UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, Colorado 80202-1129
http://www.epa.gov/region8

STATEMENT OF BASIS
FOR
UNDERGROUND INJECTION CONTROL
CLASS V DRAFT PERMIT RENEWAL
PERMIT NUMBER: CO52205-00000

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DESCRIPTION OF FACILITY AND BACKGROUND INFORMATION

On January 27, 2021, the Environmental Protection Agency Region 8 (EPA), received a permit application from Smithfield Hog Production (Smithfield) for renewal of a Class V Underground Injection Control (UIC) Area Permit. The Permit renewal, if issued, would authorize the discharge of backwash water from arsenic removal filters at nine drinking water treatment plants into a Class V injection well located at each of the nine sites listed in Table 1. Because the UIC Permit will authorize operation of more than one injection well, the Permit will be an Area Permit according to Title 40 Code of Federal Regulations (40 CFR) §144.33. The facility locations are shown on the maps in Appendix B of the Draft Area Permit; the Class V well location at each facility is show in the maps in Appendix C of the Draft Area Permit.

Table 1. Class V well sites, addresses and locations in Yuma County

UIC Well Number	Facility name	Address	Location
12191	Anchor	24786 County Road A, Yuma, CO	NESW Sec 31 T1S R48W
12192	Big Sky	716 County Road 27, Yuma, CO	SWSE Sec 30 T1S R48W
12193	Coyote Run	7455 County Road 28, Yuma, CO	SESW Sec 8 T1S R47W
12194	Gaytan	7465 County Road 28, Yuma, CO	NWSW Sec 8 T1S R47W
12195	Horizon	913 County Road 27, Yuma, CO	NESW Sec 19 T1S R48W
12196	Horseshoe	1267 County Road 27, Yuma, CO	NWSW Sec 29 T1S R48W
12197	Sandhill	1265 County Road 27, Yuma, CO	SWNW Sec 29 T1S R48W
12198	Sigmon’s	29443 County Road H, Yuma, CO	SWSE Sec 6 T1S R47W
12199	Tree Row	7451 County Road 28, Yuma, CO	SWSE Sec 8 T1S R47W

Smithfield has submitted all the required information and data necessary for Permit issuance in accordance with 40 CFR parts 144, 146 and 147. A Draft Area Permit was prepared. An announcement of the Public Notice of the Draft Permit has been published in the *Yuma Pioneer*.

Authorization to inject is issued for ten (10) years from the effective date of the Final Permit (40 CFR, Section 144.36) unless the Permit is terminated (per Part III, Section B.1 of the Permit). In the event primary enforcement authority (primacy) for the UIC program is delegated to the State of Colorado, this Permit may be modified, reissued or terminated by the state. In the absence of such modification, reissuance, or termination, all requirements of this Permit remain in full force and effect. Should this program be so delegated, the EPA UIC Director will notify the Permittee of the name and address of the State UIC Program Director, and the date that primacy is effective.

This Statement of Basis gives the site-specific Permit conditions and reasons for them. Part III of the Permit includes general Permit conditions, for which the content is mandatory and not subject to site-specific differences (based on 40 CFR, Parts 144, 146 and 147); the general Permit conditions are not included in this discussion.

I. REASON FOR THE PERMIT

The UIC Program, created under the authority of the Safe Drinking Water Act (SDWA), is a preventive program tasked with protecting underground sources of drinking water (USDWs) from contamination caused by underground injection. Shallow disposal systems that discharge certain types of fluids into the subsurface are among the types of injection wells known as Class V wells. These disposal systems consist of subsurface fluid distribution systems defined as an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground (40 CFR Section 144.3). Class V wells having this construction with waste streams potentially containing constituents with Primary Drinking Water Standards, Health Advisories, or that have the potential to contaminate or degrade groundwater for human consumption are required to operate under a permit. Permit requirements generally include monitoring the concentrations of contaminants of concern in waste fluids being released into the subsurface. The Permit may also include Best Management Practices designed to restrict or minimize the volume of contaminants released into the subsurface.

In order to demonstrate compliance with permit limits, analytical results of fluid samples must verify that all the analyzed constituent concentrations do not exceed the values established by Permit limits. The Permit limits have been established using Primary Drinking Water Standards, called Maximum Contaminant Limits or MCLs, for drinking water to prevent endangerment to USDWs. These constituents are included in Appendix D, of the Permit.

Description of Injected Fluids

The Smithfield sites consist of hog barns, office buildings and drinking water treatment plants. The source water for the drinking water treatment plants is groundwater from three wells completed in the Ogallala Formation. The source water is slightly above the arsenic drinking water standard (0.01 mg/L). Based on the ongoing monitoring of the drinking water treatment systems since August 2009, no other drinking water standards are exceeded in the source water. The concentrations of arsenic measured at the drinking water supply wells during the first year of operation are listed in Table 2. The Big Sky well provides drinking water to both the Big Sky facility and the Anchor facility. The Sandhill well provides drinking water to the Sandhill, the Horseshoe, and the Horizon facilities. The Tree Row well provides drinking water to the Sigmon's, Gaytan, Coyote Run and Tree Row facilities.

Table 2. Arsenic concentrations measured in the raw water from the drinking water supply wells.

	Arsenic Concentration (mg/L)				
Sample Date→ Well Name↓	8/18/2009	11/20/2009	2/9/2009	4/16/2009	8/4/2010
Big Sky	0.0109	0.0116	0.0125	0.0117	0.0106
Horseshoe		0.0106	0.0120	0.0118	0.0104
Tree Row		0.0123		0.0125	0.0109

Smithfield installed Culligan Smart Filters for Arsenic Reduction Water Conditioners with Soft-Minder Meter Sensing in the drinking water treatment plants. The media is a solid granular ferric oxide that has passed numerous TCLP tests performed by EPA and other independent testing labs as non-hazardous material that can be sent to any regular landfill. The filters have been designed to adsorb arsenic on the filter medium. The arsenic that is adsorbed onto the media is not expected to be rinsed off during the backwash process; therefore, the backwash water to be injected is expected to meet the arsenic drinking water standard of 0.01 mg/L. Sampling and analysis of backwash water collected before it enters the Class V wells will monitor the arsenic level to determine whether or not the arsenic drinking water standard is exceeded.

Best Management Practices

Best management practices are designed to reduce contaminants migrating into the ground water. Smithfield uses best management practices, as defined in Part II, Section D.5 of the Permit, for the disposal of waste fluids into the Class V shallow disposal system. Best management practices include proper maintenance of the arsenic filters. The filters must be replaced and disposed of in a manner compliant with federal, state, and local regulations and requirements.

II. AREA HYDROLOGY

Underground Sources of Drinking Water (USDWs)

A USDW is defined by UIC regulations as an aquifer, or a portion thereof, which contains less than 10,000 milligrams per liter total dissolved solids, and which is being used or could be used as a source of drinking water. The USDW at the site is the uniformly unconfined Ogallala Aquifer. The Ogallala Formation ranges in thickness from a few feet to about 460 feet and lies unconformably on/above the Pierre shale. The Ogallala Formation consists of a series of relatively flat-lying beds of sand, gravel, clay, limestone, and sandstone which vary greatly in character both vertically and horizontally.

The depth to the groundwater table in the Ogallala aquifer was measured at private well locations near the facilities. Depth to groundwater is shown in Table 3.

Table 3. Depth to top of the Pierre Shale and depth to static groundwater level from private well logs near the Anchor, Big Sky, Horseshoe, Sandhill and Horizon Sites.

Year	Permit #	Location	Depth to top of shale	Depth to groundwater
1974	17820	SESW Section 31, T1S, R48W	365	167
2004	159814	NESW Section 32, T1S, R48W	350	212
1995	184403	NWSW Section 29, T1S, R48W	318	195
1964	10892	SWNE Section 29, T1S, R48W	Not indicated	170
1995	184400	NWNW Section 29, T1S, R48W	Not indicated	200
1995	184404	SESE Section 19, T1S, R48W	318	193
1982	121631	SWNW Section 20, T1S, R48W	250	185

III. SAMPLING AND REPORTING OF RESULTS

Shallow Injection Well Sampling Program

Under the first Class V Area Permit, issued in May 2011, the arsenic filter backwash water flowed into septic systems located at each of the nine sites. The first Class V Area Permit required the Permittee to collect three fluid samples from each septic tank and analyze the samples for total arsenic, trihalomethanes and haloacetic acids. The sampling and analysis requirements for trihalomethanes and haloacetic acids were included in the permit because the backwash water for the arsenic filters is chlorinated. Chlorine is converted to disinfection byproducts (trihalomethanes and haloacetic acids) when it encounters the organic material and reducing conditions present in the septic tanks. Total haloacetic acid concentrations measured in the septic tanks exceeded the permit limit (MCL of 0.060 mg/L) one time at each of the Anchor, Coyote Run, Gaytan, and Sandhill facilities and five times at the Big Sky facility. Total trihalomethanes concentrations exceeded the permit (MCL of 0.08 mg/L) once at the Big Sky facility. Therefore, Smithfield is installing new Class V injection wells to dispose of the arsenic filter backwash water directly into the subsurface as an alternative to disposal into the septic systems. Because the backwash water will no longer flow to the septic tank, where organic material and reducing conditions exist, the chlorine in the backwash fluids will not be converted to disinfection by-products upon injection into the unsaturated ground above the Ogallala aquifer groundwater table, as discussed below.

The proposed Draft Area Permit requires the Permittee to annually collect fluid samples of arsenic filter backwash water from the discharge line before it flows into the Class V disposal well at each of the nine facilities listed in Table 1. The proposed Permit will require Smithfield to analyze samples only for total arsenic. Arsenic concentrations measured in the backwash fluid must meet the total arsenic drinking water standard of 0.01 mg/L before the backwash fluids are released to the Class V injection well.

The sampling techniques utilized must be adequate to provide a representative sample of injectate constituents and to allow the fluid sample to be analyzed using EPA analytical methods approved for drinking water analysis (or equivalent methods) which are included in Appendix D of the draft Area Permit. Total arsenic was selected for analysis based on its potential to deteriorate groundwater quality. The analyzing laboratory must provide a written report of all the results and laboratory documentation of quality control.

Reporting of Results

The report of analytical results from the first sample collected will be sent to the Director no later than one (1) week after the Permittee has received the analytical results from the laboratory. Subsequent analytical results must be submitted to EPA annually.

IV. THE CLASS V DISPOSAL WELL CONSTRUCTION DESIGN

The new Class V injection wells will consist of 55-gallon plastic barrels that will be buried in the ground with the top located four to six inches below the ground surface. There will be a vent cap installed in each barrel lid that will extend above the ground surface. The barrel lids will be removable to allow access if cleaning is needed. The barrels will be filled with 18 inches of gravel. The barrels will be perforated at the bottom to allow infiltration of the backwater water injectate, as shown in Appendix A of the Draft Area Permit.

Figure 1 shows the typical configuration of soil horizons. According to Maier and Pepper, 2009[1], these typical soil profiles illustrate the different horizons that develop under the influence of the soil forming factors and result in unique soils.

According to the US Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey map for Yuma County, the Sigmon's, Tree Row, Horizon, Sandhill, Horseshoe, Big Sky and Anchor sites are located over Valent soil, 3 to 9 percent slopes and the Gaytan and Coyote Run sites are located over Haxtun loamy sand, 0 to 3 percent slopes. The level injectate will enter the subsurface at these sites is approximately 39 to 41 inches below ground surface. In the Valent soil, 3 to 9 percent slopes, the C horizon typically occurs at depths ranging from 12 to 80 inches. According to Figure 1, organic material is not expected to occur in the C horizon.

In the Haxtun loamy sand, 0 to 3 percent slopes, the B2tb horizon occurs at depths ranging from 23 to 33 inches. Fine to very fine roots are common in this horizon of the Haxtun loamy sand, 0 to 3 percent slopes[2], but are expected to disappear before the base of the B horizon as shown in Figure 1. Plant roots contain humic acids that form disinfection by-products. At a depth between 39 to 41 inches, the perforations in the Coyote Run and Gaytan Class V wells will be set below the B2tb horizon of the Haxtun loamy sand.

Based on the depths of the Ogallala groundwater table at the Smithfield sites shown in Table 3, the injectate will flow into unsaturated subsurface vadose zone where oxygen is expected to be present[3,4]. With the presence of oxygen and the absence of organic materials in the soil horizons at the depth of injection, EPA does not expect the residual chorine in the injectate to be reduced to disinfection by-products.

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[1] Maier, R.M. and Pepper, I.L., 2009, Chapter 4 - Earth Environments, Editor(s): Raina M. Maier, Ian L. Pepper, Charles P. Gerba, Environmental Microbiology (Second Edition), Academic Press, at 63. (https://www.sciencedirect.com/science/article/pii/B9780123705198000043)

[2] US Department of Agriculture, 1981, Soil Survey of Yuma County, Colorado, at 71. (https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/colorado/CO125/0/yuma.pdf)

[3] Maier and Pepper, 2009, at 58, 69-70.

[4] Holden, P.A. and Fierer, N., 2005, Microbial Processes in the Vadose Zone, Vadose Zone Journal 4:1–21, at 2. (https://www.researchgate.net/publication/251543485_Microbial_Processes_in_the_Vadose_Zone)

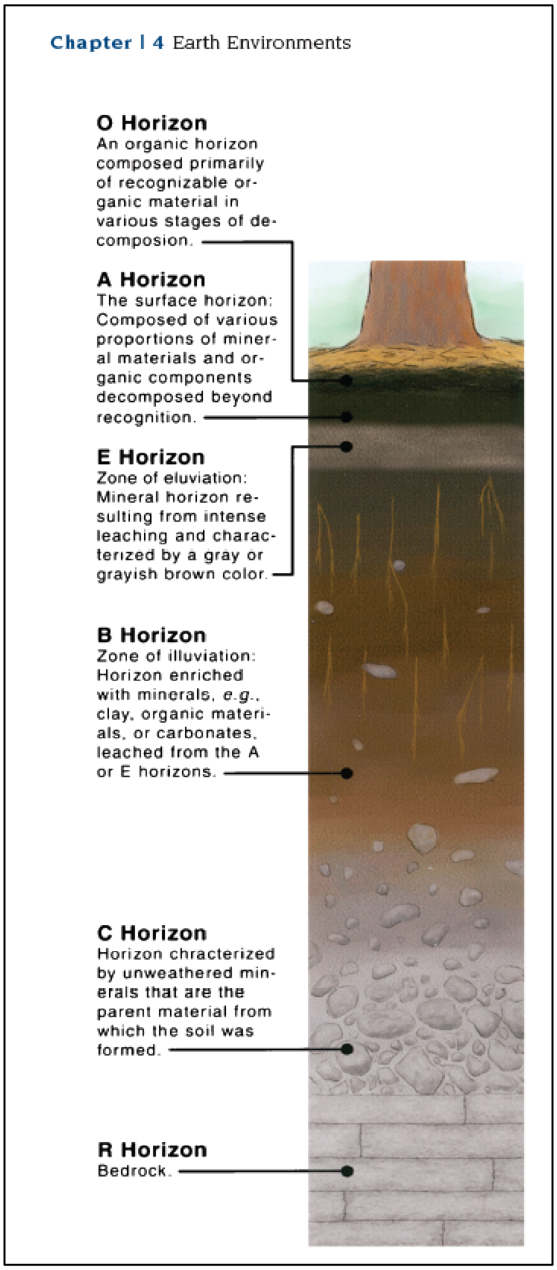

Figure 1. Typical distribution of soil horizons and their composition (from Pepper, et al., 2006).