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File Name State Programs (from index)

Sub File Name ASR (from index)

Sub-Sub File Name Wichita

Year (calendar) 2000

End Year \_\_\_\_\_

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Comments/Keywords

Class V Permit for Recharge wells (quality)

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**Water & Sewer Department**

Mr. David Pope, P.E., Chief Engineer  
Division of Water Resources  
Kansas Department of Agriculture  
901 S. Kansas Ave., Second Floor  
Topeka, KS 66612-1283

February 7, 2006

RE: Class V Permit for Recharge Wells, #45,567, #45,568, #45,576, and #46,081

Dear Mr. Pope,

On August 9, 2005 the City of Wichita received 10 water appropriations associated with the Equus Beds Aquifer Storage and Recovery Project. The Findings and Orders associated with those water rights included a requirement that the City provide a copy of the Class V permit issued by the Kansas Dept. of Health and Environment for the recharge project. Enclosed is a copy of the Class V permit issued by KDHE on January 31, 2006. The Findings and Orders also require the City to submit a water quality monitoring plan.

As part of the Class V permit, KDHE has required monitoring plans for both the injection (recharge) water and for the recharge sites (Attachment II of the Class V Permit). Under the terms of the permit, several tables of water constituents were identified, and a sampling program for each table determined. The monitoring plan for the recharge water requires that the most essential constituents be sampled monthly. In addition to collecting and analyzing grab samples, the City is also required to continuously monitor pH, specific conductance, turbidity and temperature with on-line monitors. Among the constituents that are monitored monthly in the recharge water are chlorides, arsenic, nitrates, triazines, and bacteria (fecal coliform).

The water appropriations for this project require that the City install a monitoring well network around each of the recharge sites. As part of the aquifer monitoring program, the City will utilize that network, as well as additional wells near the recharge basins, to collect water samples. All of the wells in that network, as well as nearby domestic wells, will be sampled initially for all of the constituents listed in Tables 1-7 to establish a baseline of water quality prior to beginning recharge at the six recharge sites (four wells and two recharge basins). All of the wells in the network will be sampled quarterly during the first year of recharge and semiannually in the second year for the core constituents listed in Table I, which are about the same constituents sampled monthly on the recharge water. The monitoring wells upgradient and downgradient from the recharge sites will be

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sampled annually for all of the constituents in Tables 1-7. The permit also includes monitoring requirements in the event that the recharge project is terminated.

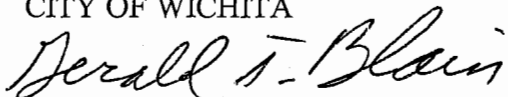
The City believes that the monitoring program required by the Class V Permit is very comprehensive, represents the most comprehensive water quality monitoring program ever attempted in the State, provides the resources needed to assure that the water quality of the aquifer is not impaired by the recharge activities and thus meets the stated requirement of the Finding and Order to have a monitoring program sufficient to prevent impairment of the water quality beyond a reasonable to economic limit. Therefore, the City recommends that the monitoring program established for the Class V Permit by KDHE be used to comply with the requirements of the Findings and Orders.

The Conditions and Orders for the subject appropriations require that the Ground Water Management District review the monitoring plan, and that the Chief Engineer approve the plan. Please let me know if this plan is acceptable, or if there are alterations to the plan.

If you have any questions, or need additional information, please contact me (316-268-4578).

Sincerely,

CITY OF WICHITA



Gerald T. Blain, P.E.

Water Supply Projects Administrator

xc: Equus Beds GMD  
David Warren

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KANSAS UNDERGROUND INJECTION  
CONTROL AREA PERMIT  
CLASS V INJECTION WELL

Pursuant to the provisions of Kansas Statutes Annotated (65-164, 65-165, 65-166, 65-170g and 65-171d) and Kansas Administrative Regulations (Chapter 28, Article 46),

Owner/Operator: City of Wichita, Water Department

Owner/Operator's Address: 455 N. Main St.  
Wichita, Kansas 67202

Owner/Operator: City of Wichita, Water Department

Owner/Operator's Telephone No.: 316-268-4578

Facility Name: Equus Beds Aquifer Storage and Recovery (ASR) Phase I

Facility Location: Harvey County, Kansas

Injection Well/Basin Identifications: RRW-1, RRW-2, RRW-3, RW-1, RB-1, RB-2

Well/Basin Locations:

RRW-1: SW SW SW 12-23-3W, Harvey Co. Kansas LAT 38° 03.478 LON 097°36.622	RRW-2: NE NE NE 23-23-3W, Harvey Co. Kansas, LAT 38°03.478 LON 097°36.662
RRW-3: SW SW SW 24-23-3W, Harvey Co. Kansas LAT 38°01.744 LON 097°37.606	RW-1: NW NW NW 36-23-3W, Harvey Co. Kansas LAT 38°00.835 LON 097°36.602
RB-1: NW NW NW 2-24-3W, Harvey Co. Kansas LAT 37°59.895 LON 097°36.687	RB-2: NW NW NW 11-24-3W, Harvey Co. Kansas LAT 37°59.056 LON 097°36.695

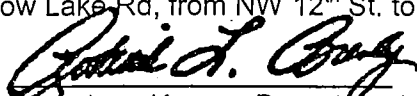
Receiving Formation: Quaternary Alluvium

is authorized to inject groundwater in to the Equus Beds Aquifer for the purpose of storage and later recovery of the groundwater and to form a hydraulic barrier to a known brine plume in accordance with the construction, operation, monitoring and reporting requirements as set forth herein.

The permittee shall comply with all conditions in this permit, federal and state regulations governing Class V injection wells and the requirements of the Kansas Department of Health and Environment (KDHE).

This permit shall become effective February 1, 2006, and will expire February 1, 2016.

FACILITY DESCRIPTION: The recharge facilities consist of three aquifer storage and recovery wells, one recharge well and two recharge basins located approximately 5 miles west of Halstead, Kansas, in Harvey County in a north-south line adjacent to Willow Lake Rd, from NW 12<sup>th</sup> St. to 48<sup>th</sup> St.

  
Secretary, Kansas Department  
of Health and Environment

January 30, 2006  
Date

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I. INJECTION LIMITATIONS, MONITORING, REPORTING, AND TESTING REQUIREMENTS

- A. The permittee is authorized to inject groundwater recovered from bank storage wells located adjacent to the Little Arkansas River during periods above base flow as permitted by the Kansas Division of Water Resources. The purpose of injection is to form a hydraulic barrier to a known brine plume and to recharge the Equus Beds Aquifer.
- B. Such injection shall be controlled, limited and monitored by the permittee as specified in this permit. Injection shall not cause degradation of the ambient water use in the Equus Beds aquifer. Monitoring data required to be submitted to KDHE on a monthly basis shall be submitted to KDHE no later than twenty-eight (28) days after the last day of the month for which the monitoring data is being reported. Monitoring data required to be submitted to KDHE on a quarterly basis shall be submitted no later than twenty-eight days after the last day of the quarter for which the monitoring data are being reported. All Monitoring data shall be submitted on forms prescribed by KDHE. The monitoring reports shall be originally signed. Monitoring reports and other information required by this permit shall be directed to:

Bureau of Water  
 Kansas Dept. of Health and Environment  
 1000 SW Jackson St. Suite 420  
 Topeka, Kansas 66612-1367

A copy of the monitoring report shall also be submitted to:

Chief Engineer  
 Division of Water Resources (DWR)  
 Kansas Department of Agriculture  
 109 SW 9<sup>th</sup> St., Second Floor  
 Topeka, Kansas 66612-1283

Manager  
 Equus Beds Groundwater Management District #2 (GMD#2)  
 313 Spruce St.  
 Halstead, Kansas 67506-1925

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C.

Injection and Operational Parameters	Injection or Parameter Limitation	Measurement or Analysis Frequency	Reporting Requirement	Sample or Measurement Type
Maximum Wellhead Injection Pressure for each well (pounds per square inch gauge)	5	*	Monthly	Gauge or Continuous Recording Device ***
Maximum Weekly Injection Volume for Each well and basin, (7 day week, gallons per week and Acre-Feet)	70,000,000 gallons 214.8 Acre Feet	*	Monthly WATER RESOURCES RECEIVED FEB 08 2006	Meter or Continuous Recording Device ***

Injection and Operational Parameters	Injection or Parameter Limitation	Measurement or Analysis Frequency	Reporting Requirement	Sample or Measurement Type
pH (Standard units)	6.0 - 9.0	Continuous	Monthly	Continuous Recording Device ***
Specific Conductance (µS/cm)	Monitor	Continuous	Monthly	Continuous Recording Device ***
Turbidity (NTU)	Monitor	Continuous	Monthly	Continuous Recording Device ***
Temperature (degrees Fahrenheit)	Monitor	Continuous	Monthly	Continuous Recording Device ***
Chloride (mg/l)	**L.T. 250 mg/l	Monthly	Monthly	Grab****
Atrazine (mg/l)	**L.T.0.003 mg/l	Monthly	Monthly	Grab****
Arsenic (mg/l)	** L.T.0.010 mg/l	Monthly	Monthly	Grab****
Hardness (mg/l)	Monitor	Monthly	Monthly	Grab****
Dissolved solids (mg/l)	Monitor	Monthly	Monthly	Grab****
Potassium, dissolved (mg/l)	Monitor	Monthly	Monthly	Grab****
Carbonate, dissolved (mg/l)	Monitor	Monthly	Monthly	Grab****
Total Phosphorus (mg/l)	Monitor	Monthly	Monthly	Grab****
Manganese, dissolved (mg/l)	Monitor	Monthly	Monthly	Grab****
Total Coliform 3 (MPN)/100 ml	Non-Detect	Monthly	Monthly	Grab****
Suspended Solids (mg/l)	Monitor	Monthly	Monthly	Grab****
Alkalinity as CaCO <sub>3</sub> (mg/l)	Monitor	Monthly	Monthly	Grab****
Calcium, dissolved (mg/l)	Monitor	Monthly	Monthly	Grab****
Bicarbonate, dissolved	Monitor	Monthly	Monthly	Grab****
Nitrate as(N) (mg/l) Daily Maximum	**L.T.10 mg/l	Monthly	Monthly	Grab****
Iron, dissolved (mg/l)	Monitor	Monthly	Monthly	Grab****
Triazine herbicide screen, dissolved	Monitor	Monthly	Monthly	Grab****
Fecal Coliform (MPN)/100 ml	Non-Detect	Monthly	Monthly	WATER RESOURCES RECEIVED Grab****

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- \* Conduct weekly inspection readings for reporting purposes.
- \*\* Denotes "less than".
- \*\*\* The gauge, meter, or continuous recording device shall at all times be maintained operational and in a location to properly measure the activity being monitored.
- \*\*\*\* Grab samples shall be collected at the main pipeline header after any well treatment systems and prior to distribution to each individual well or basin.

D. The injection fluid shall be sampled and analyzed for the individual constituents listed in tables 2 through 7 in Attachment III annually during injection and the results submitted to KDHE, DWR and GMD#2 no later than twenty-eight (28) days after the month the sampling was conducted.

E. Inspection readings of injection flow volume and injection pressure shall be made weekly and reported in the monthly monitoring report submitted to KDHE. The date and time these readings are taken and the initials of the person taking the readings shall be included in the monthly monitoring report. The total volume injected for the month shall also be reported in the monthly monitoring report.

F. The following shall also be reported to KDHE by the permittee:

1. Any injection well treatment procedures used, including those associated with normal maintenance and malfunction correction, and all injection well workovers shall be reported to KDHE within thirty (30) days of completion. An injection well treatment plan or workover plan shall be submitted to KDHE for review and approval prior to commencing a well treatment or workover. No injection well treatment or workover shall commence until the permittee has obtained approval for the well treatment or workover plan from KDHE.
2. Immediate notification of KDHE of all spills associated with the operation of the injection well.
3. Notification of KDHE of any injection well malfunction or failure, which may result in noncompliance with the permit requirements, within twenty-four (24) hours of becoming aware of the circumstances.
4. The results and interpretation of any tests or logs of the injection wells or injection zone within thirty (30) days of completion.
5. A written description and explanation of any noncompliance with the operating limitations as specified by this permit for injection pressure, injection flow volume, or injection limits occurring during the month being reported and a detailed description of corrective action to prevent recurrence of the non-compliance shall be submitted with the monthly monitoring report.

6. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to KDHE, the permittee shall submit such facts or corrected information to KDHE within five (5) days of becoming aware of the

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circumstances.

- G. All sample analyses required by this permit shall be conducted by a Kansas Certified Laboratory.

II. PLUGGING, CLOSURE, ABANDONMENT

The well(s) shall be plugged and abandoned upon reaching the end of useful life or when determined necessary by KDHE to protect public health, or the fresh and/or usable water or the soils of the State and per K.A.R. 28-30-2002. The permittee currently has a plugging and abandonment plan on file with KDHE. The permittee shall revise and update the plan when required by KDHE. The permittee shall notify KDHE and the Equus Beds Groundwater Management District #2 (GMD#2) at least sixty (60) days prior to plugging and abandonment of the well(s). With the notice, the permittee shall submit a revised and updated plugging and abandonment plan to KDHE for review and approval. The permittee shall conform to all plugging and abandonment requirements of state and federal regulations, KDHE, and K.A.R. 28-30-200 through K.A.R. 28-30-207 of GMD #2. Plugging and abandonment work shall not commence until approval of the plugging and abandonment plan has been obtained from KDHE. The report of plugging and abandonment and related information shall be submitted to KDHE within thirty (30) days after completion of the plugging operation on the form provided by KDHE.

III. CONSTRUCTION REQUIREMENTS

- A. Borehole casing, tubing and cement specifications for typical injection well for this project:

RRW-1

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
32"	18"	Carbon Steel	NA	60'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 60' to 130' with intermittent blank casing at clay zones

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RRW-2

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
32"	18"	Carbon Steel	NA	60'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

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Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 60' to 255' with intermittent blank casing at clay zones.

**RRW-3**

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
32"	18"	Carbon Steel	NA	70'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 70' to 190' with intermittent blank casing at clay zones.

**RW-1**

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
32"	18"	Carbon Steel	NA	70'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 70' to 260' with intermittent blank casing at clay zones.

RB-1 and RB-2 are recharge basins that will be lined with soil and bermed on all sides. There will be four wells placed in each recharge basin to assist in passive injection with the following construction:

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**RB-1**

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
16"	8"	PVC	NA	40'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

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Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 40' to 275' with intermittent blank casing at clay zones.

**RB-2**

Borehole Size	Casing Size	Casing Material	Weight lbs/ft	Casing Seat Depth	Type of Grout	Amount of Grout	Grouted Interval From-To
16"	8"	PVC	NA	50'	Type A Portland with 4% bentonite	220 ft <sup>3</sup>	0' to 20'

Screen or perforation material: Stainless Steel (Wire Wrapped)  
 Type of screen or perforation openings: Wire Wrapped slot size to be determined by pilot hole, set from 50' to 260' with intermittent blank casing at clay zones.

B. Injection is into the Quaternary alluvial aquifer.

IV. CONVERSION

A notice of conversion of an injection well to a use other than authorized by this permit shall be submitted to KDHE at least sixty (60) days prior to conversion. A conversion plan shall be submitted with the notice to KDHE for review and approval. The injection well shall not be converted until approval of the conversion plan has been obtained from KDHE.

V. SCHEDULE OF COMPLIANCE

None.

VI. STANDARD CONDITIONS - ATTACHMENT I

In addition to the specified conditions stated herein, the permittee shall comply with the provisions of Attachment I.

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VII. OTHER CONDITIONS

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The groundwater monitoring plan listed in Attachment II shall be implemented to evaluate the impact of the injection operation on the Equus Bed Aquifer. If the results of the monitoring indicate endangerment or potential endangerment of the public health, public safety, property or the environment, KDHE may require the permittee to submit a corrective action plan and schedule for implementation to KDHE for review and consideration for approval. Corrective action may include the requirement to cease the recharge operation.

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ATTACHMENT I

STANDARD CONDITIONS FOR  
UNDERGROUND INJECTION CONTROL PERMITS

CLASS V  
INJECTION WELLS

CONDITIONS APPLICABLE TO ALL PERMITS

- A. Duty to Comply: The permittee shall comply with all conditions of this permit, Federal and State laws and regulations. Any permit noncompliance constitutes a violation of the appropriate act or regulations and is grounds for enforcement action; for permit termination, revocation and reissuance, modification or denial of a permit renewal application.
- B. Duty to Reapply: If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. An application to renew this permit shall be filed with KDHE at least 180 days prior to its expiration date.
- C. Duty to Halt or Reduce Activity: It shall not be an acceptable defense for a permittee, in an enforcement action, that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. Duty to Mitigate: The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.
- E. Proper Operation and Maintenance: The permittee shall at all times properly operate and maintain all facilities and systems of monitoring, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when necessary to maintain compliance with the conditions of the permit.
- F. Property Rights: This permit does not convey any property rights of any sort, or any exclusive privilege.
- G. Duty to Provide Information: The permittee shall furnish to KDHE within a reasonable time, any information which KDHE may request to determine whether cause exists for modifying, revoking, reissuing or terminating the permit, or to determine compliance with this permit. The permittee shall also furnish to KDHE, upon request, copies of reports and information required to be kept by this permit.

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H. Inspection and Entry: The permittee shall allow the Secretary, or any authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
4. Sample or monitor for the purpose of assuring permit compliance or as otherwise authorized by the appropriate Act, any substances or parameters at any location.

I. Samples, Measurements and Records:

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
2. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of sample, measurement, report or application. This period may be extended by request of KDHE at any time.
3. The permittee shall retain records concerning the nature and composition of all injected fluids until three (3) years after the completion of any plugging and abandonment procedures. KDHE may require the owner or operator to deliver the records to KDHE at the conclusion of the retention period.
4. Records of monitoring information shall include:
  - a. The date, exact place, and time of sampling or measurements;
  - b. The individual(s) who performed the sampling or measurements;
  - c. The date(s) analyses were performed;
  - d. The individuals(s) who performed the analyses;

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- e. The analytical sampling, and sample preservation techniques or methods used; and
- f. The results of such analyses.

J. Signatory Requirements: All permit applications, reports required by this permit, or other information requested by KDHE shall be signed and certified in accordance with the requirements of K.A.R. 28-46-22.

K. Transfer of Permit:

This permit is not transferable to any person except after notice and approval by KDHE. KDHE may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the appropriate Act. In some cases, modification and reissuance is mandatory. The current owner shall notify KDHE at least thirty (30) days in advance of the proposed transfer date. The notice shall include a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage and liability between them, and the notice demonstrates the financial requirements will be met by the new permittee. The new permittee shall submit to KDHE at least thirty (30) days prior to the proposed transfer date a new permit application including the financial assurance documents guaranteeing resources are available to properly plug and abandon the well.

L. Emergency Reporting: The permittee shall within twenty-four (24) hours of becoming aware of the circumstances orally report to KDHE any noncompliance which may endanger human health or environment. A written submission shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, corrective action taken, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The permittee shall comply with any corrective or remedial action required by KDHE.

M. Operational Requirements:

1. The permittee shall not allow the movement of fluid containing any contaminant into any formation or aquifer not permitted to receive fluid by this permit or into any uncontaminated part of the formation permitted to receive fluid by this permit. The permittee shall have the burden of showing the requirements of this paragraph are met.
2. If any water quality monitoring of an aquifer indicates the movement of any contaminant into any formation or aquifer not permitted to receive fluids by this permit or into any uncontaminated part of the formation permitted to receive fluid by this permit, the permittee shall take such action as required by KDHE, including taking the well out of service, closure of the well or plugging and abandonment of the well.

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- N. Permit Modifications and Terminations: After notice and opportunity for a hearing, this permit may be modified, suspended or revoked, or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in K.A.R. 28-46-15 and K.A.R. 28-46-16 or if the KDHE or Environmental Protection Agency standards or regulations on which the permit was based have been changed by promulgation of new or amended codes, statutes, regulations or standards or by judicial decision after the permit was issued. The permittee shall furnish to KDHE, within a reasonable amount of time, any information which KDHE may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish, upon request, copies of all records required to be kept by this permit.
- O. Severability: The provisions of this permit are severable and if any provision of this permit and any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected thereby.
- P. Change in Injection Stream: Any facility changes or process modifications which may result in new, different or altered injection streams or an increase in injection volumes or an increase in concentration of pollutants shall be reported to KDHE at least one hundred eighty (180) days before such changes.
- Q. Anticipated Noncompliance: If for any reason, the permittee will be unable to comply with permit requirements, the permittee shall give advance notice to KDHE. The notice shall include the reason for the anticipated noncompliance and a description of steps taken to reduce, eliminate and prevent recurrence of the noncompliance. Upon receiving proper notice from the permittee KDHE may grant for a specified time a temporary waiver to a permit requirement for the purpose of testing or treating the well or for conducting a well workover or to protect human health or the environment.
- R. Permit Actions: The filing of a request by the permittee for a permit modification, a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

(CLASS5.REP)

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**ATTACHMENT II**  
**ASR PHASE I GROUNDWATER MONITORING PLAN**

The following groundwater monitoring wells shall be completed with screened intervals directly corresponding to the depth injection is occurring: monitoring wells number RR1MN, RR1ME, RR1MS, RR1MW, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW. Monitoring wells RB1MN, RB1MS, RB2MN, RB2MS shall be nested wells with shallow and deep screened intervals, approved by KDHE, corresponding to the upper and lower injection intervals at each recharge basin location.

1. Monitoring wells number RR1MN, RR1ME, RR1MS, RR1MW, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW, RB1MN, RB1MS, RB2MN, RB2MS, depicted on the map labeled Attachment IV, and all domestic wells within one-quarter mile of the recharge/recovery wells and recharge basins, which the permittee is able, using best efforts, to obtain access for sampling, shall be sampled prior to any injection into the aquifer for the analytes listed in Tables 1 through 7 found in Attachment III to provide a baseline. The results shall be submitted to KDHE, DWR, and GMD #2 no later than (90) days after completion of a monitoring well network sampling event.
2. Monitoring wells number RR1MN, RR1ME, RR1MS, RR1MW, IW02, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW, RB1MN, RB1MS, RB2MN, RB2MS shall be sampled quarterly during the first year and semi-annually in the second year of the injection project's operation for the analytes listed in Table 1 found in Attachment III. Sampling results shall be submitted to KDHE DWR, and GMD #2 no later than ninety (90) days after completion of a monitoring well network sampling event.
3. Monitoring wells number RR1MN (upgradient), RR1MS (downgradient), RR2MN (upgradient), RR2MS (downgradient), RR3MN1 (upgradient), RR3MS1 (downgradient), RW1MN (upgradient), RW1MS (downgradient), RB1MN (upgradient), RB1MS (downgradient), RB2MN (upgradient) and RB2MS (downgradient) shall be sampled annually for the analytes in Tables 1-7 in Attachment III, and the results submitted to KDHE, DWR, and GMD #2 no later than ninety (90) days after completion of a monitoring well network sampling event.
4. Static fluid levels must be obtained in each of the monitoring wells RR1MN, RR1ME, RR1MS, RR1MW, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW, RB1MN, RB1MS, prior to any injection into the aquifer to provide a baseline and each December, at the conclusion of a calendar year's recharge operations, with the data being used to generate piezometric surface maps. The piezometric surface maps shall be submitted to KDHE, DWR, and GMD #2 no later than ninety (90) days after the month the static fluid levels were recorded.

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5. Fluid levels in each of the monitoring wells RR1MN, RR1ME, RR1MS, RR1MW, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW, RB1MN, RB1MS, RB2MN, RB2MS, for this project shall be automated and measured on a frequency not to exceed six hours. The groundwater levels shall not exceed a minimum separation distance of 10 feet below ground surface.
  
6. Within 30 days upon notification to KDHE that the injection project has terminated, monitoring wells number RR1MN, RR1ME, RR1MS, RR1MW, IW02, RR2MN, RR2ME, RR2MS, RR2MW, RR3MN1, RR3MN2, RR3ME1, RR3ME2, RR3MS1, RR3MS2, RR3MW1, RR3MW2, RW1MN, RW1ME, RW1MS, RW1MW, RB1MN, RB1MS, RB2MN, RB2MS, and all domestic wells within one-quarter mile of the recharge/recovery wells and recharge basins which the permittee is able, using best efforts, to obtain access for sampling, shall be sampled for the analytes listed in Tables 1 through 7 found in Attachment III and the results submitted to KDHE, DWR, and GMD #2 no later than ninety (90) days after completion of a monitoring well network sampling event.

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# ATTACHMENT III

**Table 1**

Specific Conductance	pH
Water temperature	Oxygen, dissolved
Hardness	Alkalinity as CaCO <sub>3</sub> , dissolved
Dissolved solids	Calcium, dissolved
Potassium, dissolved	Bicarbonate, dissolved
Carbonate, dissolved	Nitrite plus nitrate as nitrogen, dissolved
Total Phosphorous	Iron, dissolved
Manganese, dissolved	Triazine herbicide screen, dissolved
Total Coliform <sup>3</sup>	Fecal Coliform
Suspended Solids	Arsenic, dissolved
Chlorides	

**Table 2**

Inorganic constituents:

Turbidity	Fluoride, dissolved
Silica, dissolved	Nitrite, dissolved
Ammonia, dissolved	Orthophosphate, dissolved
Antimony, dissolved	
Barium, dissolved	Beryllium, dissolved
Boron, dissolved	Bromide, dissolved
Cadmium, dissolved	Chromium, dissolved
Copper, dissolved	Cyanide, dissolved
Lead, dissolved	Mercury, dissolved
Nickel, dissolved	Selenium, dissolved
Silver, dissolved	Strontium, dissolved
Thallium, dissolved	Vanadium, dissolved
Zinc, dissolved	Total organic carbon
Total solids	

**Table 3**

Dissolved pesticides and metabolites:

2,4-DB	2,4-D	2,4,5-T
Aciflourfen	Alachlor	Aldicarb
Aldicarb sulfone	Adicarb sulfoxide	Atrazine
Azinphos, methyl	Benfluralin	Bentazon
Bromacil	Bromozynil	Butylate
Carbaryl	Carbofuran	Carbofuran-3-hydroxy
Chloramben	Chlorothalonil	Chlorpyrifos
Clopyralid	Cyanazine	Dacth-m

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DCPA	DDE	Deethylatrazine
Deisopropylatrazine	Diazinon	Dicamba
Dichlobenil	Dichlorprop (2,4-DP)	Dieldrin
Diethylalanine	Dimethoate	Dinoseb
Disulfoton	Diuron	DNOC
EPTC	Esfenvalerate	Ethalfuralin
Ethoprop	Fenuron	Fluometuron
Fonofu	HCH-alpha	HCH-alpha D6
HCH-gamma	Linuron	Malathion
MCPA	MCPB	Methiocarb
Methomyl	Methyl parathion	Metolachlor
Metribuzin	Molinate	1-Naphthol
Napropamide	Neburon	Norflurazon
Oryzalin	Oxamyl	Parathion
Pebulate	Pendimethalin	Permethrin-cis
Phorate	Picloram	Prometon
Pronamide	Propachlor	Propanil
Propargite	Propham	Propoxur
Silvex (2,4,5-TP)	Simazine	Tebuthiuron
Terbacil	Terbufos	Terbutylazine
Thiobencarb	Triallate	Triclopyr
Trifluralin		

**Table 4**

Total Recoverable Volatile Organic Compounds:

Acrolein	Acrylonitrile	Benzene
Bromobenzene	Bromochloromethane	Bromodichloromethane
Bromoform	Bromomethane	n-Butylbenzen
sec-Butylbenzene	tert-Butylbenzene	Carbon tetrachloride
Chlorobenzene	Chloroethane	2-Chloroethylvinyl ether
Chloroform	Chloromethane	1,2-Chlorotoluene
1,4-Chlorotoluene	Dibromochloromethane	1,2-Dibromo-3-chloropropane
Dibromomethane	1,2-Dibromoethane (EDB)	1,2-Dichlorobenzene
1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane
1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloropropene
cis-1,2-Dichloroethene	1,2-trans-Dichloroethene	1,2-Dichloropropane
1,3-Dichloropropene	2,2-Dichloropropane	1,1-Dichloropropylene
cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	1,3-Dichloropropylene
Ethylbenzene	Hexachlorobutadiene	Isopropylbenzene
p-Isopropyltoluene	Methylene chloride	Methylterbutylether
Naphthalene	n-Propylbenzene	Styrene
1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene
Toluene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene
1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene
Trichlorofluoromethane	1,2,3-Trichloropropane	Trichlorotrifluoroethane
1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl chloride
Xylene (o,p,m)		

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**Table 5**

Dissolved radionuclides:

Gross beta radiation

Gross alpha radiation

Total recoverable organochlorine and organophosphate pesticides

**Table 6**

Acid compounds:

p-Chloro-m-cresol	2-Chlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	4,6-Dinitro-o-cresol	2-Nitrophenol
4-Nitrophenol	Pentachlorophenol <sup>3</sup>	Phenol
1,2,4-Trichlorobenzene	2,4,6-Trichlorophenol	

**Table 7**

Base/neutral compounds:

Acenaphthene	Acenaphthylene	Anthracene
Benzidine	Benzo(a)anthracene	Benzo(a)pyrene
3,4-benzofluoroanthene	2,4-benzo(ghi)perylene	Benzo(k)fluoranthene
Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether
Bis(2-ethylhexyl)phthalate	4-Bromophenyl phenyl ether	Butylbenzyl phthalate
2-Chloronaphthalene	4-Chlorophenyl phenyl ether	Chrysene
Dibenzo(a,h)anthracene	1,2-Dichlorobenzene	1,3-Dichlorobenzene
1,4-Dichlorobenzene	3,3'-Dichlorobenzidine	Diethyl phthalate
Dimethyl phthalate	Di-n-butyl phthalate	2,4-Dinitrobenzene
2,6-Dinitrotoluene	Di-n-octyl phthalate	1,2-Diphenylhydrazine
Fluoranthene	Fluorene	Hexachlorobenzene
Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane
Indeno (1,2,3-cd) pyrene	Isophorone	Napthalene
Nitrobenzene	N-nitrosodimethylamine	N-nitrosodi-n-propylamine
N-nitrosodiphenylamine	Phenanthrene	Pyrene

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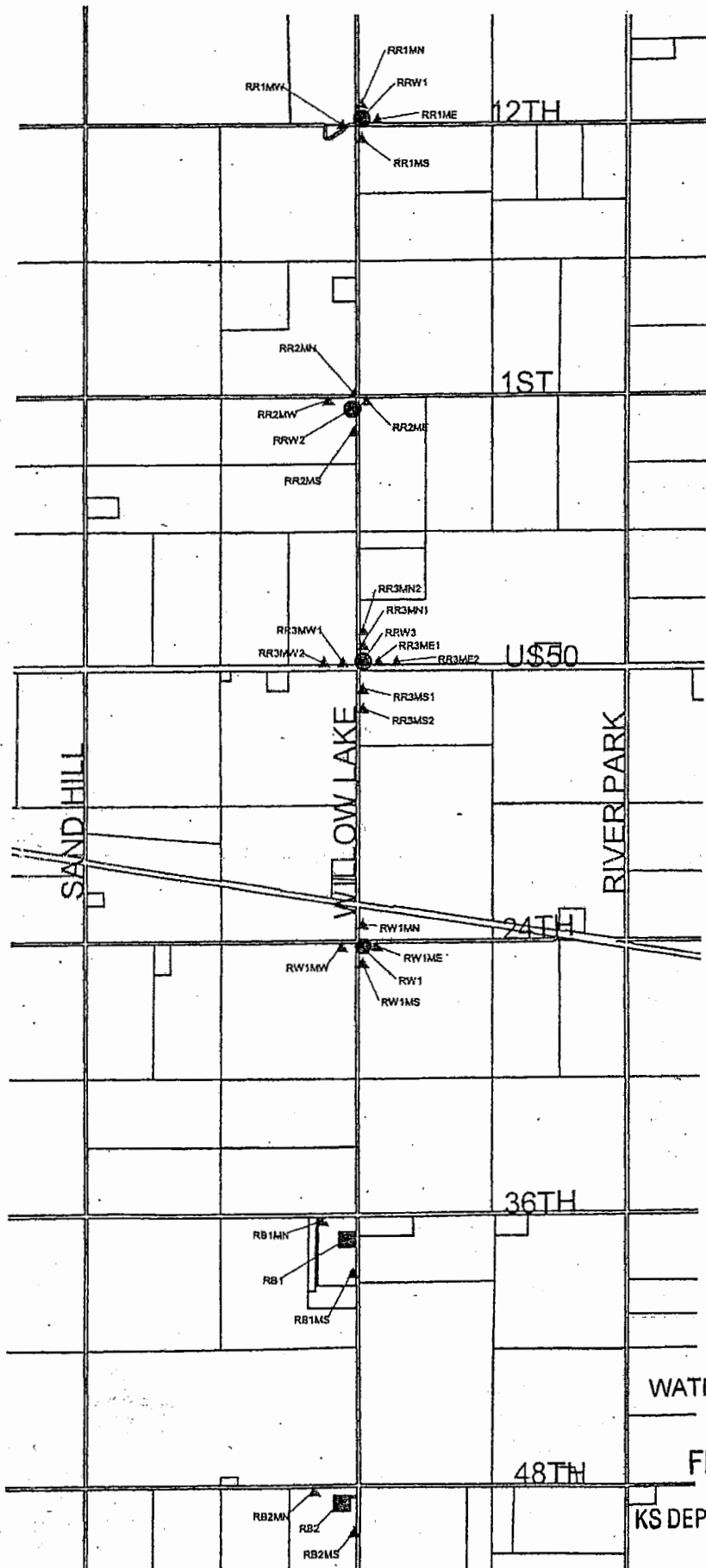
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# ATTACHMENT IV

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- RB
- ▲ RBM
- ▲ RM
- ▲ RRM
- RRW
- RW



1"=3,000'

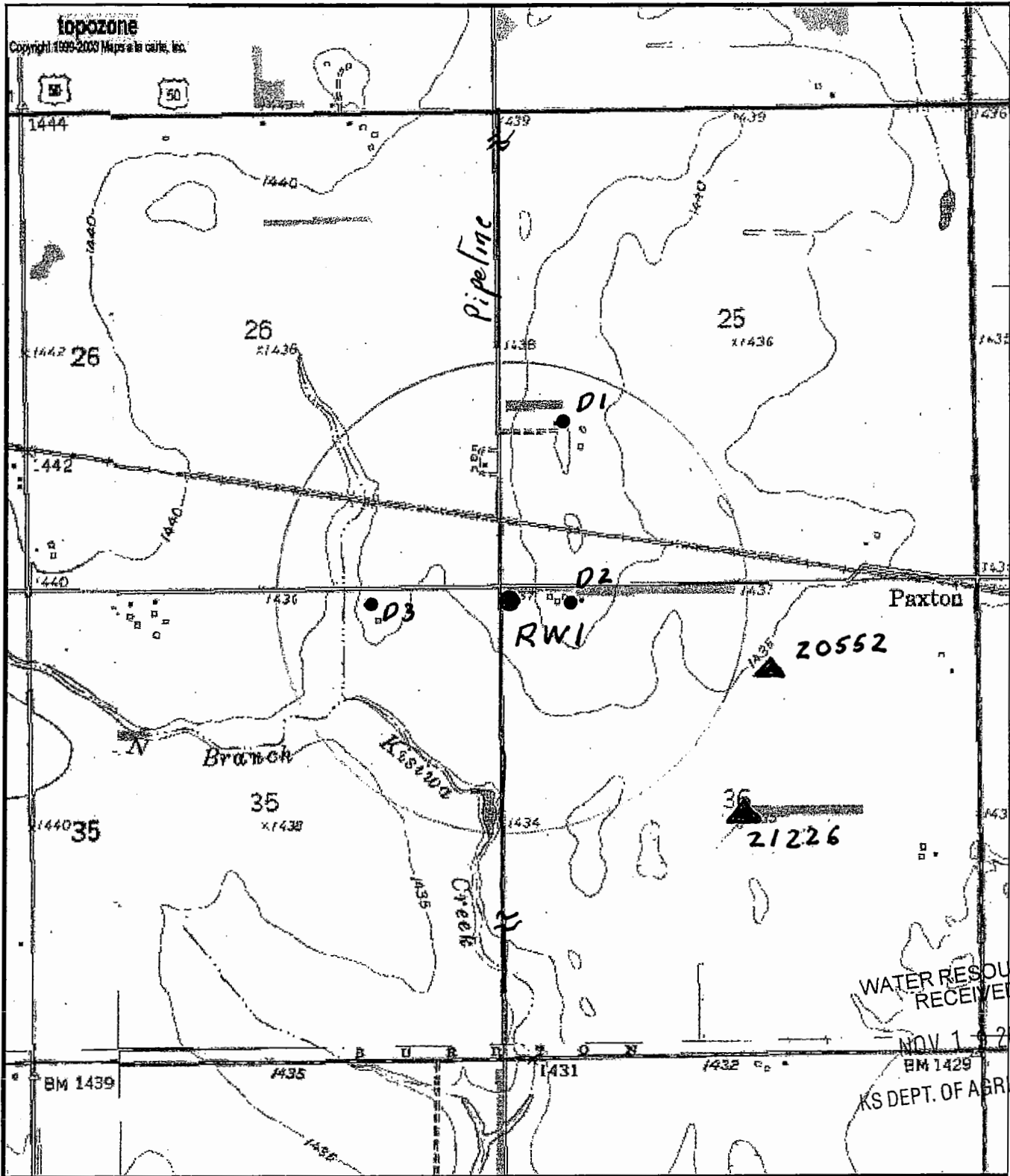


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Map center is UTM 14 622012E 4208266N (WGS84/NAD83)  
**Halstead** quadrangle  
 Projection is UTM Zone 14 NAD83 Datum

T 23 S  
 R 3 W

M=5.881  
 G=0.856