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Agricultural Section, NDWEE
245 Fallbrook Blvd Ste 100
Lincoln, NE 68521

Reference:

Ground Water Monitoring Plan
TK Angus, Co.
SW1/4 of the SW1/4, Section 13, Township 23N, Range 27N, Cherry County
IIS# 124885

Dear Brad,

Please find the enclosed Ground Water Monitoring Plan for the above referenced.

Please call with any questions.

Sincerely,

Ross Kirby



Groundwater Monitoring Plan (GWMP) TK Angus, Co.

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1. LIST OF ATTACHMENTS

Appendix A	Topography Map and Site Map
Appendix B	Regional Groundwater Contour Map and Monitor Well Construction Schematic
Appendix C	Groundwater Sampling Information Form, Chain-Of- Custody Form and Sampling Plan Deviations and Additions Form

2. GENERAL INFORMATION

2.1. Purpose

The Construction permit conditions issued by the Nebraska Department of Water, Energy & Environment (NDWEE) require this facility to develop a site-specific Groundwater Monitoring Plan (GWMP) for the livestock waste control facility (LWCF). Settje Agri-Services & Engineering, Inc. (SASE) has been retained by TK Angus, Co. to develop this plan and address the following issues:

- Number of proposed groundwater monitor wells
- Monitor well installation procedures
- Groundwater sampling methods and procedures
- Laboratory analytical methods

2.2. Site Location and Description

The facility is located in the SW $\frac{1}{4}$ of the SW $\frac{1}{4}$, Sec. 13, Township 23 N, Range 27N, Cherry County (see Topography Map, Appendix A). The facility is operated as a feeding and general care livestock operation. Wastewater from the facility is retained in an on-site holding ponds (See Site Map, Appendix A).

2.3. Regional and Site Hydrogeology

The facility lies in the Sand Hills hydro-geologic region of Nebraska. The sandhills geological characteristics of eolian silt to sand in the subsurface to a depth of 30 feet. There is a transition below eolian material to depositional layers of siltstone, sandstone, and sand to gravel of the Ogallala Group to a depth of 300 feet. (Conservation and Survey Division GIM-98). The regional ground water table flow direction in this area is North-Northwest (Configuration of the Water Table from GIS groundwater elevation layer) (See Ground Water Contour Map, Appendix B). The static water level is estimated at 40-60 feet below ground level (bgl). (Nebraska Department of Natural Resources Well Logs)

3. MONITOR WELL INSTALLATION AND DEVELOPMENT

3.1. Monitor Well Locations

The proposed groundwater-monitoring network consists of an up-gradient (MW-1) and two down-gradients (MW-2 and MW-3) (see Site Map, Appendix A). The regional ground water flow direction was used to propose well locations. SASE estimates the total depth of the wells being approximately 40-60 feet below ground level elevation. (Nebraska Department of Natural Resources Well Logs)

3.2. On-Site Verification

Representatives of SASE will be in contact with the well-driller during installation to insure proper screen placement. Field information, well registrations, a site map showing the drilled locations of the monitoring wells, and the top of casing elevations for each monitoring well will be provided with the facilities initial sampling event.

3.3. Monitor Well Design, Drilling, Installation and Development

The monitor wells will be constructed and installed following state standards as presented in Title 178, Chapter 12. The drilling contractor will be certified in the State of Nebraska Health and Human Services – Department of Regulation and Licensure Title 178, Chapter 12.

The monitor wells will be drilled with a truck-mounted drill rig using 4.25-inch, inside diameter (I.D.) hollow-stem augers (HSA). Upon completion of drilling activities, a clean, two-inch, inside-diameter, Schedule 40 PVC casing and ten feet of 0.010-inch slot screen will be used to construct each monitor well. The well screen will be placed approximately seven to eight feet below the observed water table. Filter pack will be placed in the annular space between the borehole wall and the well screen and will extend to approximately one foot above the well screen. The type of filter pack will be based upon the recommendation of the drilling contractor. A one-foot-thick bentonite seal (pellets or chips) will be placed above the filter pack and hydrated. The remaining open borehole will be pressure grouted to the surface with bentonite slurry or filled with chip bentonite. A protective steel cover with a locking cap (stick-up) mounted in concrete will be placed over the well. Bollards will be mounted in a concrete pad surrounding the wells. A typical monitor well construction schematic is included in Appendix B.

Following well installation, the drilling contractor will develop each monitor well to remove drilling fluids, solids or other particulate that may have been introduced during drilling and construction activities. Well development will be performed with either a bailer or submersible pump.

Each well will be surveyed into the existing facility's topographic survey.

4. GROUNDWATER SAMPLING AND ANALYSIS

4.1. Groundwater Sampling

A person certified to collect groundwater samples as identified in Title 178, Chapter 12, will collect samples from each monitor well. The overall objective of groundwater sampling is to collect samples that accurately depict the chemical, physical or biological conditions at the sampling site.

4.2. Sampling Procedures

Sampling activities are to be conducted **“twice”** per year, during the **spring** and **fall** seasons. Exact sampling dates will be selected by the sampling personnel and will be dependent upon the weather and site access.

The sampling representative will contact the laboratory and either pick up the containers or have the appropriate containers shipped to the site. The sampling personnel will also prepare the field equipment for use. All field equipment (electronic water level indicator, pH, temperature and conductivity meter) will be checked by sampling personnel prior to use, including any manufacturer’s recommended calibration.

Prior to sample collection, groundwater level and well depth will be measured and recorded to an accuracy of 0.01 feet. Any well damage or well construction problems shall be noted in a field logbook. The measuring point and survey elevation shall be the top-of-casing (identified by a permanent ink mark) unless otherwise noted in the as-built construction details. Prior to purging, the volume of water in the well casing will be calculated to determine one well volume. Sampling personnel will wear protective gloves when sampling. New gloves will be worn between each well. Non-dedicated sampling equipment will be decontaminated using distilled water prior to arriving on site, between wells and before leaving the site.

The monitor wells will be purged using a variable speed, submersible pump or a bailer. Purging activities will continue until a minimum of three well volumes have been removed and/or if the temperature, pH and conductivity parameters have stabilized within +/- 10% over three consecutive well volumes. Sample collection will begin following stabilization of purge parameters. For monitor wells that are sampled with bailers, the bailer should be lowered slowly to minimize agitation. For wells sampled with a submersible pump, the groundwater discharge rate will be reduced prior to sampling (approximately 0.25 gallons per minute) in order to collect a representative ground water sample. If a well goes dry while purging, following sufficient recharge, water samples will be collected. Sampling personnel will be responsible for sample handling once the groundwater sample has been collected. This person will verify that the proper sample collection, labeling, preservation, packaging, storage, shipment and chain of custody procedures are carried out throughout the sampling event in accordance with the guidelines cited below.

4.3. Sampling Parameters

The laboratory selected by the owner will analyze the groundwater samples for the parameters shown in Table 1. The laboratory will provide the appropriate sample containers.

Table 1 – Analytical Parameters for Groundwater Samples

Analytical Parameter	Analytical Method	Method Detection Limit (mg/l)	Reporting Limit (mg/l)	Sample Container	Sample Preservation	Holding Time
Chloride	EPA 325.1	0.1	1.0	125 ml Plastic	4 °C	28 days
Ammonium	EPA 350.1	0.01	0.1	125 ml Plastic	H ₂ SO ₄ pH ≤ 2 4 °C	28 days
Nitrate	EPA 353.2	0.05	0.1	125 ml Plastic	H ₂ SO ₄ pH ≤ 2 4 °C	28 days

Notes:

1. "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, Revised March 1983 and 1979, where applicable.
2. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," Rev.1, November 1990.

The analytical laboratory may substitute acceptable sample containers in place of those proposed. Also, the laboratory may combine analytical parameters in the same sampling container when analytical methods allow.

4.4. Groundwater Sampling Information Forms

A description of sampling activities shall be recorded on the Groundwater Sampling Information Form. The Groundwater Sampling Information Form serves as a record of sampling activities. Sampling personnel will complete all applicable information in the field during the sampling event. A copy of this form is included in Appendix C.

4.5. Sample Labeling/Numbering

Samples will be identified by well number and facility name.

4.6. Quality Assurance/Quality Control

To provide quality assurance/quality control (QA/QC), SASE will collect one duplicate sample and one field blank sample. The duplicate sample will be submitted to the laboratory as a blind sample. Information concerning the duplicate sample will be included on the appropriate Groundwater Sampling Information Form. The field blank will be prepared in the field using de-ionized water, preserved, and handled in the same manner as a regular sample. The sample will be labeled "Field Blank". The duplicate and field blank samples will be analyzed for the same constituents listed in Table 1.

4.7. Sample Preservation and Storage

Laboratory supplied containers will be used to collect the groundwater samples. Sample preservatives will be added at the laboratory or in the field prior to sample collection. All samples will be kept in a cool environment until delivery to the laboratory.

4.8. Sample Transfer

A chain-of-custody (C-O-C) will be completed for each sample and will include all applicable information. A copy of SASE's C-O-C is included in Appendix C.

To prepare the samples for shipment, sample containers will be placed inside a cooler and bagged ice placed over the samples. If the samples are to be shipped by commercial carriers, bagged ice will be placed over the samples, and the shipping container will be closed and sealed with shipping tape. Samples will either be transported by hand to the laboratory or by ship via commercial carrier.

5. FIELD DOCUMENTATION

Sampling personnel will maintain a complete record of field activities. This information will be included in the ground water sampling report.

5.1. Field Records

Field personnel will make field log entries on the appropriate forms using ink. The written records will provide a permanent record of site activities, conditions, sampling information, and field measurements. All entries shall be dated. The information recorded shall be factual, detailed, and objective. Copies of the completed logbook will be transmitted to the manager's office and placed with the other groundwater sampling information.

6. REPORTING

A report including all field sampling data, laboratory results, well construction records and a narrative of site activities from each sampling event will be submitted to the NDWEE for review within 45 days following the sampling event. Semi-annual reports provided will follow NDWEE guidance "Guideline for Ground Water Monitoring Plans at Livestock Waste Control Facilities."

7. ADDITIONS AND DEVIATIONS

Any changes or alterations to this plan will be noted by field personnel on the appropriate field log forms and on a separate Sampling Plan Deviations and Additions Form, as provided with this plan (Appendix C). If any changes to this plan are made while conducting field activities, the field personnel will use appropriate discretion in collecting any additional field data.

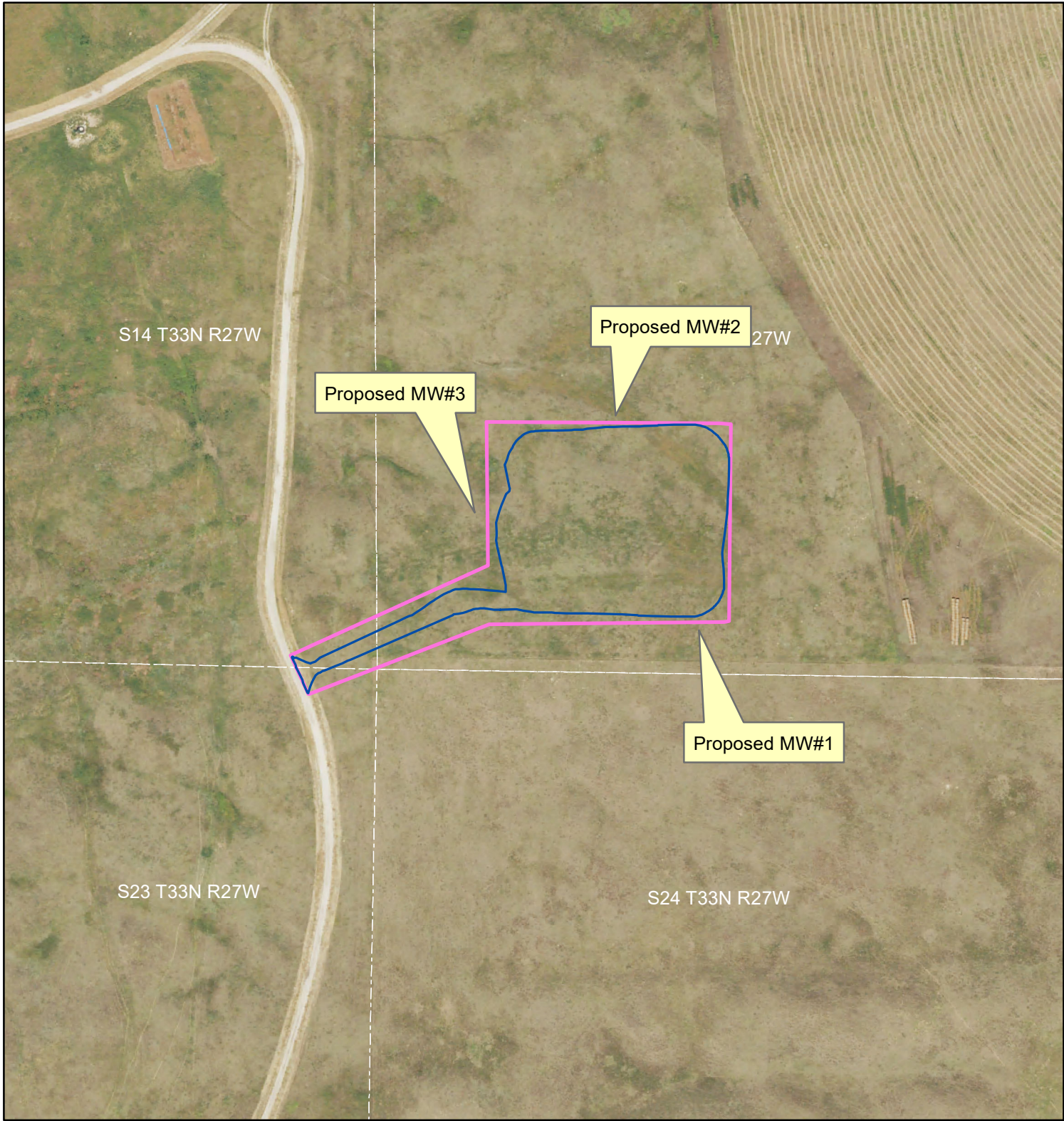
Appendix A



Topography Map and Site Map

TK Angus Co

Proposed GWM Well Locations



- Grading Boundary
- Proposed Facility
- Section_Lines



TK Angus Co

Site Map with Surface Contour Elevations



0 650 1,300 2,600 3,900 5,200 Feet

- Surface Contours
- Proposed Facility
- Section_Lines



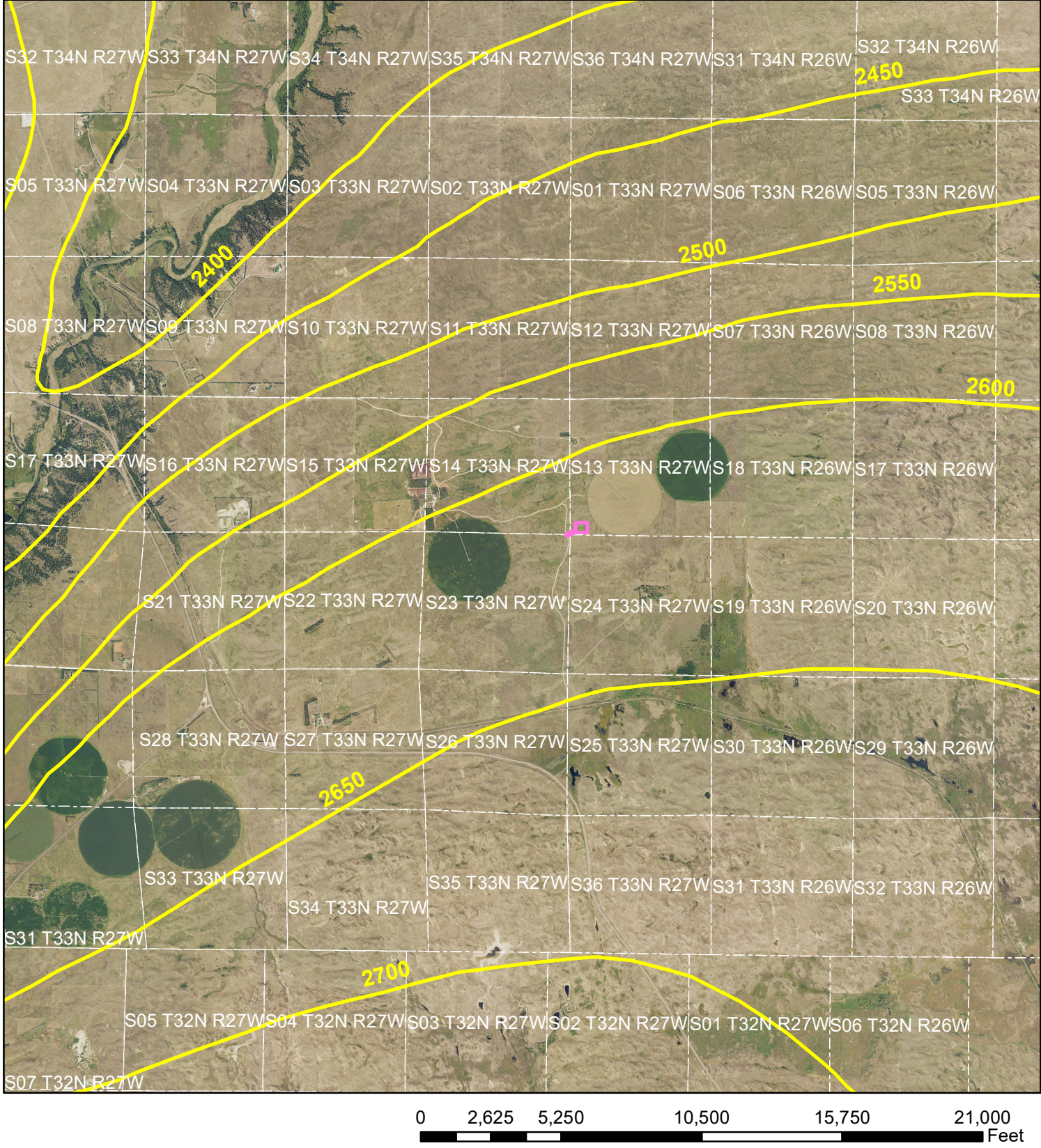
Appendix B



Regional Groundwater Contour Map
And Monitor Well Construction Schematic

TK Angus Co

Site Map with Regional Groundwater Elevations



- Groundwater Contours
- Proposed Facility
- Section_Lines





Monitor Well Schematic

WELL NO.	LOCATION OF WELL			ELEVATION	DATUM	DRILLER	LOGGER
WATER LEVEL OBSERVATIONS				TYPE OF SURFACE		DRILL RIG	
WHILE DRILLING	END OF DRILLING	24 HRS. AFTER DRILLING	_ HOURS DRILLING				
				DRILLING METHOD		TOTAL DEPTH	
PROTECTIVE COVER				GROUND LEVEL		BRIEF GEOLOGIC DESCRIPTION	
TYPE: _____						SEE BORING LOG	
SIZE: _____				RISER			
				TYPE: _____			
GROUT				SCHEDULE: _____			
TYPE: _____				INSIDE DIAMETER: _____			
AMOUNT: _____				LENGTH: _____			
WELL SEAL				LENGTH: _____			
TYPE: _____				#: _____			
AMOUNT: _____							
WATER: _____							
WELL PACK				SCREEN		SEE BORING LOG	
TYPE: _____				TYPE: _____			
AMOUNT: _____				SCHEDULE: _____			
				SLOT: _____			
				INSIDE DIAMETER: _____			
				LENGTH: _____			
				#: _____			
				LENGTH: _____			
				#: _____			
NOTES: _____				END CAP			
_____				TYPE: _____			
_____				LENGTH: _____			
SETTJE AGRI-SERVICES AND ENGINEERING, INC.				PROJECT: _____			
				LOCATION: _____			
				JOB NO. _____		DATE: _____	

Appendix C



Groundwater Sampling Information Form, Chain-Of-Custody Form and Sampling
Plan Deviation and Additions Form



Ground Water Sampling Information

Project Name		Date
Monitoring Well #	Sampled by	
Sample #	NDEE IIS #	
Weather Conditions		

Static Water Level – ft. (S)	Actual Water Purged (gal.)
Bottom of Casing – ft. (B)	Measuring Equipment Used
Casing Diameter – in (C)	Purge Equipment Used (bailer, pump/rate, etc.)
Well Volume (gal.) $[(C/24)^2 \times 3.14] \times (B-S) \times 7.48$	Sample Appearance: High ____ Medium ____ Low ____ Color
3x Well Casing Volume (3*well volume)	Well Evacuated to Dryness YES NO

Monitoring Well Purge Parameters

Gallons Purged	PH	Temperature	Conductivity

Purge Start Time: _____

Ground Water Sample Information

Gallons Purged	PH	Temperature	Conductivity

Note: _____



Chain of Custody Record

Client
Address
Phone
Contact

Lab Use
IIS #
Project
Location
Sampled by
Date

Sample Type: Soil Water Other_____

Monitoring Well ID	SASE ID	# of Containers	Sample Date & Time	Test(s) Requested			Lab Use
				Preservation H2SO4	Preservation H2SO4	Preservation None	

Relinquished by	Date / Time	Received by	Date / Time



GWM Plan or GW Sampling Deviations and Additions Form

Date:

Facility / Manager
NDEE IIS # _____

Description of Requested Change:

Justification for Change:

Name of person requesting change:

Signature and Date