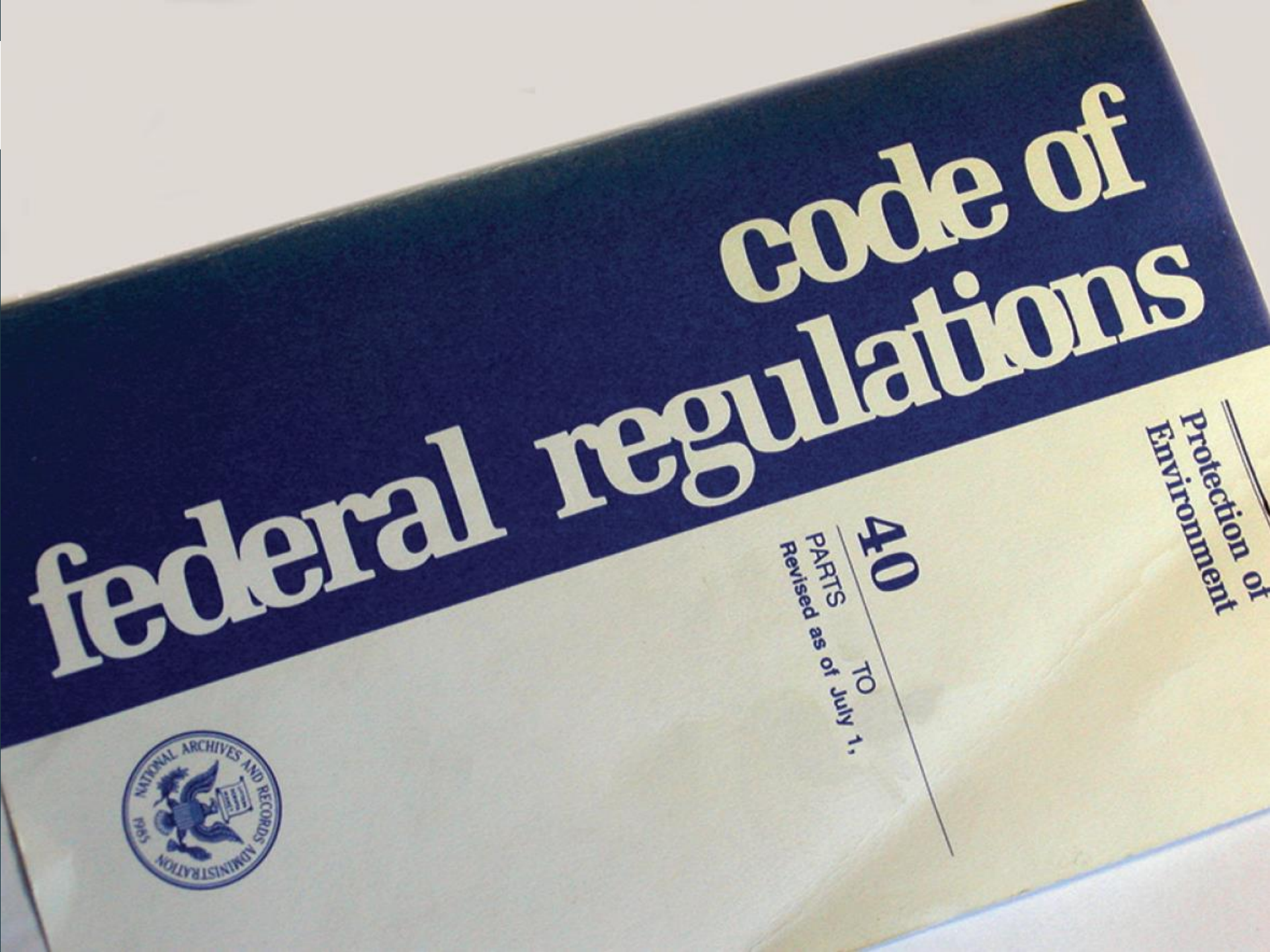

# SESSION 7: *Water Quality and Testing*

# Water Quality and Testing

- Drinking water standards
- Common contaminants
- Testing
  - Why?
  - When?
  - What?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federal regulations
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PARTS TO
Revised as of July 1,
Protection of
Environment
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION
1985

# *Water Supply Regulations*

## EPA – National Drinking Water Standards

- Public water systems
- Primary Standards – Health
- Secondary Standards – Nuisance
- Can be used as a guide for your private well.

## Texas Private Well Regulations

- Well location requirements
- Well construction
- **No requirements** for water testing or maintenance after construction

# EPA Drinking Water Standards

## Primary Standards

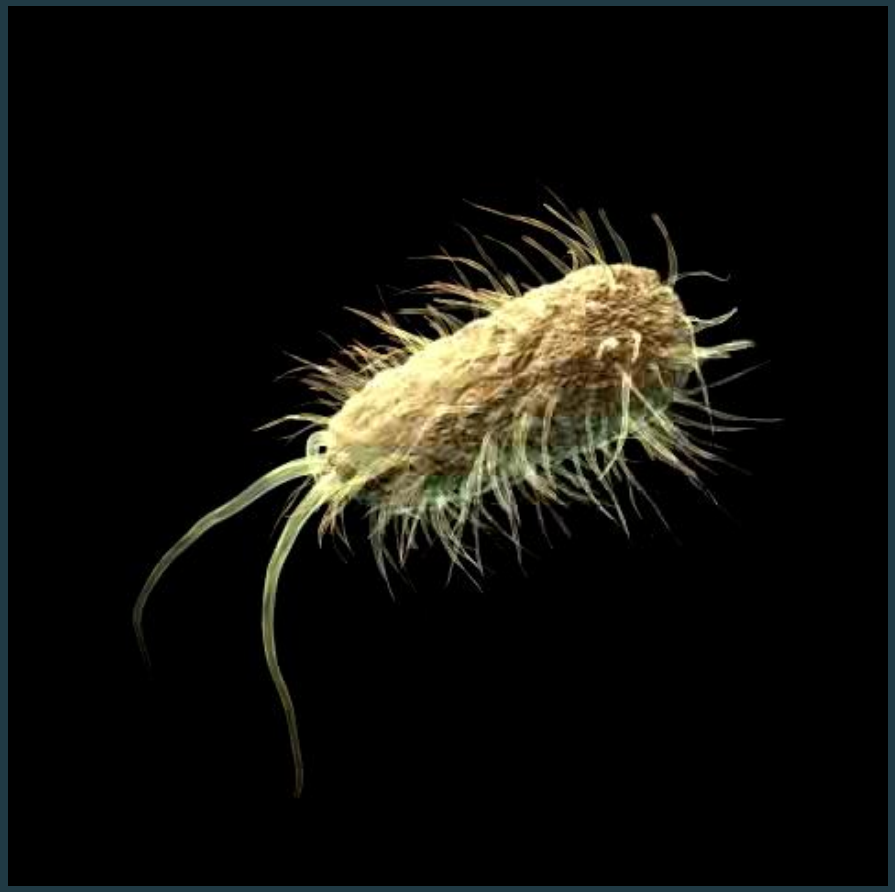
- Maximum Contaminant Level, or MCL
- Pose risks to human health
- Over 80 contaminants
- Examples:
  - Nitrate
  - Coliform bacteria
  - Arsenic
  - Organic chemicals and pesticides

## Secondary Standards

- Secondary standards, or SMCL
- Set for aesthetic considerations
  - Taste
  - Color
  - Odor
- 15 contaminants
- Examples:
  - Iron
  - Sulfate
  - TDS

# *Fecal Bacteria*

- Microscopic organisms found in feces of humans and other warm-blooded animals
- Not all are harmful by themselves
- *Indicator* organisms: indicate presence of *pathogenic* bacteria, viruses, parasites
- Fecal coliform and *E. coli* are most commonly tested



# *Why Check for Fecal Coliform?*

- Indicator bacteria
  - Indicates disease risk from other organisms that are pathogenic
- Cost effective
- MCL (maximum contaminant level) is 0 colonies/100 ml
- Test annually and each time the well is opened or repaired

# Sources of Bacteria

**HUMANS**

**50 Ft. Minimum Separation**

**100 Ft. Minimum Separation drain/Spray Field**

# Sources of Bacteria

## LIVESTOCK

- 150 Ft. Minimum Separation
- Down slope from Well

# Sources of Bacteria

**DOMESTIC ANIMALS**

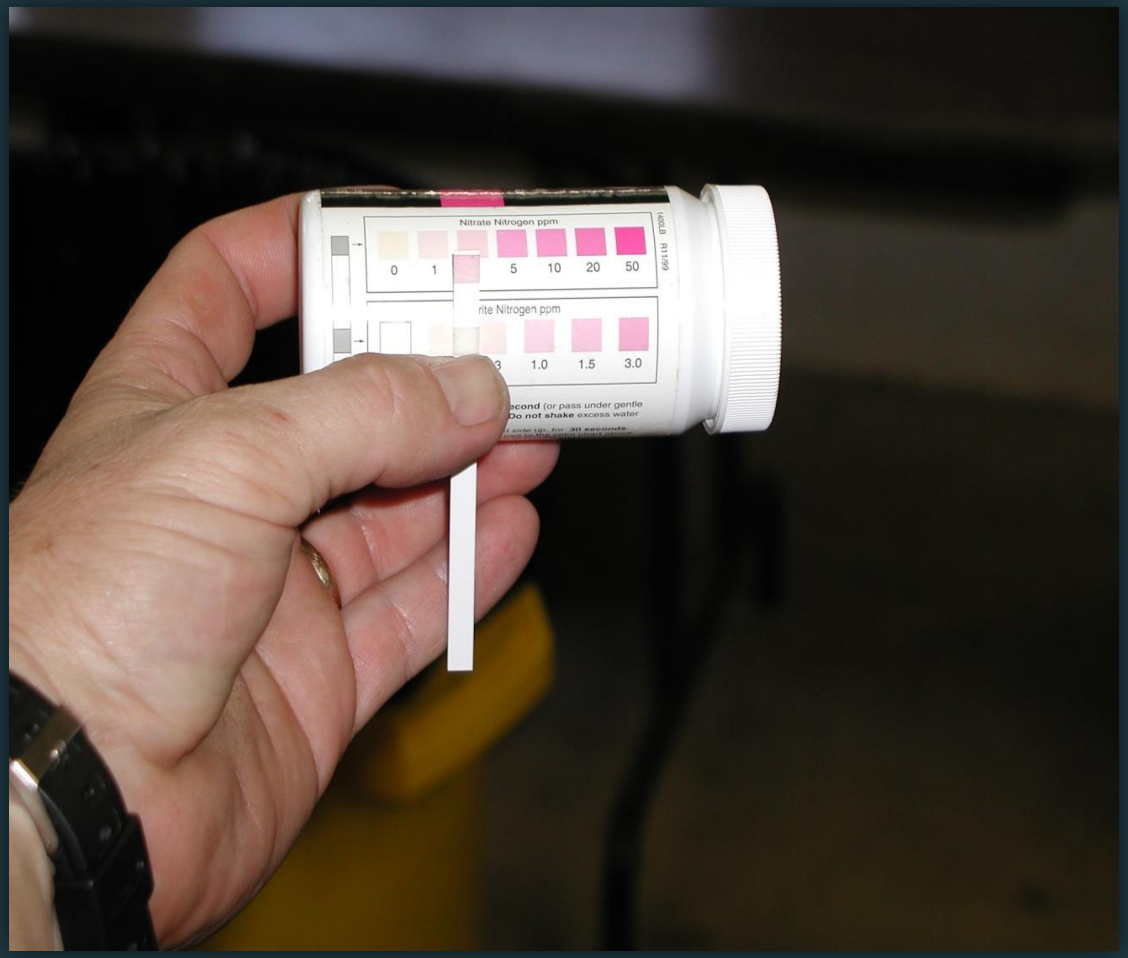
**150 Ft. Minimum Separation From pens, yards and runs**

# Nitrate

- Methemoglobinemia (blue baby syndrome)
  - Pregnant/ nursing women
  - Infants
  - Elderly/ suppressed immune systems
- Sources: fertilizer, animal waste, sewage

**Treatment: reverse osmosis, ion exchange, distillation**

# Nitrate




MCL = 10 ppm

# *Total Dissolved Solids (TDS)*

- Level of dissolved minerals, including salts
- More than 500 mg/L tastes salty
- Sodium is often referred to as a measure of salinity, most common cause of high TDS in Texas

# *Salinity Tolerance - Plants*

| PPM TDS | |
|---|---|
| 0 - 175 | Excellent, no risk to plants |
| 175 – 525 | Good, not for sensitive plants |
| 525 – 1,400 | Permissible, not for low salt tolerant plants |
| 1,400 – 2,100 | Doubtful, damage to high salt tolerant plants |
| >2,100 | Unsuitable |

# *Salinity Tolerance - Animals*

| PPM TDS | |
|---|---|
| 0 - 3,000 | O.K. for all livestock |
| 3,000 – 4,999 | Satisfactory, may result in temporary refusal/diarrhea; poor quality for poultry |
| 4,999 - 6,999 | Reasonably safe, not for pregnant/ lactating animals |
| 6,999 - 10,000 | Risky to young, pregnant/lactating animals or animals under heat stress |
| >10,000 | Unsuitable for all livestock |

# *Iron and Manganese*

- Nuisance – can give water unpleasant taste odor, and color
- SMCL:
  - Iron = 0.3 mg/L
  - Manganese = .05 mg/L
- Stains- Iron (reddish brown) Manganese (brownish black) stains on concrete, glassware, laundry, porcelain, sinks and plumbing fixtures

# *Iron and Manganese Treatment*

Treatment depends on type and concentration

- Initially clear, but particles form and settle out
- Water from tap has solid particles or has a tint
- Iron/manganese bacteria- reddish or black slime in toilet or faucets.

Treatment: Phosphate injection, water softener, oxidizing filter, aeration/filtration, shock treatment and filtration

# Hydrogen Sulfide

- Colorless gas with a “rotten egg” odor
- Formed by sulfur- and sulfate-reducing bacteria that can occur naturally in groundwater
- Shallow or poorly constructed wells
- Wells drilled in shale, sandstone, near coal or oil fields

# Hydrogen Sulfide ($H_2S$) Treatment

- Only in your hot water?
  - Problem might be caused by a chemical reaction with the magnesium control rod (anode)
  - Can be removed or replaced with an aluminum rod.
- Cause and concentration must be determined before appropriate treatment
  - If from sulfur-reducing bacteria, shock chlorination may treat.
  - If $H_2S$ naturally-occurring in the groundwater, a carbon filter may treat.
- Treatment depends on concentration
  - Need to test

# What to Test for: Nearby Land Use

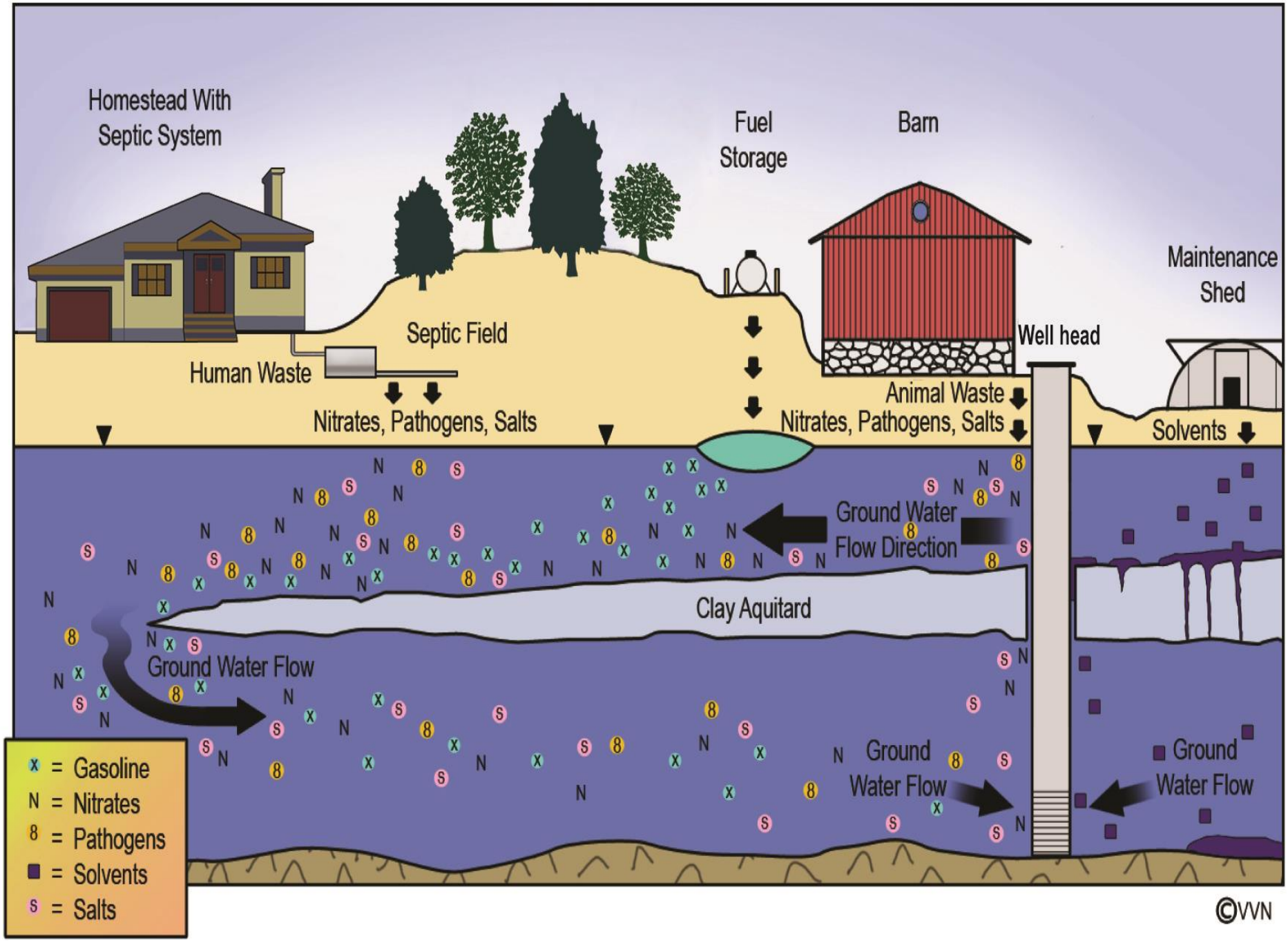
| Problem Type | Symptoms | Recommended Test |
|---|---|---|
| If suspect or observe | Leaking fuel tank | Hydrocarbon scan, VOCs |
| | Landfills | TDS, pH, heavy metals |
| | Gas or oil drilling | TDS, chloride, sodium, barium, lead, pH, corrosivity, strontium |
| | Coal mining | TDS, iron, sulfate, pH, corrosivity, manganese, aluminum |
| | Septic system failure | Fecal coliform/*E. coli* , nitrate |
| | Intensive agricultural use | Total coliform, nitrate, pesticide scan, pH, TDS |

# What to Test for: Nuisance Problems

| Problem Type | Symptoms | Recommended Test |
|---|---|---|
| Stains on Fixtures or Plumbing | Red or brown | Iron |
| | Black | Manganese |
| | Reddish-brown slime | Iron bacteria |
| | White deposits, soap scum | Hardness |
| Odor or Taste | Rotten egg | Hydrogen sulfide |
| | Metallic | pH, iron, zinc, copper, lead |
| | Salty | TDS, chloride, sodium |
| | Septic, musty, earthy | Coliform bacteria, iron, methane |
| | Gasoline or oil | Hydrocarbon scan, VOCs |
| | Soapy | Surfactants, detergents |
| Appearance of water | Brown, yellow, reddish | Iron |
| | Cloudy | Turbidity, suspended solids |
| | Black | Manganese |

# What to test for: Health Concerns

| Problem Type | Symptoms | Recommended Test |
|---|---|---|
| Uses or Symptoms | Gastrointestinal illness | coliform bacteria, sulfates, *Giardia* |
| | Water supplies used for infants less than six months old, pregnant or nursing women, or elderly with genetically impaired enzyme system | Nitrates |
| | Family member on recommended low-sodium diet | Sodium |
| | Dicoloration of children's teeth | Fluoride |


Homestead With Septic System
Fuel Storage
Barn
Maintenance Shed
Septic Field
Well head
Human Waste
Nitrates, Pathogens, Salts
Animal Waste
Nitrates, Pathogens, Salts
Solvents
Ground Water Flow Direction
Clay Aquitard
Ground Water Flow
Ground Water Flow
Ground Water Flow
x = Gasoline
N = Nitrates
8 = Pathogens
= Solvents
s = Salts
©VVN

TWON

TEXAS Well Owner NETWORK

# Questions?