Private Wells & Septic Systems

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Outline

- Well and septic components
- Predicting and preventing problems
- Resources
Private Well/Septic = Homeowner Responsibility
The Well

- Pipeline / conduit to aquifer
- Cased hole
Well type

- Drilled
  - Most common, modern standard
- Driven (sand point)
  - Shallow, more common for garden
- Dug
  - Dangerous and impossible to keep clean
Hand Dug and/or Abandoned Wells
Basic components

- Pressure Tank
- Faucet
- Grout
- Water Table
- Frost Line
- Pump
- Ground slopes away from the well
The well – casing

- **Type**
  - Concrete
  - Galvanized Steel
  - Steel
  - PVC - Allowed until 1988 at surface
  - PVC with Steel at surface
- **Size:** 4 – 12 inches
- **Perforations or well screen in aquifer of choice**
Inspecting well cap/seal

- Vent pipe is screened
- Cap is secure
- Casing extends 12" above ground
- No cracks or holes in casing
- Never any surface water at base
Cap/seal on casing

- Water tight, removable cap
- Several types in use
The well – casing grout

- Well casing sealed with grout
  - At surface
    - Prevents contamination from surface to aquifer
    - Extends 10 to 40 feet depending upon aquifer type
  - At confining layers
Well components – down hole

- Pump
  - Submersible
  - Check valve
- Wire
- Pipe
- Torque arrestor
- Pitless adapter
Well components – down hole
Submersible pump

- Pump size/type dependant upon:
  - Well capacity
  - Depth
  - Casing size
- Two or Three wire models
Pumps
Well components – down hole Pipe, torque arrestors

- **Pipe**
  - Sch 80 PVC or galvanized
  - 1” to 2 ½” ID

- **Torque arrestors**
  - Deep wells
  - Prevent wear to wire and pipe from vibration
Well components – down hole
Pitless adapter

- Connects vertical pipe inside casing to horizontal pipe leading to rest of system
- Installed below frost line (3-5’)
- Supports all Pipe, pump, wire down hole
Well components – above hole

- Pump
  - Centrifugal
  - Jet
  - Pumpjack/windmill
- Casing seal
- Electrical controls
- Storage tank
- Check Valve
- Plumbing
Well components –
Out of hole
Special Considerations - Cisterns
Existing Wells – special problem, pits

If have pit, watch for ANYTHING stored in pit that could contaminate well.
Potential Problems for Existing Wells

- **Location**
  - Above ground vs. in pit
  - Aspect of land – slope & drainage
  - Potential sources of contamination
  - Access

- **Materials**
  - Age and condition
  - PVC vs Steel
  - Cap and seal

- **Condition**
  - Cracks
  - Settling
  - Last service date
New wells

- Location, location, location

- Where to drill:
  - Water present
  - Power source & close to use
  - Accessible for equipment
  - Away from Potential Sources of Contamination
Drilling a Well

- Hire a licensed driller
- Obtain correct permit
- Get a copy of the well log – keep on record
Well Permits

- General Residential With Lawn/Garden Irrigation and Domestic Animal Watering
- Livestock Watering Only
- Residential Household Use Only

http://water.state.co.us/groundwater/wellpermit/Pages/default.aspx
Well Construction and Test Report
Potential Sources of Contamination
Potential Sources of Contamination
Separation between well and potential contamination sources

**50 feet**
- animal yard or barn
- septic tank
- concrete silo

**100 feet**
- pesticide or fertilizer storage
- chemical mixing/loading site
- fuel and oil products
- septic leach field

**250 feet**
- waste lagoon
- household waste dump
- manure stockpiles
- silage storage

*For sources not listed, provide as much separation as feasible.*
Corral/livestock >50’ Separation
Diagnosing Water Quality Problems

- How old is the well?
- How deep is the well?
- Have neighbors had problems?
- Do you have a recent water test?
- Is the well located near:
  - Underground storage tanks
  - Feedlots
  - Dumps
  - Leach fields – septic system
  - Abandoned wells
  - Mines
Diagnosing Water Quality Problems

- Symptoms:
  - Taste
  - Odor
  - Appearance
  - Feel

- Many problems have none of these symptoms!
Diagnosing problems

- Starts with a GOOD water sample

- **ALL** new, prospective, and current well owners should sample well water to get baseline quality!! – And keep records!!

- Complete or routine – pH, TDS, hardness, sulfate, nitrate, chloride, sodium, calcium, magnesium, metals, etc.

- Bacteria – total coliform, fecal coliform, and/or E. coli.

- Sample location depends:
  - What do you want to know?
  - Water treatment equipment
  - Site conditions
  - Nature of the problem
Good sample?

- Fresh, chilled
- Clean bottle – lab bottle best

**Inside:**
- Bypass water treatment
- Faucet – remove aerator
- Flush one minute

**Outside:**
- Nearest hydrant
- 10 min. flush

*See Handouts*
Sample interval

- **Annual**
  - Bacteria + nitrate
- **Five to ten**
  - Complete – pH, TDS, hardness, sulfate, sodium, chloride, metals
- **Sample interval depends upon:**
  - Well construction
  - Well depth
  - Previous problems
  - Location – proximity to contaminants

- **Keep records!!!**
Welcome to the Northern Plains and Mountains Water Quality Interpretation Tool. This tool has been created to help you evaluate your drinking, livestock and irrigation water quality. Adobe Reader is required to view PDF files. To download free Adobe Reader software click here.

To use the tool, simply follow these steps:

1. **Select the state where you collected your water samples:**
   - Colorado

2. **Select your water application type:**
   - Drinking Water

3. Enter the values that have been provided to you by a laboratory in the spaces pertaining to your analyses results. If you do not have a value for a particular parameter, leave the space blank.

4. Click the submit button below to obtain a table with an interpretation of the quality of your water.

5. If you need to start over, or wish to enter data for a different type of water, click the reset button below.

### Routine Water Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>mg/L</td>
</tr>
<tr>
<td>Ammonium (NH₄)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>mg/L</td>
</tr>
<tr>
<td>Boron (B)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Carbonate (CO₃)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Chloride (Cl)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Electrical Conductivity (EC)</td>
<td>dS/m (mmhos/cm)</td>
</tr>
<tr>
<td>Hardness</td>
<td>mg/L</td>
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<tr>
<td>Magnesium (Mg)</td>
<td>mg/L</td>
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<tr>
<td>Nitrate as Nitrogen (NO₃-N)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrite as Nitrogen (NO₂-N)</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Trace Elements Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony (Sb)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Beryllium (Be)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Cobalt (Co)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Cyanide (CN) (free)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Fluoride (F)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Lithium (Li)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Radon (Rn)</td>
<td>pCi/L</td>
</tr>
<tr>
<td>Selenium (Se)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Silver (Ag)</td>
<td>mg/L</td>
</tr>
<tr>
<td>Thallium (Tl)</td>
<td>mg/L</td>
</tr>
</tbody>
</table>
Treating Water Quality Problems

- Start with *independent* lab test
- Talk with the lab
- Make sure treatment fits problem
- Choose a reputable dealer
Treatment Categories

- Physical
  - Filtration
  - Reverse Osmosis
  - Activated carbon

- Chemical
  - Chlorination
  - Ion Exchange (softening)

- Point of Entry
- Point of Use
- Both
There are over 600,000 Septic Systems in Colorado

¼ of wastewater in Colorado treated by septic systems

10-20% of systems fail each year (nationally)

Septic systems are regulated and permitted by the local/county health department
Septic Systems – Main Points

- A properly designed and maintained septic system is a safe, reliable wastewater treatment system.
- Septic systems are NOT static, self maintaining units – they require owner action.
- Like a well, an individual wastewater disposal system is the owner’s responsibility.
Basic components

- House
- Cleanout
- Septic tank
- Junction box
- Inspection ports
- Leach field
Single Chamber and Baffled Tanks
Septic Tank Effluent Filter
Drainfield
Designs

- Conventional systems may not always be appropriate
- Thin topsoil or shallow ground water or bedrock may necessitate an engineered system:
  - (recirculating) sand filters
  - low-dose drip irrigation
  - mounded systems
  - aerobic systems
  - trickling filter systems
Leach lines with Gravelless Chambers
Pressure Dosed Systems

Figure 1: Low-Pressure Pipe System
Source: U.S. Environmental Protection Agency (1992)
Existing Systems – Questions to Ask

- **Location?**
  - Map or permit
  - Cleanout, tank, or vegetation signals
  - Proximity to well?

- **Age?**

- **Type** – conventional or advanced treatment

- **Capacity** – is it correct for size of home?

- **Service/maintenance records?**
Septic Effects on Drinking Water

- Proper design, installation, location, and maintenance of septic and well systems should result in healthy systems for the lifetime of each.
Well Contamination Risk

- If the wastewater treatment system is not designed or installed properly, or if the tank is not regularly pumped, the system *will* malfunction
- Well proximity to septic system increases significant risk for contamination
Taking Care of Your Groundwater: A homeowner’s guide to well and septic systems
Preview - DVD

NORTHERN PLAINS & MOUNTAINS

Regional Water Program
Obtaining Copies

- Downloadable at: www.region8water.org
- Click on ‘highlighted projects’

Causes of Septic Failure and How to Avoid It

- Common causes of failure:
  - improper design, installation, or placement
  - not pumping the septic tank solids

- System overload
  - space out your laundry loads during the week
  - practice water conservation

- Keep solids and toxins out of your tank
Septic Failure (cont.)

- Leach field compaction – do not build or drive on top of your leach field
- Placement in poor drainage area
- Pouring kitchen grease into drains
- Flushing of inorganic solids such as cigarette butts, sanitary napkins, or other trash
- Tree roots clogging the leach field and/or pipes
Summary Points

- Private/septic well owner has responsibility of clean drinking water and waste disposal

- Maintenance of both systems critical to your family’s health

- Best to understand what this means before you purchase the property

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