

RURAL WATER DISTRICT No. 9, LEAVENWORTH COUNTY

SOURCE WATER PROTECTION PLAN



Outcrop of sandstone on west bank of Stranger Creek, Leavenworth County, Kansas.

Approved by the Governing Body and Signed by the Chair

August 16, 2016

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1. SOURCE WATER PROTECTION AREA DESCRIPTION

Rural Water District No. 9, Leavenworth County Point of Diversion Locations and Information:

Identification Name or Number	Well No. 1
Legal Description	NE¼ SE¼ NE¼ 3-11-21E
County	Leavenworth
Distance from SE Corner	3,400' N × 10' W
DWR File Number	43,489
Authorized Quantity (m.g.y.) and Rate (g.p.m.)	13,000 m.g.y. & 50 g.p.m.
Normal Quantity and Rate (Range)	6,140 m.g.y. & 25 g.p.m.
Status	In Use

Identification Name or Number	Well No. 2
Legal Description	SE¼ SE¼ NE¼ 3-11-21E
County	Leavenworth
Distance from SE Corner	2,740' N × 150' W
DWR File Number(s)	19,460
Authorized Quantity (m.g.y.) and Rate (g.p.m.)	36,000 m.g.y. & 44 g.p.m. (Quantity shared with Well No. 5)
Normal Quantity and Rate (Range)	10,270 m.g.y. & 20 g.p.m.
Status	In Use

Identification Name or Number	Well No. 3
Legal Description	SW¼ SE¼ NE¼ 3-11-21E
County	Leavenworth
Distance from SE Corner	2,680' N × 900' W
DWR File Number	43,488
Authorized Quantity (m.g.y.) and Rate (g.p.m.)	23,000 m.g.y. & 60 g.p.m.
Normal Quantity and Rate (Range)	7,210 m.g.y. & 33 g.p.m.
Status	In Use

Identification Name or Number	Well No. 4
Legal Description	SE¼ NE¼ SE¼ 3-11-21E
County	Leavenworth
Distance from SE Corner	1,840' N × 330' W
DWR File Number(s)	43,487
Authorized Quantity (m.g.y.) and Rate (g.p.m.)	39,000 m.g.y. & 95 g.p.m.
Normal Quantity and Rate (Range)	15,600 m.g.y. & 54 g.p.m.

Status	In Use
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1. Source Water Assessment and Source Water Protection Area (cont.)

Identification Name or Number	Well No. 5
Legal Description	SE ¹ / ₄ SE ¹ / ₄ NE ¹ / ₄ 3-11-21E
County	Leavenworth
Distance from SE Corner	2,680' N × 460' W
DWR File Number(s)	19,460
Authorized Quantity (m.g.y.) and Rate (g.p.m.)	36,000 m.g.y. & 32 g.p.m. (Quantity shared with Well No. 2)
Normal Quantity and Rate (Range)	8,420 m.g.y. & 15 g.p.m.
Status	In Use

Basis of Source Water Protection Areas:

Many factors were considered before a determination was made of the areas that should be designated as the source water protection area for Rural Water District No. 9, Leavenworth County (Leavenworth RWD 9). The full 2-mile “circle” of the Source Water Assessment that was completed in 2003 was the starting point of the discussion. An evaluation of the surface water flow directions, the presumed bedrock topography and the known and presumed properties of the aquifer were evaluated.

Based on the location of the wellfield and the nearby water well drilling logs, it can easily be determined that the aquifer supplying water to Leavenworth RWD 9 is the Tonganoxie Sandstone. Kansas Geological Survey Bulletin No. 86, Part 5, published in 1950, gives a description of this valley-fill member of the Stranger Formation. The valley has a maximum width of about 20 miles and a depth of 90 to 100 feet in Leavenworth County. It is believed that the stream that cut the valley flowed in a southwesterly direction, as the bottom of the channel deepens from northeast to southwest. There is evidence of this valley in Missouri, in Platte and Clay Counties, where it is only about 50 feet deep. It’s presence further upstream has been eroded from the geologic record. The Missouri River cut its valley through the Stranger formation, and the base of the current valley lies lower in elevation than the Tonganoxie Sandstone, so there is no hydrologic connection between the bisected channel, nor with the Missouri River Alluvium. In Kansas, the Tonganoxie Sandstone is comprised of four distinct kinds of materials (from bottom to top): basal conglomerate, sandstone, shale and coal. The valley is cut into and through the Weston Shale, the South Bend Limestone, the Rock Lake Shale and into the top of the Stanton Limestone. It is capped by the Vinland Shale and the Haskell Limestone (above the Vinland). (In some locations, the Ireland Sandstone, which is a younger valley-fill deposit, may cut through the Haskell and Vinland into the Tonganoxie.) A large outcrop of sandstone is present on the west side of Stranger Creek at the Leavenworth Road Bridge, approximately 2.25 miles from the wellfield.

1. Source Water Assessment and Source Water Protection Area (cont.)

The sandstone outcrop at Stranger Creek in Section 36, Township 10 South, Range 21 East is in contact with the stream and could be present below the bed of the stream. The outcrop is visible between the elevations of approximately 820 to 860 feet, m.s.l. The elevation of the surface at the wellfield ranges from approximately 895 feet to 905 feet, m.s.l. No stratigraphic well logs are available at this time for the District's wells, but water use reports have consistently shown that the wells have depths ranging from 126 to 145 feet. If these are accurate, then the bottom of the wells are at an elevation of approximately 755 to 780 feet m.s.l., 40 to 70 feet below the floodplain of Stranger Creek. A nearby drilling log in Section 34 (between the wellfield and the outcrop) shows the Tonganoxie Sandstone to be present between 780 and 830 m.s.l. It appears that the sandstone outcrop, being higher in elevation than the Tonganoxie Sandstone aquifer less than 2 miles away, is the Ireland Sandstone. No information is available to determine if the two sandstone members are hydrologically connected. As the Tonganoxie Sandstone deepens to the southwest, there is some possibility that the recharge of the aquifer comes from Stranger Creek and its alluvium.

Based on the reported well depths, aquifer elevation calculations, observed outcrops of sandstone and published reports showing confined aquifer conditions at the wellfield, it has been decided that the protection area should include the area in the immediate vicinity of the wellfield. If new information becomes available to directly connect Stranger Creek surface water to the recharge of the aquifer at a specific location, consideration will be given to expanding the chosen protection area.

The protection area for Well Nos. 1, 2, 3, 4 & 5 comprises 4.58 square miles. The Source Water Assessment completed by the Kansas Department of Health and Environment on November 21, 2003, designated an assessment area of 14.02 square miles.

It is believed that identified protection activities established in the designated source water protection areas will contribute protection benefits. Maps of the Leavenworth RWD No. 9 Source Water Assessment Area and the Source Water Protection Area may be found in Appendix 1.

1. Source Water Assessment and Source Water Protection Area (cont.)

The following narrative describes the local factors and circumstances unique to the Source Water Protection Area:

Leavenworth RWD No. 9 has five wells under their four water rights. None of the wells are classified as being in a battery of wells. Only the most senior of the appropriations (File No. 19,460) is a certified water right. The remaining appropriations (File Nos. 43,487; 43,488 & 43,489) still have time available in which to perfect the authorized quantities. The four water rights authorize the diversion of 111.000 million gallons per year (m.g.y.) at a maximum rate of diversion of 281 gallons per minute (g.p.m.). Depths reported by the district for the wells are 125 - 145 feet. The United States Geological Survey (USGS) designates the area in which the wells are located as Hydrologic Unit Code (HUC) 102701040404, named the Tonganoxie Creek - Stranger Creek Subwatershed of the Lower Kansas River Subbasin. The Source Water Protection area also includes parts of HUC 102701040403, the Jarbalo Creek - Stranger Creek Subwatershed and HUC 102701040407, the Little Stranger Creek - Stranger Creek Subwatershed, both also in the Lower Kansas River Subbasin.

The district owns the land on which all of the wells, the iron/manganese filter plant, the shop and the chlorination building are located. Copies of the ownership documents are located in the Water Rights and Water Well Landownership Appendix, Appendix 9.

2. CONTAMINANT SOURCE INVENTORY

The pollutant source inventory was developed using the checklist found at [Appendix 2](#). Analysis of the protection areas was accomplished with a drive-through survey of the protection areas. The drive-through survey and inventory was conducted by Douglas S. Helmke, P.G., and Kenneth A. Kopp, P.G., Kansas Rural Water Association on June 8, 2016.

Kansas Source Water Assessment Program Plan - Contaminant Source Inventory

Name of Public Water Supply: Rural Water District No. 9, Leavenworth County

Water Supply Diversion Points: Well Nos. 1, 2, 3, 4 & 5

Inventory Prepared by: Douglas S. Helmke, P.G. & Kenneth A. Kopp, P.G. - K.R.W.A.

Date Inventory Completed: June 8, 2016

Code	Description	Present	Comments
7531*	Auto Body Repair & Paint Service	x	Zone C
7538	Auto Truck Repair Service	x	Zone C - Motorcycle Conversion Shop
7542	Car Wash	x	Zone B
211	Cattle Farm	x	Zone C
0	Drinking Water Treatment	x	Zone A & B
AF	Electric Power Lines	x	Zones A, B & C
AH	Farmstead	x	Zone C
5541	Gasoline Service Station	x	Zone B (Testing occurring this day)
9100	Government Office Building	x	Zone C
BF	Gravel Road	x	Zones A, B & C
BH	Grazing Livestock	x	Zones A, B & C
G	Health Services--offices of physicians, dentists, etc.	x	Zone C
BN	Native Grass Land (not CRP)	x	Zones A, B & C
1389	Oil of Gas Well	x	Zones B & C (Historical)
4600	Pipeline (Petroleum, Chemical, etc.)	x	Zone C (Natural Gas Compressor Station)
BQ	Pond	x	Zones B & C
4220	Public Warehouse	x	Zone C
F	Range & Pasture	x	Zones A, B & C
N	Rural Homestead	x	Zone C
4952	Sanitary Sewer	x	Zones B & C
N	Septic Tank--lateral field	x	Zone C
1521	Single-Family Housing Construction	x	Zone B
AP	Telephone Lines	x	Zones B & C
742	Veterinary Services--Specialties	x	Zone C
4221	Warehouse	x	Zone C
BA	Wells	x	Zones B & C
Other	Orthotics Manufacturing	x	Zone C
Other	Post Office	x	Zone C
Other	Emergency Medical Response Station	x	Zone C
Other	Bank	x	Zone C
Other	Metal Specialty Warehouse	x	Zone C

2. Contaminant Source Inventory (cont.)

In the Kansas Source Water Assessment Program, the assessment areas were divided into three zones: Zone A, Zone B and Zone C. These zones were developed for the purpose of determining assessment scores. In theory, the presence a contaminant source in Zone A has a greater risk than a similar contaminant source in Zone B, etc. The zones for water systems using groundwater were defined in this manner:

- Zone A = Land within 100 feet of the wells
- Zone B = Land within 2,000 feet of the wells
- Zone C = Land within 2 miles of the wells

A general description of the contaminant sources found in the protection area, with emphasis on Zones A and B, as shown in the latest Source Water Assessment, is as follows:

-Within 100 feet of the District's wells (Zone A) are:

1. Native Grass, some Grazed.
2. District Facilities.
3. Existing and Future Single Family Subdivision Lots.
4. Proposed 206th Parkway Transportation Corridor.
5. Electric Power Lines.

-Within 2,000 feet District's wells (Zone B), not repeating the items in Zone A, are:

1. Subdivisions with Single Family Homes and Duplexes.
2. Sanitary Sewers.
3. Single Family Homes with Septic Systems, some with Wells.
4. Major Traffic Corridor (US Highway 24/40).
5. Abandoned Oil Well.
5. Gravel Roads.
6. Telephone Lines.
7. Gasoline Station with Other Retail and Car Washing.
(Underground Storage Tank Integrity Testing being done on June 8, 2016.)
8. Ponds.

Within the protection area, 32 categories of potential pollutant sources were identified. The inventory worksheet identifying the potential pollutant sources may be found in [Appendix 2](#).

Not appearing in the source water assessment were two sites that were investigated as possible contaminated sites. The contaminated site (Stewart Property, Project Code C405272336) at 20736 Parallel Road was found to have buried material described as having a tar-like consistency. Also found was a small area where waste treated lumber was burned. Approximately 88 tons of soil was removed and the site was considered to be resolved in April of 2009. Petroleum leases in Section 34, Township 10 South, Range 21 East were on file with the Leavenworth County Register of Deeds from the 1960's and earlier, but KDHE did not locate

any abandoned oil wells. KDOT's 2008 US Highway 24/40 Corridor Study shows the possible location of an oil well in Section 34.

2. Contaminant Source Inventory (cont.)

The second potential contamination site (Williams Natural Gas, Project Code C405270971) at 20031 207th Street is also in Section 34. Sampling of soil and an impoundment was done in 1991 by an EPA contractor to determine the presence of PCB's, VOC's and SVOC's. None of the samples had contamination of the target constituents exceeding contamination criteria. This site was considered to be resolved on October 30, 1998.

3. WATER QUALITY PROTECTION MEASURES

Leavenworth RWD No. 9 has identified measures to assure protection of the quality of its source of water. These Water Quality Protection Measures are described in Appendix 3 of this document.

4. SUSCEPTIBILITY ANALYSIS

The purpose of a susceptibility analysis is to identify risks. It is a systematic procedure for determining the likelihood that a public water supply's raw water will contain contaminants at concentrations of concern. Using this information, a water system can direct water quality protection efforts in the most effective manner, thereby reducing contamination risks to its drinking water source.

The Source Water Protection Planning Committee used the susceptibility analysis procedure developed by the Kansas Department of Health and Environment for use in the Kansas Source Water Assessment Program. The following is a quote from the Kansas Source Water Assessment Report that describes in part the susceptibility analysis process:

“This analysis was based on a decision tree framework consisting of a series of yes and no questions. These questions considered the proximity of contaminant sources to the water supply intake, the type of contaminant, and the application of pollution prevention or water quality protection practices to sources of contamination. As the evaluator moved through the analytical framework, susceptibility points were accumulated based on the presence of contaminant sources in the assessment area (AA).”

“After all the questions were answered, the susceptibility likelihood score (SLS) was calculated for each contaminant of concern category. The SLS was determined by counting the number of contaminant risk factors found to occur in the delineated AA and applying a multiplier to this number. Because the number of contaminant category risk factors is not equal, the multiplier is used to establish a common scale for the SLS of each contaminant category.”

4. Susceptibility Analysis (cont.)

The process described above was used to determine the susceptibility of the District’s wells. For this activity, the protection areas for each well or group of wells was separated into three zones: Zone A – 100 foot radius around the wells; Zone B – 2000 foot radius around the wells; Zone C – 2 mile radius around the wells. The decision tree procedure of questions was used to assess the circumstances pertinent to each zone and the scores were recorded using the Kansas Department of Health and Environment’s Automated Source Water Assessment Tool (ASWAT).

The resulting SLS scores for the District’s wells do not indicate whether the wells are at high or low risk to contamination, but rather the scores are intended to help the water system identify the types of contaminants that are most likely to impact the wells. With this information in hand, the water system can then direct water quality protection efforts towards addressing (and hopefully lowering) the highest contamination risks to a well. All risk factors should be addressed in a source water protection plan, but the use of a susceptibility analysis helps focus the protection activities.

The decision tree procedure and ASWAT scoring used to tally the Susceptibility Likelihood Score (SLS) for the District’s wells may be found in Appendix 4 of this document. The Susceptibility Likelihood Score (SLS) for the wells used by Rural Water District No. 9, Leavenworth County, are as follows:

Susceptibility Likelihood Score (SLS)						
Susceptibility Likelihood Score - SLS	A	B	B*	C	C*	D
Leavenworth RWD 9 (Assessment Area 26)	44	45	48	52	48	55
SLS Range	Low	Low	Low	Mid	Low	Mid

Contaminant Risk Factors

- A – Microbiological
- B – Inorganic Compounds (IOC’s)
- B* – Nitrates
- C – Synthetic Organic Compounds (SOC’s)
- C* – Pesticides
- D – Volatile Organic Compounds (VOC’s)

The Susceptibility Likelihood Score (SLS) can range from 0 to 100. The greater the number, the greater the susceptibility of the water supply to contamination by the contaminant of concern. While the SLS is intended to reflect the relative susceptibility of the water supply to contamination by a particular contaminant group, there is no quantitative or value scale intended. Therefore, an SLS below a certain value is not intended to represent no problem to the water supply. There is also no intent to develop an overall or single “susceptibility score” for the water supply. The SLS is most useful for helping the public water supply direct water quality protection actions towards a contaminant category of concern. For example if the SLS for microbiological contamination is high relative to volatile organic compounds, water supply

protection planners would conclude that attention should be directed towards microbiological contaminant sources rather than VOC sources.

4. Susceptibility Analysis (cont.)

Based on the Susceptibility Likelihood Scores shown above, there is no one category of contamination threat that appears to be significantly greater than any of the others to the District's water supply. All efforts to reduce the risks from all contaminant sources will be beneficial, including those not addressed by the assessment tool.

In the opinion of the Source Water Protection Planning committee, the most significant potential risks to the quality and quantity of the source water to Leavenworth Rural Water District No. 1, ranked highest to lowest, are:

1. Abandoned Water Wells.
2. Proposed Parkway Construction.
3. Subdivision Encroachment.
4. Proposed Developments with water wells (cross contamination and backflow to aquifer).
5. Abandoned Oil Wells.

A listing of other potential pollutant sources that may pose a risk can be found in Appendix 3.

5. INFORM PUBLIC OF SOURCE WATER PROTECTION PLAN

In accordance with the 1996 Safe Drinking Water Act Amendments, the results of the Source Water Assessment portion of the Rural Water District No. 9, Leavenworth County, Source Water Protection Plan have previously been made public. The Source Water Assessment requirements are:

delineation of the protection area, an inventory of the potential contaminant sources, and a susceptibility analysis to determine the risk of contamination to the water source.

The Kansas Department of Health and Environment has provided this information to the public on their website at:

<http://www.kdheks.gov/nps/swap/download/LEAVENWORTHCORWD9.pdf>

The District will provide information to the public regarding the Source Water Protection Plan in the following manner:

Upon approval of the Source Water Protection Plan, a summary will be prepared for the water systems patrons. The summary will be posted to the District's web site with the Consumer Confidence Report. Availability of these documents will be announced on customer water bills.

6. SOURCE WATER PROTECTION STRATEGY

The Source Water Protection Strategy describes the actions necessary to minimize the risk to the quality of the source water utilized by Leavenworth RWD No. 9.

1. The following actions will be taken to implement Water Quality Protection Measures:
 - a. The Leavenworth County Sheriff, the Stranger Township Fire Department, the Leavenworth County Conservation District, the Leavenworth County USDA Offices, the Leavenworth County Extension Office, the Leavenworth County Commissioners, and the Leavenworth County Departments of Emergency Management, Public Works, Planning and Zoning, and Geographic Information Systems (GIS), Stranger Township, the Mid-America Regional Council (MARC) and the City of Tonganoxie will be contacted and informed of the location of the Leavenworth RWD No. 9 Source Water Protection Area and the development of the Source Water Protection Plan.
 - b. A program to educate landowners of the dangers of abandoned and poorly maintained water wells and to promote the plugging of these hazards will be established with the Leavenworth County Conservation District, K-State Research & Extension, and the Leavenworth County Planning and Zoning Department. Also included in this program will be cross-connection prevention education.
 - c. Objections to the proposed 206th Parkway route as found in the 2008 US 24/40 Corridor Study will be filed with the Kansas Department of Transportation, Leavenworth County, the City of Tonganoxie and the Mid-America Regional Council (MARC) expressing the unsuitability of placing a traffic corridor through the water district's wellfield and treatment plant facility.
 - d. The District will attempt to work with the City of Tonganoxie to protect the shared source of water by restricting the drilling of water wells within all new subdivisions proposed in the protection area.
 - e. The Leavenworth County Sheriff Department will be asked to regularly patrol the protection area to prevent vandalism and any other illegal activities. Regular first responder training and appreciation events will be scheduled at the treatment plant and wellfield. The District will work with the Sheriff Department to establish a National Drug Take Back site in Tonganoxie.
 - f. Landowners in the protection area will be invited to share information and knowledge of petroleum production history that occurred within the protection area, which will be shared with the Kansas Corporation Commission.

- g. Kansas Rural Water Association will be asked to evaluate the progress of the water right perfection of File Nos. 43,487; 43,488 & 43,489 before December 31, 2018.

6. Source Water Protection Strategy (cont.)

2. The following actions will be taken to assure continued maintenance of Water Quality Protection Measures presently in place:
 - a. Each year the Source Water Protection Plan will be re-evaluated. (This will occur at about the same time of the year that the water systems Consumer Confidence Reports are due.) At this time, progress and continued completion of the protection goals will be evaluated. If any new potential pollutant sources are identified, the potential risk they may pose to the water supply will be evaluated and the plan revised to reflect the change.
 - b. Efforts will be made to maintain good communication with the landowners and the partners providing assistance within the protection area, providing beneficial information concerning recommended Water Quality Protection Measures.
 - c. Water analytical reports will be closely monitored, evaluated and compared to previous years' results to make sure there is not an increase in any inorganic or organic substances that could indicate a possible contamination problem.
 - d. Water levels at a specific well will be measured monthly to help understand the seasonal and annual elevation changes of the groundwater table.

3. The following actions will be taken to assure that persons responsible for future potential pollutant sources are aware of the expectations / requirements of the Leavenworth RWD No. 1 Source Water Protection Plan:
 - a. The source water will be tested regularly and the reports reviewed and compared to insure no significant change to water quality. The results will be made available to the customers and area landowners through the Consumer Confidence reports.
 - b. Efforts will be made to stay alert to any future activities that could potentially effect the water quality of Leavenworth RWD No. 9's groundwater supply.
 - c. Efforts will be made to educate new landowners concerning the recommended Water Quality Protection Measures by mailing information concerning the Source Water Protection Plan once a year. This will be done at the same time that the Consumer Confidence Report is made available to all water users. Information concerning educational materials and resources available through the conservation district, extension office, the county planning and zoning departments, etc., will be provided.

7. EMERGENCY WATER SUPPLY PLAN AND WATER CONSERVATION PLAN

Appendix - 1.

**Maps of Source Water Assessment Area,
Source Water Protection Area,
and Water Well Drilling Logs**

Appendix - 2.

Contaminant Source Inventory

Appendix - 3.

Recommended Water Quality Protection Measures

Index of Recommended Water Quality Protection Measures

Less Developed Rural Land

1. Forest Land
2. Wetland

Land Cover And Crop

3. Land Cover & Crop (dryland)
4. Land Cover & Crop (irrigated)
5. Pasture (Tame & Range)
6. Conservation Reserve Program (CRP)
7. Irrigation Well Pump Site
8. Chemigation System
9. Tail Water Pit

Livestock

10. Dairy- Drylot
11. Dairy- Pasture
12. Dog Kennel
13. Cattle- Feedlot
14. Cattle- Pasture
15. Hog- Feedlot
16. Hog- Barn
17. Horses- Pasture
18. Horses- Barn
19. Poultry- Barn
20. Sheep- Pasture

Farmstead and Household

21. Abandoned Water Well
22. Farmstead Equipment Maintenance
23. Farmstead Feed Mill
24. Farmstead Feed and Hay Storage
25. Farmstead Fertilizer Storage
26. Farmstead Fuel Storage
27. Farmstead Grain Storage
28. Household Wastewater (septic tank, lateral field)
29. Household Wastewater (lagoon)
30. Household Wastewater (city sewer)
31. Landscape Maintenance
32. Farmstead and Temporary Livestock Confinement
33. Animals (pets)
34. Farmstead Pesticide Storage
35. Farmstead Silage
36. Solid Waste Storage
37. Water Well in Use
38. Abandoned Farmstead

Transportation and Utilities

39. Railroad Tracks
40. State/Federal Highway
41. City Streets (paved and gravel)
42. County & Township Roads (paved and gravel)
43. Electrical Substation and Power Lines

Pipelines and Pump Stations

44. Pump Station- Raw surface water
45. Pump Station- Petroleum
46. Pump Station- Sewer
47. Natural Gas Pipelines
48. Petroleum Pipelines (crude)
49. Petroleum Pipelines (refined product)
50. Sewer Lines

Airports

51. Airport Fuel Storage
52. Airport Pesticide Applicator
53. Airport Maintenance Areas
54. Airport- Onsite Sanitary Wastewater

Recreation Area

55. Fair Ground
56. City Park
57. Camping Area (primitive)
58. Camping Area (modern)
59. Golf Course
60. Gun Club
61. Sports Complex

Municipal Waste Treatment

62. Municipal Wastewater: Lagoon
63. Municipal Wastewater: Mechanical
64. Wastewater: Land Application
65. Wastewater: Biosolids Storage
66. Wastewater: Biosolids Application
67. Injection Well
68. Sanitary Landfill
69. Composting
70. Abandoned Dump
71. Solid Waste Transfer Station

Institutions and Businesses

72. Cemetery
73. Church
74. Hospital
75. Motel/Hotel

- 76. Nursing Home
- 77. Prison
- 78. Restaurant
- 79. School

- 80. Agricultural Center- Onsite Sanitary Wastewater
- 81. Agricultural Center- Water Well in Use

Index of Recommended Water Quality Protection Measures (cont.)

- 82. Agricultural Center Fuel Sales
- 83. Agricultural Center Equipment Repair
- 84. Agricultural Center Fertilizer Sales
- 85. Agricultural Center Fertilizer Application Service
- 86. Agricultural Center Pesticide Sales
- 87. Agricultural Center Pesticide Application Service
- 88. Agricultural Center Feed Mill
- 89. Agricultural Center Grain Elevator
- 90. Farm Equipment Dealer- Onsite Wastewater
- 91. Farm Equipment Dealer- Water Well in Use
- 92. Farm Equipment Dealer- Fuel Storage & Sales
- 93. Custom Packing Plant
- 94. Sale Barn
- 95. Seed Processor
- 96. Truck Wash
- 97. Veterinary Clinic
- 98. Auto Repair Shop
- 99. Beauty Shop
- 100. Car Wash
- 101. Dry Cleaner
- 102. Fuel Service Station
- 103. Funeral Home
- 104. Hardware Store

- 105. Photography/Print Shop
- 106. Small Engine Repair
- 107. Welding Shop

Industrial

- 108. Food Processor
- 109. Pharmaceutical Plant
- 110. Meat Processor
- 111. Metal Fabrication
- 112. Metal Plater
- 113. Petro-Chemical Refinery
- 114. Research Laboratory
- 115. Salvage/Recycler
- 116. Industrial Facility- Onsite Sanitary Wastewater
- 117. Industrial Facility- Water Well in Use

Mineral Extraction

- 118. Coal Mine
- 119. Oil or Gas Well
- 120. Rock Quarry
- 121. Geophysical Exploration Test Holes
- 122. Mineral Extraction- Onsite Sanitary Wastewater
- 123. Mineral Extraction- Water Well in Use

Recommended Water Quality Protection Measures

1. Forest Land

When possible leave in undisturbed state. Maintain good woodland conditions. Avoid or minimize woodland grazing. Control gully erosion. Use pesticides carefully.

2. Wetland

When possible leave in undisturbed state. Maintain in good wetlands condition. Avoid or minimize wetlands grazing. Use pesticides carefully.

3. Land Cover & Crop (dryland)

Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production - Nutrient Management and Pesticide Application.

4. Land Cover & Crop (irrigated)

Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production - Nutrient Management and Pesticide Application. Use only the amount of water the crop needs.

5. Pasture (Tame & Range)

Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production - Nutrient Management and Pesticide Application

6. Conservation Reserve Program (CRP)

When possible leave in undisturbed state. Maintain according to State and Federal laws regulations concerning CRP lands.

7. Irrigation Well Pump Site

Maintain site in such away that no fuels or other contaminants may enter the soil. When possible, maintain a vegetative buffer strip between the well site and crop.

8. Chemigation System

Follow applicable State and Federal laws and regulations concerning proper operation and maintenance of Chemigation Systems. In particular, attention should be give to proper operation of anti-pollution devices.

9. Tail Water Pit

Construct and maintain according to State and Federal laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production-Nutrient Management and Pesticide Application.

10. Dairy- Drylot

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

11. Dairy- Pasture

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

12. Dog Kennel

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

13. Cattle- Feedlot

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

14. Cattle- Pasture

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

15. Hog- Feedlot

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

16. Hog- Barn

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

17. Horses- Pasture

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

18. Horses- Barn

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

19. Poultry- Barn

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

20. Sheep- Pasture

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application.

21. Abandoned Water Well

Identify and properly plug all abandoned wells through a coordinated effort with landowners, cost share programs such as the County Conservation District Non-Point Source Program and the Public Water Supply.

22. Farmstead Equipment Maintenance

Use good practices for handling, recycling and disposal of equipment parts and fluids, so no contaminants may enter the soil.

23. Farmstead Feed Mill

Avoid long term spillage of grain on the ground. Use care when using pesticides to prevent them from entering the soil.

24. Farmstead Feed and Hay Storage

When possible, avoid storage of feed or hay on the ground. When storing on the ground, protect from rain and/or store at different sites each year. Use care when using pesticides to prevent them from entering the soil.

25. Farmstead Fertilizer Storage

Store fertilizer in such a manner that any spills are contained and prevented from entering the soil.

26. Farmstead Fuel Storage

Visually monitor above ground tanks for leaks. Comply with applicable State and Federal laws and regulations for large aboveground and underground fuel storage tanks.

27. Farmstead Grain Storage

Avoid long term spillage or storage of grain on the ground. Use care when using pesticides to prevent them from entering the soil.

28. Household Wastewater (septic tank, lateral field)

Install and maintain septic system according to Kansas Department of Health and Environment regulations and local codes.

29. Household Wastewater (lagoon)

Install and maintain lagoon according to Kansas Department of Health and Environment regulations and local codes.

30. Household Wastewater (city sewer)

Install and maintain lines according to Kansas Department of Health and Environment regulations and local codes.

31. Landscape Maintenance

Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production-Nutrient Management and Pesticide Application. Prevent fuels, solvents, or paints from entering the soil.

32. Farmstead and Temporary Livestock Confinement

Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application. Clean out confinement area regularly.

33. Animals (pets)

Follow Kansas Catalog of NPS Pollution Control Practices-Waste Management and Pesticide Application. Clean out confinement area regularly.

34. Farmstead Pesticide Storage

Follow Kansas catalog of NPS Pollution Control Practices for Proper Pesticides Storage, Handling and Mixing. Handle pesticides in such a manner that it is not allowed to enter the soil at the storage site. Follow label directions.

35. Farmstead Silage

Protect from rain and runoff. In areas with shallow aquifers avoid storage in unlined ground storage bunkers.

36. Solid Waste Storage

Contain all wastes in such a manner that no waste materials have an opportunity to enter the soil.

37. Water Well in Use

Properly protect and maintain the well and wellhead area according to Kansas Department of Health and Environment standards and recommendations

38. Abandoned Farmstead

Follow guidelines and recommended protection measures for associated land use activities, properly plug any abandoned wells as listed elsewhere. Use proper practices for handling, recycling and disposal of fluids, heavy metals and other contaminants.

39. Railroad Tracks

Maintain railroad tracks in good condition. Contact the Kansas Department of Health and Environment immediately in the event of an accidental spill or derailment.

40. State/Federal Highway

Use good practices for use and handling of de-icers, pesticides, and road construction materials. Use good erosion control practices.

41. City Streets (paved and gravel)

Use good practices for use and handling of de-icers, pesticides, and road construction materials. Use good erosion control practices.

42. County & Township Roads (paved and gravel)

Use good practices for use and handling of de-icers, pesticides, and road construction materials. Use good erosion control practices.

43. Electrical Substation and Power Lines

Use good practices for herbicide application and brush control. Follow Kansas Catalog of NPS Pollution Control Practices for proper pesticide handling and mixing.

44. Pump station- raw surface water

Maintain Pump Station site in such a manner that no contaminants may enter the soil or be washed away from the site.

45. Pump Station- petroleum

Operate and maintain according to applicable State and Federal laws and regulations. Inspect regularly to ensure proper operation. Maintain Pump Station site in such a manner that no contaminants may enter the soil or be washed away from the site.

46. Pump Station- sewer

Operate and maintain according to applicable State and Federal laws and regulations. Inspect regularly to ensure proper operation. Maintain Pump Station site in such a manner that no contaminants may enter the soil or be washed away from the site.

47. Natural Gas Pipelines

Operate and maintain according to applicable State and Federal laws and regulations. Periodically inspect pipelines for leaks. Maintain pipelines in good condition. Follow Kansas Catalog of NPS Pollution Control Practices for proper handling and mixing of weed and brush control pesticides.

48. Petroleum Pipelines (crude)

Operate and maintain according to applicable State and Federal laws and regulations. Periodically inspect pipelines for leaks. Maintain pipelines in good condition. Follow Kansas Catalog of NPS Pollution Control Practices for proper handling and mixing of weed and brush control pesticides.

49. Petroleum Pipelines (refined product)

Operate and maintain according to applicable State and Federal laws and regulations. Periodically inspect pipelines for leaks. Maintain pipelines in good condition. Follow Kansas Catalog of NPS Pollution Control Practices for proper handling and mixing of weed and brush control pesticides.

50. Sewer Lines

Operate and maintain according to applicable State and Federal laws and regulations. Smoke test sewer system to locate leaks. Maintain pipelines in good condition.

51. Airport Fuel Storage

Visually monitor above ground tanks for leaks. Comply with applicable State and Federal laws and regulations for large aboveground and underground fuel storage tanks.

52. Airport Pesticide Applicator

Operate and maintain according to applicable State and Federal laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices for Proper Pesticides Storage, Handling and Mixing. Handle pesticides in such a manner that it is not allowed to enter the soil at the storage site. Follow label directions.

53. Airport Maintenance Areas

Use approved practices for handling, recycling and disposal of equipment parts, fluids, and fuels, so no contaminants may enter the soil

54. Airport- Onsite Sanitary Wastewater

Operate and maintain according to Kansas Department of Health and Environment laws and regulations and local codes. Use system for sewage disposal only.

55. Fair Ground

Maintain grounds in such a manner that all wastes are disposed of properly. Limit use of fertilizers and pesticides when possible.

56. City Park

Maintain park in such a manner that all wastes are disposed of properly. Limit use of fertilizers and pesticides when possible.

57. Camping Area (primitive)

Provide facilities with proper containment of wastes for later disposal according to Kansas Department of Health and Environment regulations and local codes.

58. Camping Area (modern)

Construct, maintain, and operate waste disposal systems according to Kansas Department of Health and Environment regulations and local codes.

59. Golf Course

Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production - Nutrient Management and Pesticide Application.

60. Gun Club

Limit area exposed to spent lead shot. Limit use of fertilizers and pesticides when possible.

61. Sports Complex

Maintain area in such a manner that all wastes are disposed of properly. Limit use of fertilizers and pesticides when possible.

62. Municipal Wastewater: Lagoon

Operate and maintain according to applicable State and Federal laws and regulations.

63. Municipal Wastewater: Mechanical

Operate and maintain according to applicable State and Federal laws and regulations.

64. Wastewater: Land Application

Operate and maintain according to applicable State and Federal laws and regulations.

65. Wastewater: Biosolids Storage

Operate and maintain according to applicable State and Federal laws and regulations.

66. Wastewater: Biosolids Application

Operate and maintain according to applicable State and Federal laws and regulations.

67. Injection Well

Operate and maintain according to applicable State and Federal laws and regulations.

68. Sanitary Landfill

Operate and maintain according to applicable State and Federal laws and regulations.

69. Composting

Operate and maintain according to applicable State and Federal laws and regulations.

70. Abandoned Dump

Maintain and monitor according to State and Federal laws and regulations.

71. Solid Waste Transfer Station

Contain all wastes in such a manner that no waste materials have an opportunity to enter the soil. Maintain according to KDHE guidelines and regulations.

72. Cemetery

Maintain awareness of potential to contaminate groundwater supplies with heavy metals and various contaminants. Limit use of fertilizer and pesticides.

73. Church

Limit use of fertilizer and pesticides on lawn. Dispose of waste according to State laws and local codes.

74. Hospital

Properly dispose of biological and chemical waste in accordance with State and Federal laws and regulations. Limit use of fertilizer and pesticides on lawn.

75. Motel/Hotel

Limit use of fertilizer and pesticides on lawn. Dispose of waste according to State laws and local codes.

76. Nursing Home

Properly dispose of biological and chemical waste in accordance with State and Federal laws and regulations. Limit use of fertilizer and pesticides on lawn.

77. Prison

Limit use of fertilizer and pesticides on lawn. Dispose of waste according to State laws and local codes.

78. Restaurant

Limit use of fertilizer and pesticides on lawn. Dispose of waste according to State laws and local codes.

79. School

Limit use of fertilizer and pesticides on lawn. Dispose of waste according to State laws and local codes.

80. Agricultural Center-Onsite Sanitary Wastewater

Install and maintain onsite wastewater system according to Kansas Department of Health and Environment regulations and local codes. Use system for sewage disposal only.

81. Agricultural Center-Water well in use

Properly protect and maintain the well and wellhead area according to Kansas Department of Health & Environment standards and recommendations.

82. Agricultural Center Fuel Sales

Visually monitor above ground tanks for leaks. Comply with applicable State and Federal laws and regulations for large aboveground and underground fuel storage tanks.

83. Agricultural Center Equipment Repair

Use good practices for handling, recycling and disposal of equipment parts and fluids, so no contaminants may enter the soil.

84. Agricultural Center Fertilizer Sales

Store bulk fertilizer according to State and Federal laws and regulations. Handle fertilizer in such a manner that it is not allowed to enter the soil at the storage site.

85. Agricultural Center Fertilizer Application Service

Conduct soil test before application of fertilizer. Apply fertilizer according to crop nutrient requirements. Follow Kansas Catalog of NPS Pollution Control Practices for Cropland Production-Nutrient Management and Pesticide Application.

86. Agricultural Center Pesticide Sales

Store all pesticides according to State and Federal laws and regulations. Handle pesticides in such a manner that it is not allowed to enter the soil at the storage site. Follow label directions.

87. Agricultural Center Pesticide Application Service

Operate and maintain according to applicable State and Federal laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices for Proper Pesticides Storage, Handling and Mixing. Handle pesticides in such a manner that it is not allowed to enter the soil at the storage site. Follow label directions.

88. Agricultural Center Feed Mill

Avoid long term spillage of feed on the ground. Use care when using pesticides to prevent them from entering the soil.

89. Agricultural Center Grain Elevator

Avoid long term storage or spillage of grain on the ground. Use care when using pesticides to prevent them from entering the soil.

90. Farm Equipment Dealer- Onsite Wastewater

Install and maintain onsite wastewater system according to Kansas Department of Health and Environment regulations and local codes. Use system for sewage disposal only.

91. Farm Equipment Dealer- Water Well in Use

Properly protect and maintain the well and wellhead area according to Kansas Department of Health & Environment standards and recommendations.

92. Farm Equipment Dealer Fuel Storage & Sales

Visually monitor above ground tanks for leaks. Comply with applicable State and Federal laws and regulations for large aboveground and underground fuel storage tanks.

93. Custom Packing Plant

Dispose of all waste according to State and Federal laws and regulations.

94. Sale Barn

Operate and maintain according to applicable State and Federal waste management laws and regulations. Follow Kansas Catalog of NPS Pollution Control Practices- Waste Management and Pesticide Application.

95. Seed Processor

Maintain and operate in a manner that prevents any pesticides or processing chemicals from entering the soil.

96. Truck Wash

Dispose of wash water according to State and Federal laws and regulations and local codes.

97. Veterinary Clinic

Dispose of all biological and chemical waste in accordance to State and Federal laws and regulations and local codes.

98. Auto Repair Shop

Use good practices for handling, recycling and disposal of equipment parts, fuels, and solvents. Prevent contaminants from entering the soil.

99. Beauty Shop

Prevent perm solutions or dyes from entering the soil.

100. Car Wash

Dispose of wash water according to State and Federal laws and regulations and local codes.

101. Dry Cleaner

Dispose of all dry cleaning waste according to State and Federal laws and regulations. Prevent solvents and spotting chemicals from entering the soil.

102. Fuel Service Station

Visually monitor above ground tanks for leaks. Comply with applicable State and Federal laws and regulations for large aboveground and underground fuel storage tanks.

103. Funeral Home

Prevent biological and chemical materials from entering the soil.

104. Hardware Store

Prevent paints, solvents, fuels, and other contaminants from entering the soil.

105. Photography/Print Shop

Prevent solvents and processing chemicals from entering the soil.

106. Small Engine Repair

Use good practices for handling, recycling and disposal of equipment parts, fuel and solvents. Prevent contaminants from entering the soil.

107. Welding Shop

Use good practices for use, handling, recycling and disposal of solid wastes, fuels, and solvents. Prevent contaminants from entering the soil.

108. Food Processor

Dispose of all waste according to State and Federal laws and regulations.