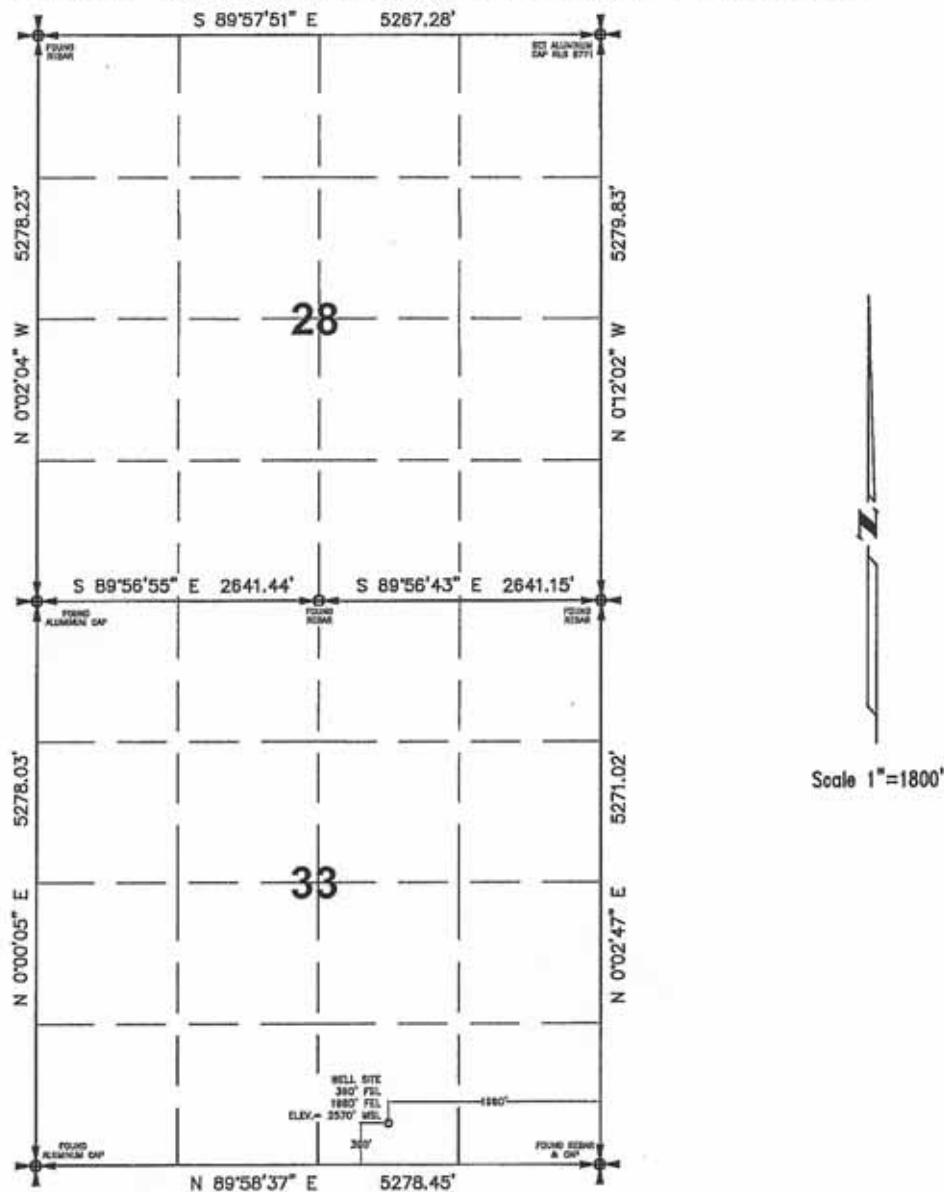
Section 33, T141N, R97W - 5th Principal Meridian

Dunn County, North Dakota

Surface Owner at well site - Charles & Gladys Faiman

Latitude 46°58'54.08" North - Longitude 102°58'36.82" West

[derived from N.G.S. O.P.U.S. Solution REF FRAME: NAD\_83 (CORS96)(EPOCH:2002.0000)]



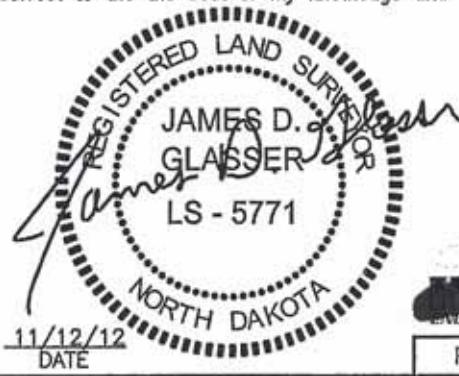
NOTE: All land corners are assumed unless otherwise noted.  
Location shown hereon is a preliminary staked location and  
is not an as-built.

I, James D. Glasser, Registered Land Surveyor, N.D. No. 5771, do hereby certify  
that the well plat shown hereon was made by me, or under my direction, and is  
true and correct to the best of my knowledge and belief.

JAMES D. GLASSER 9/25/12

Surveyed by N.D.R.L.S. #5771 Date

Vertical Control Datum Used  
Sea-Level Datum of NAVD 88  
Based on elevation derived from OPUS Solution  
on GPS Base Station (Base) in the SE $\frac{1}{4}$ SE $\frac{1}{4}$  of  
Section 22, T139N, R97W, 5th P.M. located  
N88°38'02"E a distance of 2059.66' from the  
south quarter corner of said Section 22 being at  
2544.35 elevation MSL



PROJECT NO. 123500

## WHITING OIL &amp; GAS CORPORATION

FAIMAN 34-33PH

390' FSL &amp; 1980' FEL

SE $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota

EXISTING SITE ELEVATION	2,570.3' MSL
PROPOSED PAD ELEVATION	2,570.6' MSL

EXCAVATION (INCLUDES 6" TOPSOIL STRIPPING)	14,156 CY
PLUS PIT	<u>5,000 CY</u>
	19,156 CY

EMBANKMENT	7,253 CY
PLUS SHRINKAGE (30%)	<u>2,175 CY</u>
	9,428 CY

STOCKPILE PIT	5,000 CY
STOCKPILE TOP SOIL (6")	4,026 CY

ROAD EMBANKMENT OR STOCKPILE FROM PAD	702 CY
--	--------

DISTURBED AREA FROM PAD AND STOCKPILE	6.21 ACRES
--	------------

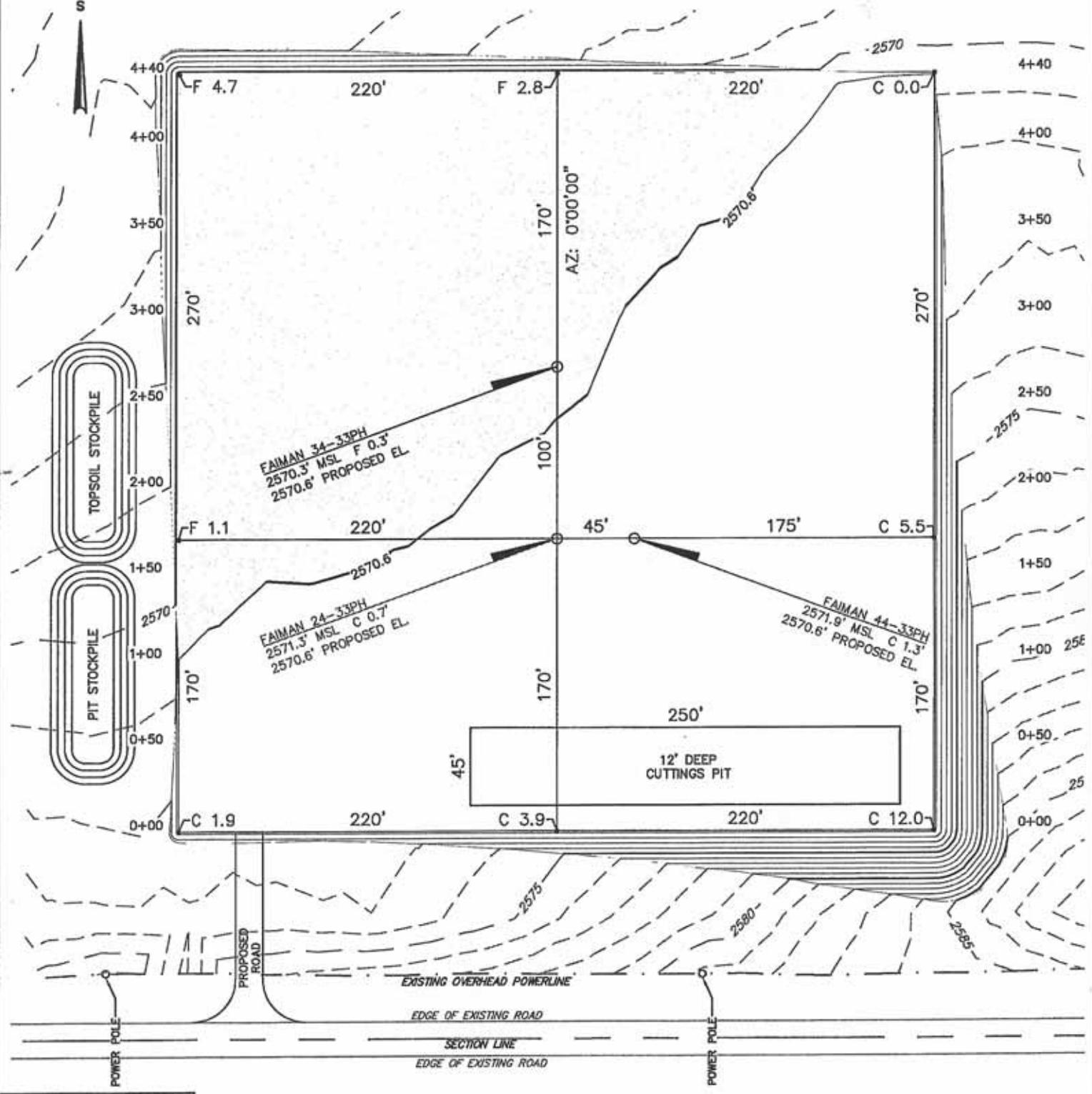
NOTE: REQUIRED EMBANKMENT IS  
CALCULATED AFTER 6" TOPSOIL IS  
STRIPPED FROM THE LOCATION.

NOTE: ALL CUT END SLOPES ARE  
3:1 AND FILL END SLOPES ARE 3:1

SHEET NAME	QUANTITIES	DATE	DRAWN BY	SCALE	PROJ. NO.	SHEET NO.
		11/12/12	A.V.	N/A	123500	1

WHITING OIL & GAS CORPORATION  
FAIMAN 34-33PH  
390' FSL & 1980' FEL

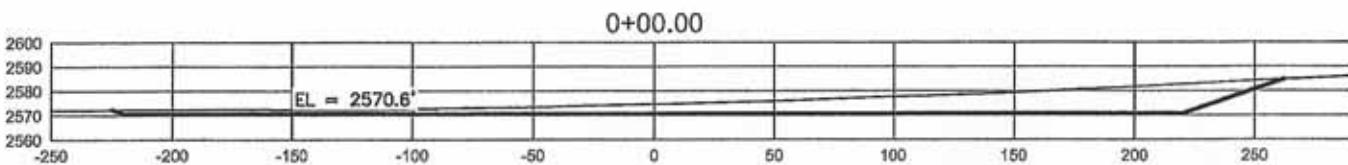
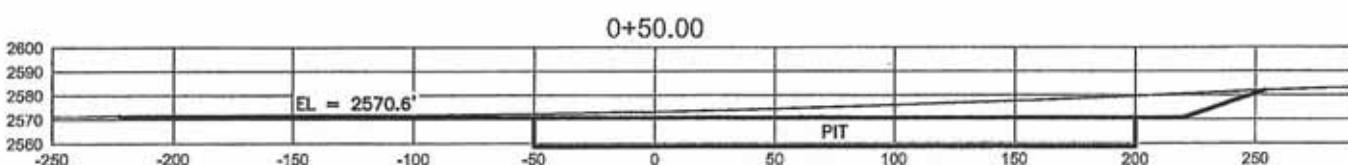
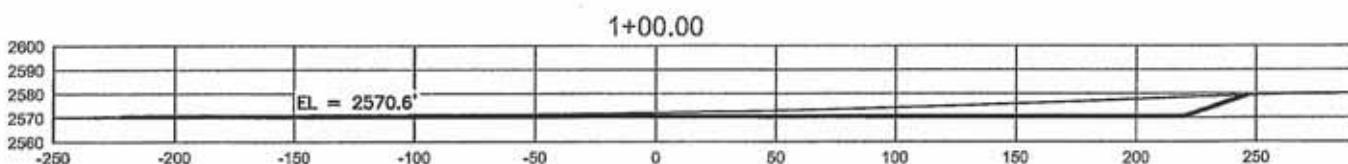
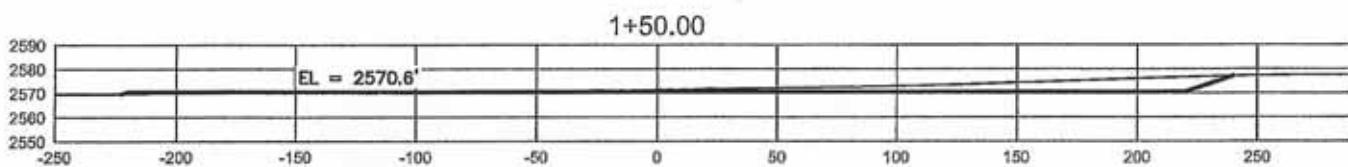
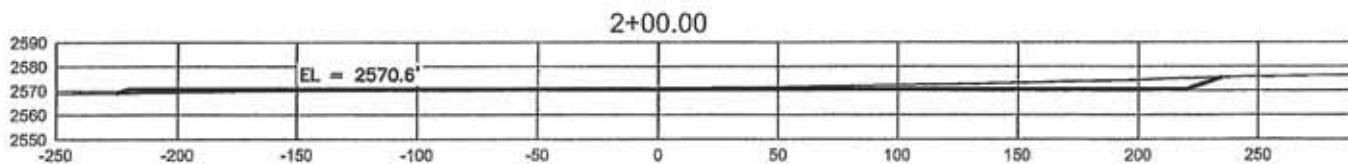
SE  $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota



SHEET NAME	DATE	DRAWN BY	SCALE	PROJ. NO.	SHEET NO.
PAD LAYOUT	11/12/12	A.V.	1"=80'	123500	2

WHITING OIL & GAS CORPORATION  
FAIMAN 34-33PH  
390' FSL & 1980' FEL

SE  $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota

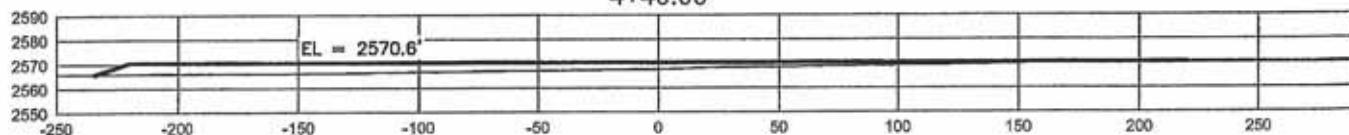


SHEET NAME:	DATE:	DRAWN BY:	SCALE:	PROJ. NO.	SHEET NO.
CROSS SECTIONS	11/12/12	A.V.	1"=80'	123500	3

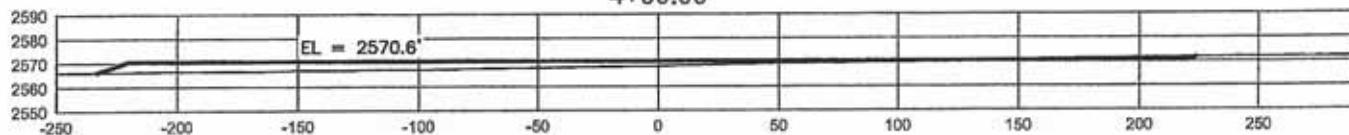
WHITING OIL & GAS CORPORATION  
FAIMAN 34-33PH  
390' FSL & 1980' FEL

SE  $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota

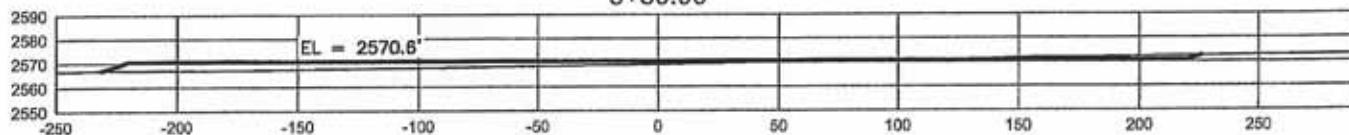
4+40.00



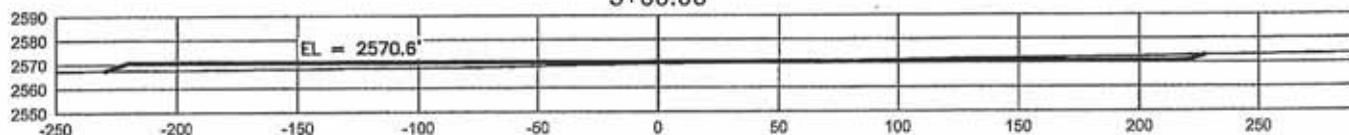
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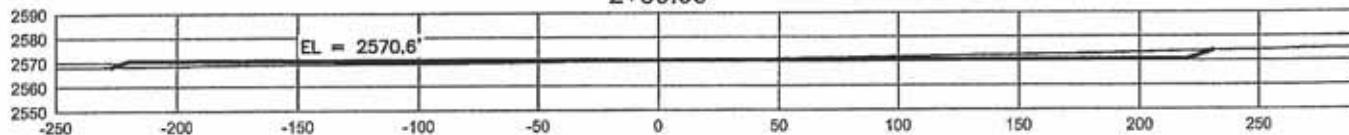
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3+00.00



2+50.00



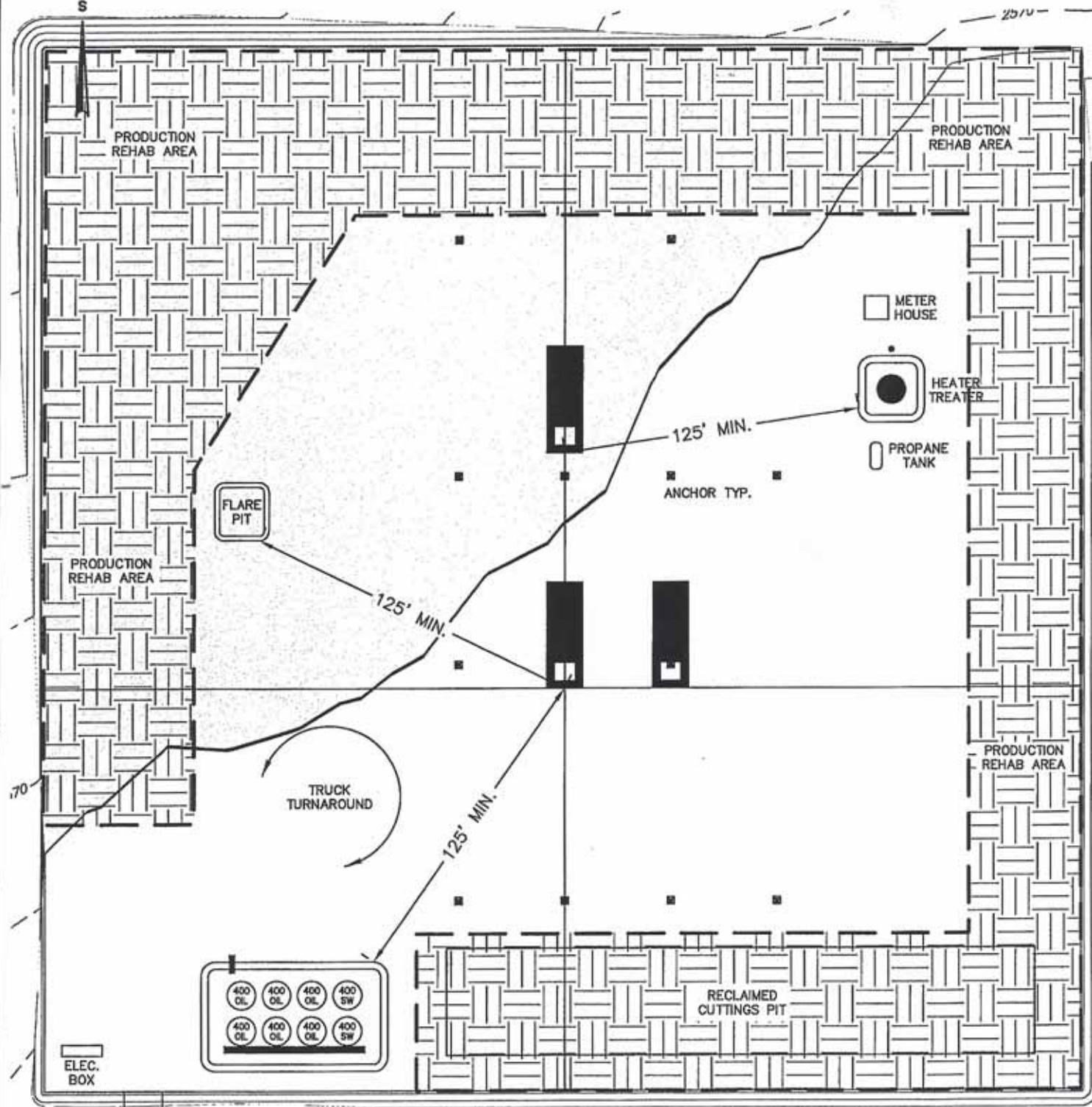
SHEET NAME:	CROSS SECTIONS	DATE:	11/12/12	DRAWN BY:	A.V.	SCALE:	1"=80'	PROJ. NO.	123500	SHEET NO.	4
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WHITING OIL & GAS CORPORATION  
FAIMAN 34-33PH  
390' FSL & 1980' FEL

SE  $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota

N  
W E  
S

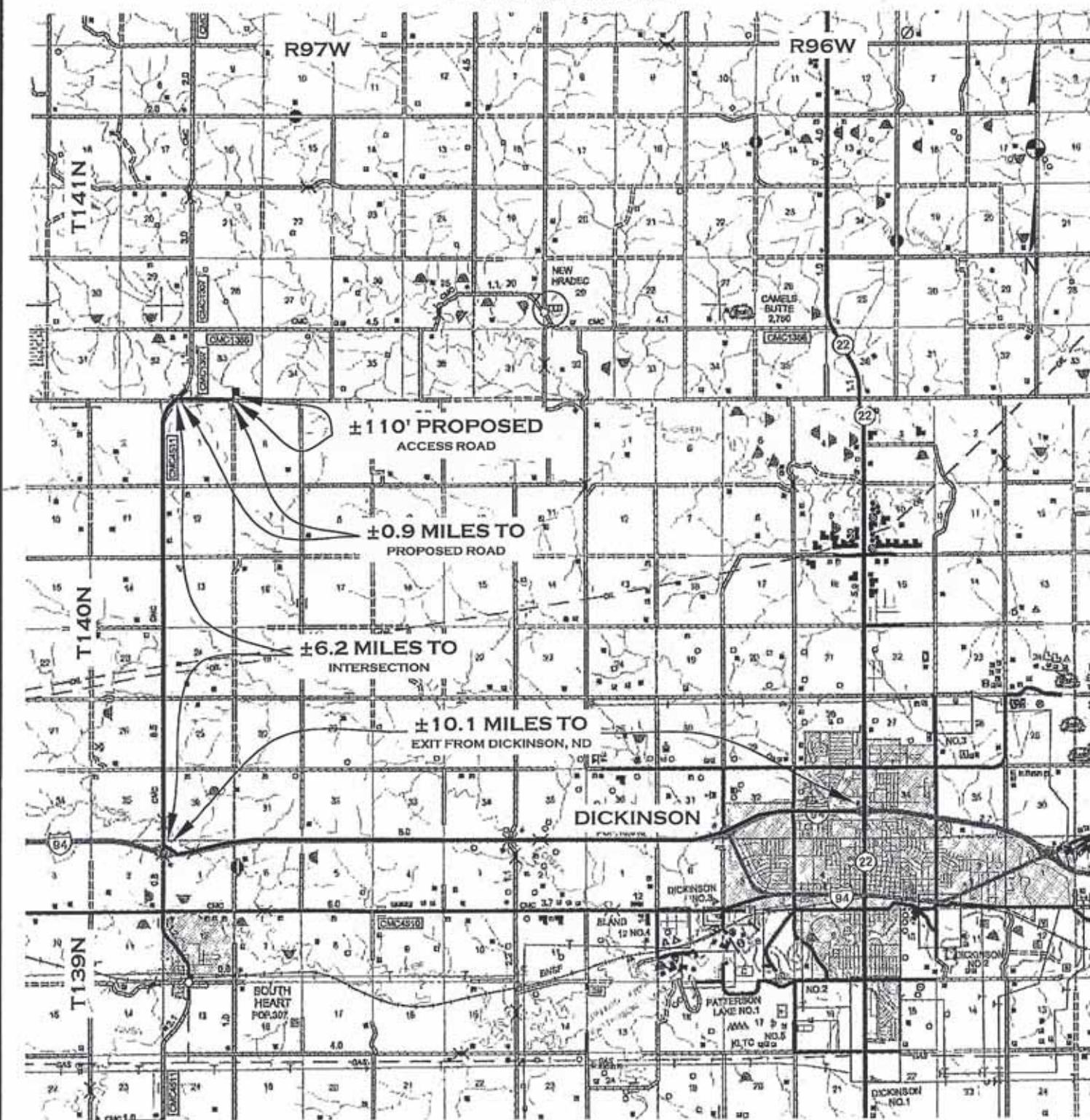
25/11



SHEET NAME: PRODUCTION LAYOUT DATE: 11/12/12 DRAWN BY: A.V. SCALE: 1"=60' PROJ. NO. 123500 SHEET NO. 5

WHITING OIL & GAS CORPORATION  
FAIMAN 34-33PH  
390' FSL & 1980' FEL

SE  $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian  
Dunn County, North Dakota



HIGHLANDS  
ENGINEERING &  
SURVEYING, PLLC  
33 24th Street East  
Dickinson, ND 58601  
(701) 483-2444 office  
(701) 483-2610 fax  
[www.hightlands.com](http://www.hightlands.com)



ENGINEERING & SURVEYING, PLLC

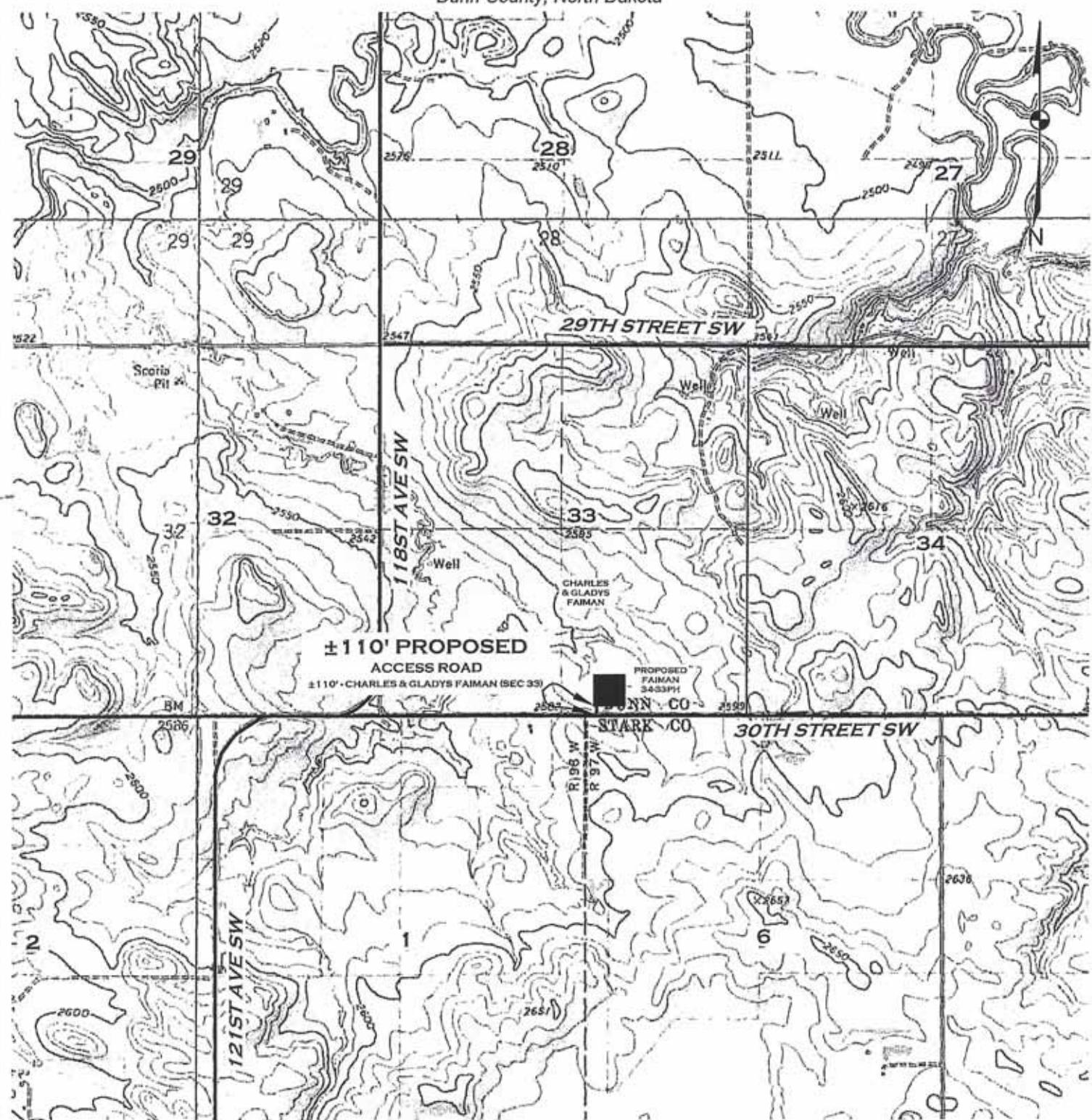
WHITING OIL & GAS CORPORATION

FAIMAN 34-33PH

390' FSL & 1980' FEL

SE $\frac{1}{4}$  Section 33, T141N, R97W - 5th Principal Meridian

Dunn County, North Dakota



**LEGEND**

PROPOSED ROAD

EXISTING ROAD

**DISCLAIMER**  
ENGINEERING &  
SURVEYING, PLLC  
24th Street East  
Johnson, ND 56601  
(218) 244-0116  
(218) 261-1016  
[www.ndengineering.com](http://www.ndengineering.com)



ENGINEERING & SURVEYING, PLLC

SHEET NAME: QUAD ACCESS

DATE: 9/26/12

SCALE: 1"=2000'

PROJ. NO.

123500

SHEET NO. 7