

tank assembly, which is located in the resort structure then to the distribution system. The system serves a transient population of 25 people per day in the summer and, a resident population of 4 people per day year-round through 5 active service connections. Because the water supply does not regularly serve the same 25 persons for at least six months a year, it is classified as a transient, non-community public water supply. Water demand is approximately 400 to 1650 gallons per day depending on the season, assuming water use is 50 gallons per day per transient and, 100 gallons per day per resident (EPA, 1991).

The well log available for the PWS system states the well was drilled in 1986 with a 7-inch casing from 2 feet above the ground surface to 33 feet below ground surface and 6-inch PVC casing from 20 feet to 180 feet below ground surface. The well is grouted to 20 feet deep with cement. The well is perforated at 100 feet to 125 feet. The static water level is 12 feet below ground surface. The pumping water level was 30 feet below ground surface at 1 hour with 5-10 gallons per minute, and 70 feet below ground surface after 4 hours of pumping 10-20 gallons per minute. The sanitary survey indicates the maximum production of the well is 30 gallons per minute (gpm). The average use is 5 gpm. The well is lacking a sanitary seal, but a k-packer and shale trap was used. The well log indicates the lithology of the aquifer is 35 feet of clay and gravel, 12 feet of brown sandstone and water, 13 feet of gray shale and 20 feet of gray oil shale. For the purpose of this assessment, the aquifer that the Kiowa Resort well taps is conservatively considered to be unconfined and is assigned a high sensitivity rating to potential contaminant sources in the area, in accordance with the Source Water Protection Guideline document (MT DEQ, 1999). If a well log or additional accurate well completion information becomes available in the future, it may be necessary to amend the sensitivity rating and susceptibility ratings in Table 1.

It appears that Kiowa Resort wastes are handled by multiple large capacity septic tanks and drainfields. A septic system is considered to be large capacity if it serves 20 or more people per day.

The sanitary survey for the resort made one recommendations for the water system. It is recommended that the wellhead be equipped with a proper sanitary seal and a downward-facing, screened vent.

Kiowa Resort tests for microbiological contaminants and nitrate. The well system completes quarterly bacteriological sampling, as well as an annual nitrate sample. The campground monitoring data indicates there have been no coliform bacteria detections in the past five years. The highest level of nitrate detected in the well in the last five years is 0.03mg/L in 1999, which is below the maximum concentration level (MCL) for nitrate of 10 mg/L set by the U.S. Environmental Protection Agency (EPA).

Delineation

Two source water protection zones are delineated for Kiowa Resort. They are a 100-foot radius control zone and a one-mile radius inventory region ([Figure 1](#)). The control zone is the most critical area from which direct introduction of contaminants into the well or immediate area can occur. The inventory region encompasses the area from which water or contaminants can flow into the resort's water supply over a period of months to years.

Inventory

The Montana Source Water Protection Program (Montana DEQ, 1999) requires that land uses and all potential sources of nitrate and microbial pathogens within the control zone and inventory region be identified.

The sanitary survey for Kiowa Resort provides a site map for the facility (Appendix B). No potential sources of contamination were identified in the control zone.

Analysis of the area surrounding Kiowa Resort reveals that the predominant land covers are grassland/shrubland (65%), mixed forest (28%), open water/wetlands (7%), and bare rock/sand/clay (<1%). See [Figure 2](#) and [Figure 3](#) for summarization of this data. These landuse areas are not considered threats to the water supply.

One potential mining site, Kiowa Junction Deposit, is located in the inventory region. It is listed as an "iron and titanium mineral location" and active mining was not noted at the site. Transient water systems such as the Kiowa Resort are not required to monitor for typical mining constituents. However, if this becomes an active mineral extraction site, spills, leaks, or improper handling of chemicals and wastes generated in mining operations or from heavy equipment may impact the drinking water supply.

Low septic density land makes up 100% of the inventory region and is not a significant threat to the aquifer. However, the resort's on-site septic systems and drainfields could pose a potential threat to the aquifer.

Susceptibility Assessment

Susceptibility to potential contaminant sources is assessed for a public water supply well. It is assumed that the aquifer is unconfined with a high sensitivity to potential contaminant sources located in the area (Montana DEQ, 2000, Table 2). Well log information helps verify that the well is constructed properly and helps identify the aquifer that the well is completed in. When constructed properly, shallow ground water that is more vulnerable to contaminant sources at the land surface is prevented from entering the well's bore hole and co-mingling with water from the deeper aquifer. Under some circumstances, the well bore would act as a conduit for contaminants entering the deeper aquifer.

Barriers to contamination can be anything that decreases the likelihood that contaminants will reach a well. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices (BMPs) are considered management barriers. Thick clay-rich soils, a deep water table or a thick saturated zone above the well intake can be natural barriers. Two barriers have been identified for the Kiowa Resort large capacity septic system. The well appears to be 1,200 feet up gradient from the septic system and the drainfield is a pressure dosed design.

The resort’s well system is susceptible to nitrate and bacterial contaminants from the resort’s large capacity septic systems.

The resort’s on-site septic system(s) are assigned a moderate hazard (Montana DEQ, 2000, Table 9b). The septic system is down gradient from the well and is considered a barrier making the susceptibility rating moderate (Montana DEQ, 2000, Table 10)

Management Options

Possible management options for potential contamination from the drain field and large septic system include properly maintaining the drain field and distribution lines.

The hazard and susceptibility ratings for each potential contaminant source as well as management options are summarized in Table 1 below.

Table 1: Significant Potential Contaminant Sources

Source	Contaminant	Hazard Rating	Barriers	Susceptibility	Management
Campground’s On-Site Septic Tanks (down gradient location)	Pathogens, nitrate	Moderate	-Well is up gradient to septic system -drainfield is pressure dosed	low	Properly operate and maintain on-site septic tank, drainfield and distribution lines (see attached Fact Sheet – Appendix C).

References:

DEQ Permitting and Compliance Division, 2002. Sanitary Survey for Kiowa Resort, PWS- PWS ID: #MT0002750.

Montana DEQ, 1999. Montana Source Water Protection Program, Approved by EPA in November 1999.

Montana DEQ, 2000. Montana Source Water Protection Program, Template for Non-Community Transient Public Water Supplies, Revised 2002.

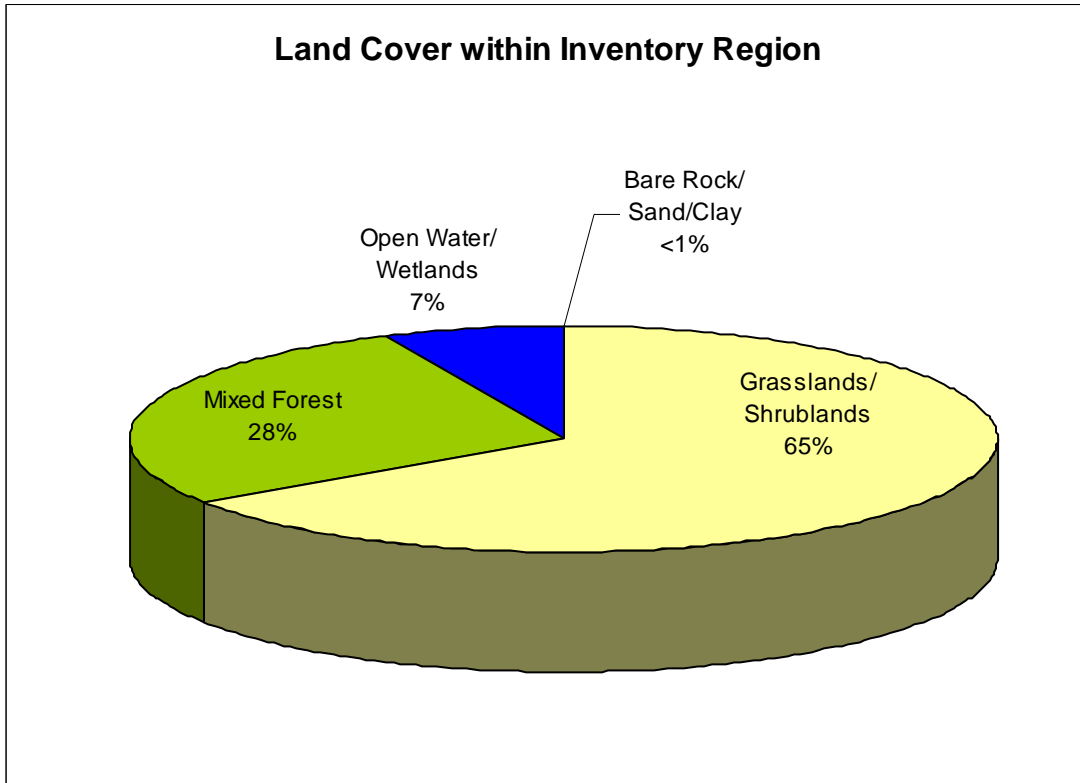
Montana State Library - Natural Resources Information System (NRIS) 2000 map base of the USGS Topographical coverage at 1:24,000 scale in MrSID format.

U.S. EPA, Office of Water, 1991. Manual of Small Public Water Supply Systems, EPA 570/9-91-003, 211 p.

U.S. Geological Survey, 2000. National Landcover Dataset, Montana. 30-meter electronic digital landcover/land use dataset interpreted from satellite imagery.

[Figure 1.General Location Map and Figure 2. Land Cover Map](#)

Figure 3: Land use pie chart.



Appendix A: Public Water System

SANITARY SURVEY FORM - DIAGRAMS (Page 1 of 2)

Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc. and label with appropriate facility designation. (See example on instruction sheet)

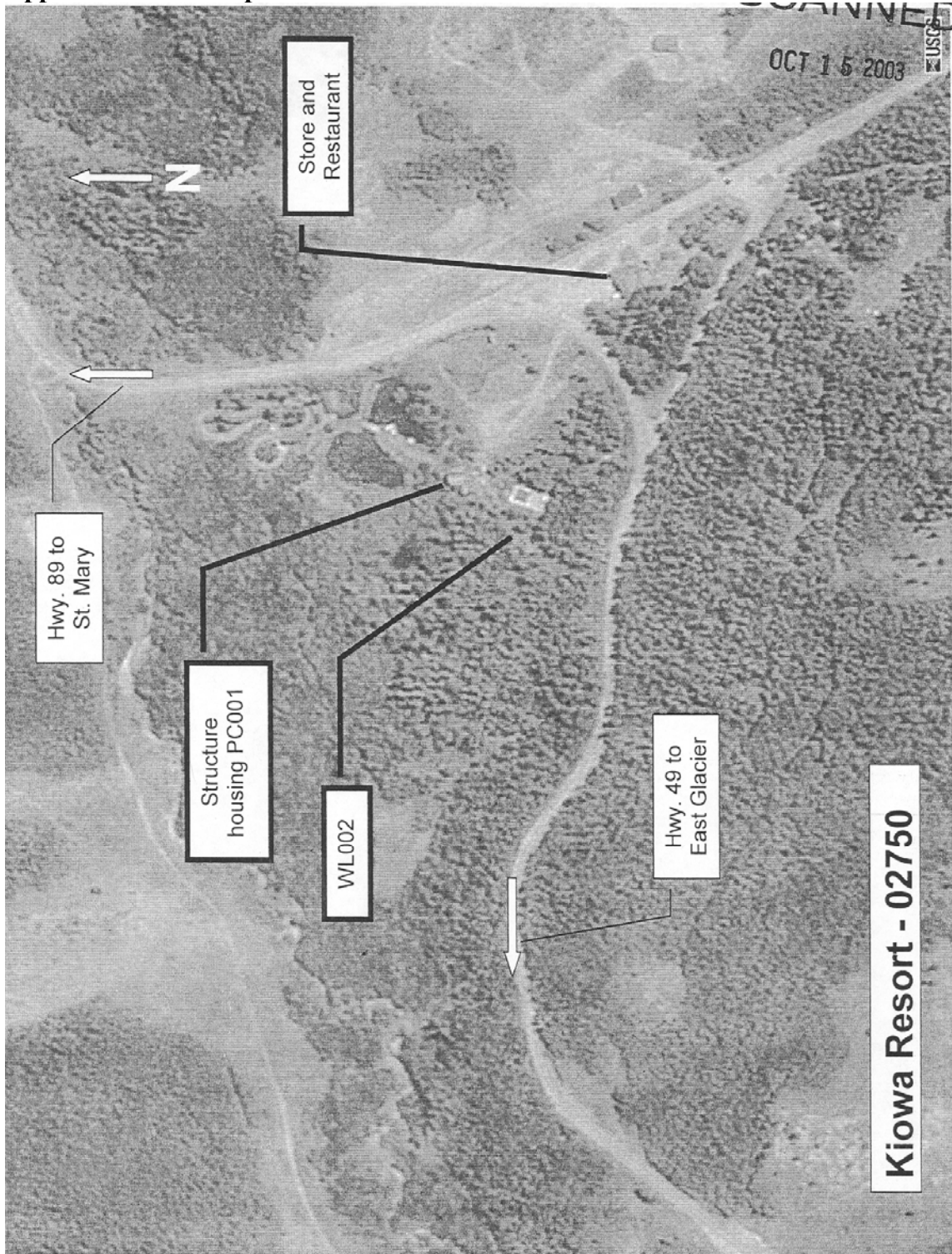
SEE AERIAL MAP

Draw brief schematic of pumphouse facilities (pressure control assemblies, treatment(s) valves, filters, meters, electrical controls, etc.)

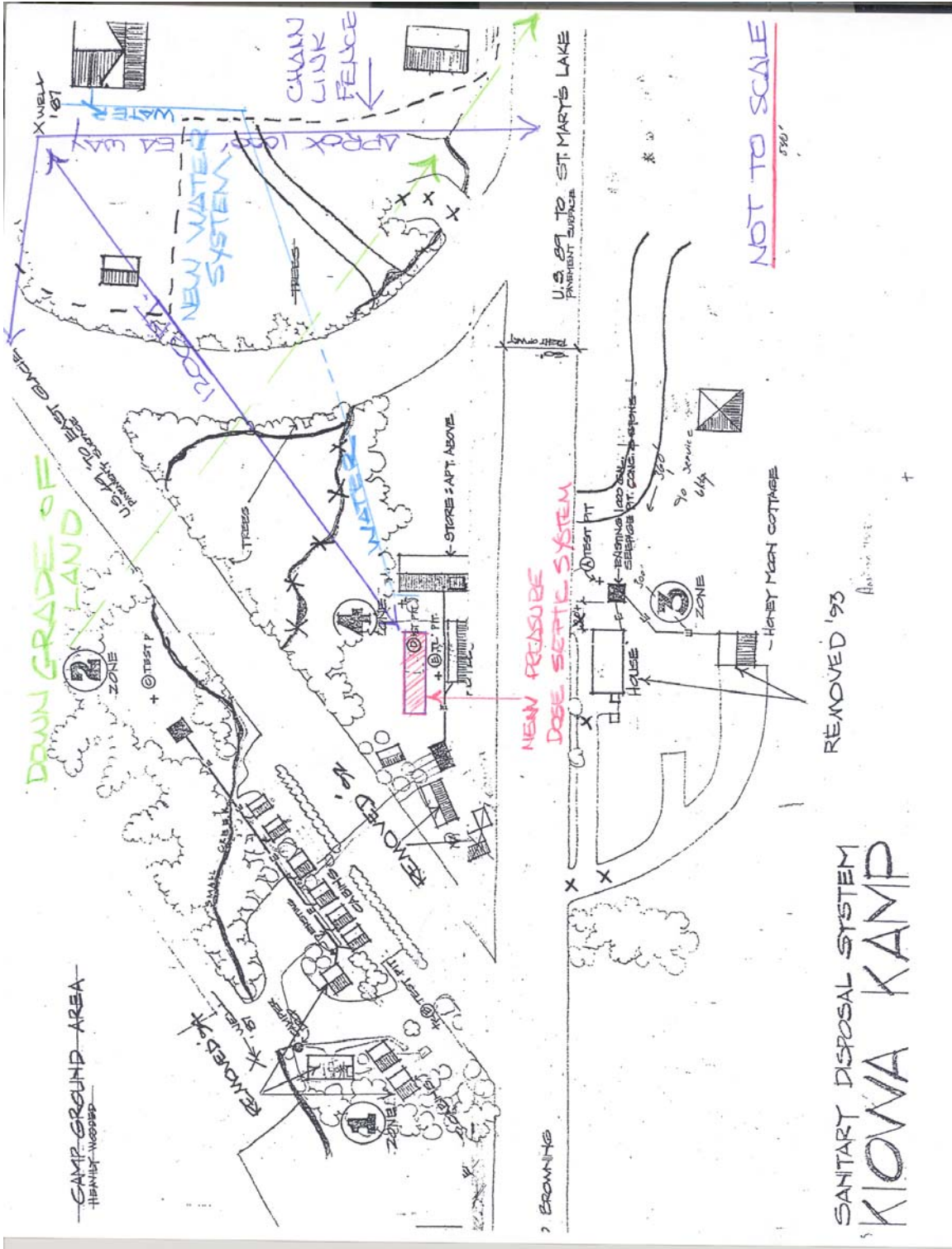
```
graph LR; Inlet[ ] --- PG[Pressure Gauge + switch]; PG --- AT[85.3' CAPTIVE AIR TANK]; AT --- PRV[PRESSURE RELIEF VALVE]; PRV --- Meter[1 1/2" METER]; Meter --- Valve[1 1/2" VALVE]; Valve --- Dist[to DISTRIBUTION]; Dist --- Split(( )); Split --- STORE[STORE]; Split --- MOTEL[MOTEL (4 Rooms)]; Split --- CAMPSITES[CAMP SITES (2)];
```

*Drawing by Paul Montgomery, PE. Taken from 2001 sanitary survey of Kiowa Resort.

Appendix B: Site Map



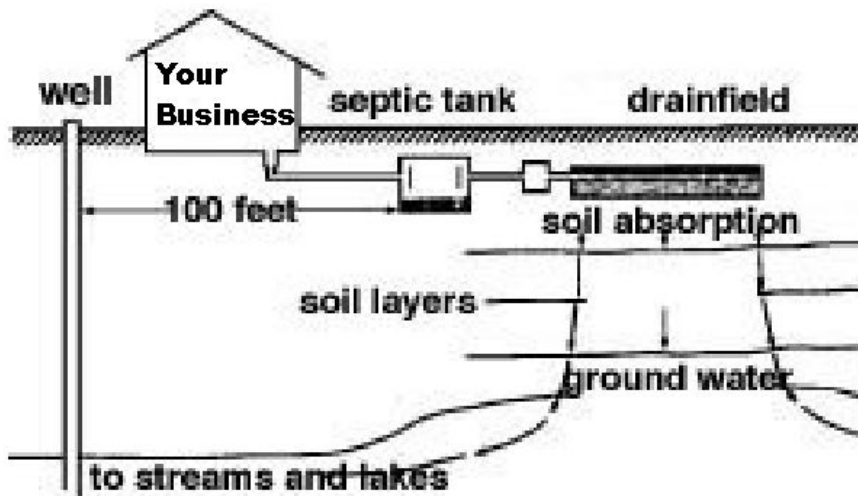
*Figure by Paul Montgomery, PE. Taken from 2001 sanitary survey of Kiowa Resort.



Large Capacity Septic System Operation and Maintenance

Basic information on proper operation and maintenance of residential scale septic systems is available through various sources in the state (see Resources near the end of this publication). For some commercial establishments, the sources and characteristics of wastewater may be quite similar to those of residential wastewater. For other businesses and institutions, however, wastewater may be very different: for example, it may contain harsh industrial-strength cleaners or high concentrations of oils, or it may derive from processes (e.g., small-scale manufacturing) that introduce chemicals and other substances not found in residential wastewater. Accordingly, many large capacity septic system owners face a couple of special considerations in operating and maintaining their systems. If improperly used or operated, septic systems can be a significant source of ground water contamination that can lead to waterborne disease outbreaks and other adverse health effects. This fact sheet is provided to address some of those considerations and to help owners of large capacity

septic systems protect their source of drinking water.



Large capacity septic systems fall under the EPA designation of "Class V Injection Wells" and are regulated by Underground Injection Control (UIC) programs set up by the

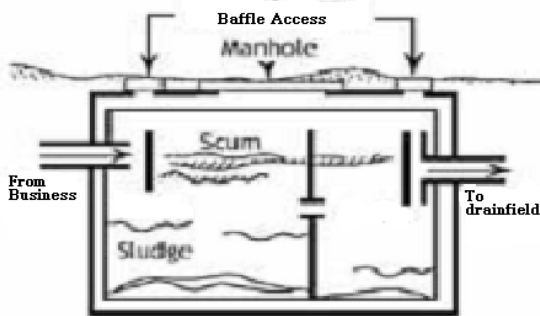
EPA. In broad terms, this means commercial systems are subject to more stringent oversight than residential systems--out of heightened concern for contamination of groundwater by various types of Class V wells and shallow disposal systems. Of particular concern are systems receiving wastewater from industries and automotive service stations.

Tank Pumping Frequency

As with residential systems, regular, scheduled pumping of the septic tank is arguably the most essential element of large capacity septic system maintenance. The key difference lies in the frequency of pumping: commercial septic tanks typically require (much) more frequent pumping than their residential counterparts. There are several reasons for this:

- Faster rate of wastewater flow, resulting in greater likelihood of solids carry-over to drainfield
- Greater strength of wastewater (higher "organic load," that is, higher concentrations of solids and fats, oils and grease), resulting in faster accumulation of solids in septic tank
- Presence of higher strength cleaners and other chemicals not normally found in household wastewater, potentially resulting in harm to bacteria that breakdown wastewater in the septic tank
- Varied and changeable group of system users (employees and customers), resulting in somewhat lessened ability to control/enforce good maintenance practices (as compared to household)

How frequently you will need to have your particular tank pumped depends on a number of factors, including:



- Type and size of your establishment
- Size of your septic tank
- Volume and rate of wastewater flows
- Amount of organic matter (e.g., waste solids, food scraps, fats/oils/grease) in your establishment's wastewater

The first two factors are essentially fixed. If, however, your septic tank is undersized, you may need to replace it with a larger tank to improve the quality of wastewater treatment. The second two factors can be significantly influenced by your operational practices.

Here are some things you can do to avoid overstressing your septic system over the long term and using pumping (which will always be necessary, whatever your maintenance habits) as a substitute for good operational basics:

- *In restrooms:* make sure plumbing fixtures don't leak; install automatic shut-off faucets;
- *In kitchens:* divert kitchen wastewater to grease trap; scrape plates into the garbage, not the sink; install drain covers and sink baskets/strainers to prevent solids (food scraps, fats, oils and grease) from entering your system; avoid use of garbage disposal; use water-saving dishwasher cycle; use mild detergents, not harsh industrial cleaners; use paper towels rather than rags to mop up grease from counters, grills, etc.
- *In laundry facilities:* avoid use of harsh detergents; space out laundry over the course of the week rather than doing establishment's washing all at once

An inspection of your septic system by a licensed septic inspector (which should be an annual event) can help you determine the pumping frequency your tank requires. You should schedule pumpings with a licensed pumper based on your required frequency (e.g., every three months, twice a year). This same pumper can also pump out your grease trap. Note, however, that grease traps will almost always require more frequent pumping than your septic tank to function effectively.

Fats, Oils and Grease

The most serious problem that plagues large capacity septic systems is the carry-over of fats, oils and grease (sometimes referred to as FOG) into the drainfield (leachfield). When carry-over occurs, these materials reduce the absorption capacity of the drainfield and can lead to system overflows (i.e., breakout), at which point, depending on the extent of damage, the drainfield will need to be repaired, extended or even replaced.

The drainfield of a well-designed and maintained system can handle small amounts of FOG, such as natural body oils carried over from a household's shower water. However, drainfields or alternative treatment systems cannot accommodate significant concentrations of FOG, such as that produced by restaurants, bakeries, cafeterias and camps (and even households that are heavy garbage disposal users and regularly pour cooking grease down their drains).

For this reason, many counties and states require the use of grease traps (also called grease interceptors) by restaurants and similar commercial establishments. Grease traps are holding tanks; modified septic tanks that receive kitchen wastewater prior to the passage of that wastewater to the main septic tank. In the grease trap, wastewater is slowed and allowed to cool somewhat, giving fats, oils and grease a chance to settle out before the effluent passes to the septic tank, where further settling occurs. Grease traps generally range in size from one to three times the average daily flow that will be discharged into it. As with the main septic tank, proper sizing of the grease trap is critical to its ability to fulfill its function.

Operation and Maintenance

Good operation and maintenance practices enable the grease trap and septic tank to work effectively in reducing grease and oil. Restaurants and other establishments should:

- Scrape food scraps and congealed fats into the garbage
- Use drain covers and sink baskets and strainers to prevent solids from entering the flow of wastewater
- Eliminate the use of a garbage disposal
- Avoid pouring cooking oil and grease should down the drain
- Not rely on septic system additives that claim to reduce oils and grease. Although these additives do indeed dissolve oils and grease, this only increases the likelihood that these materials will be carried over to the drainfield rather than remaining in the grease trap and septic tank where they can be slowly broken down and pumped out at regular intervals.

Perhaps above all else, the key to the grease trap's effectiveness is regular, frequent pumpings. Depending on the size of the grease trap and the strength and flow of wastewater at a given commercial establishment, required pumping frequency may range from twice per month to once every three or six months. A proper pumping does not just remove the liquid in the grease trap but scours the grease trap and the associated lines to eliminate caked-on substances and oily residue. Pumping should be done by a licensed solid waste hauler who will dispose of grease and oils properly (e.g., in designated landfill areas).

Resources: Where can you get help?

For local assistance, check your phone directory for the following telephone numbers:

- County Environmental Health Department or Sanitarian's Office under *County Government* listings.
- *Septic tanks and Systems Cleaning and pump-and-haul contractors* in the yellow pages.

DEQ can provide information about state and federal requirements for:

- Safe alternatives for industrial chemicals
- Hazardous waste technical assistance
- Pollution prevention and planning
- Drinking water protection planning
- Underground injection control
- Shallow disposal systems
- Air and water quality compliance assistance
- Discharge permits
- Septic or other waste disposal systems
- Underground storage tanks
- Solid waste management and disposal

Call DEQ at (406) 444-6697 for assistance. You can also access DEQ's Internet Page at <http://www.deq.state.mt.us/>. If you would like more information on drinking water protection, please contact DEQ's Source Water Protection Program – Joe Meek 406-444-4806.

Montana State University Extension Service has several publications on septic systems and other topics available (406) 994-3273 or on the Internet at www.montana.edu/publications.

Contact EPA in Denver to learn about federal regulations pertaining to large capacity septic systems by calling (303) 312-6276 or visit EPA on the Internet at <http://www.epa.gov/region8/water/uic/>

The bottom line for a large capacity septic systems is:

- **Have a knowledgeable septic professional determine how frequently your tank and grease trap requires pumping,**
- **Set a maintenance schedule based on that and stick to it!**

Reference: Septic Information and Resources On-Line. Retrieved September 2003 from the World Wide Web: www.Septic-Info.com

Appendix D: Sanitary Survey and System Data (Well Log)

Form No. 603 (R 6-84)

File No. _____

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well.

<p>1. WELL OWNER Name <u>Kiowa Kamp</u></p>	<p>8. WATER LEVEL Static water level <u>12</u> feet below land surface If flowing; closed-in pressure _____ psi _____ gpm Controlled by: _____ valve, _____ reducers, other, (specify) _____</p>																								
<p>2. CURRENT MAILING ADDRESS <u>Junction US 89-49</u> <u>Browning, MT, 59417</u></p>	<p>9. WELL TEST DATA _____ pump _____ bailer <input checked="" type="checkbox"/> other, (specify) <u>Air</u> Pumping water level below land surface: <u>30</u> ft. after <u>1</u> hrs. pumping <u>5-10</u> gpm <u>70</u> ft. after <u>4</u> hrs. pumping <u>10-20</u> gpm</p>																								
<p>3. WELL LOCATION County <u>Glacier</u> Township <u>32 N</u> N/S Range <u>3 W</u> E/W Lot <u>1/4</u> <u>1/4</u> E <u>1/2</u> <u>1/4</u> Section <u>10</u> Block _____ Subdivision _____</p>	<p>10. WAS WELL PLUGGED OR ABANDONED? Yes _____ No <input checked="" type="checkbox"/> If yes, how? _____</p>																								
<p>4. PROPOSED USE Domestic <input type="checkbox"/> Stock <input type="checkbox"/> Irrigation <input type="checkbox"/> Other <input checked="" type="checkbox"/> specify <u>Commercial</u></p>	<p>11. DATE COMPLETED <u>8/16/86</u></p>																								
<p>5. DRILLING METHOD _____ cable, _____ bored, <input checked="" type="checkbox"/> forward rotary, _____ reverse rotary, _____ jetted, other (specify) _____</p>	<p>12. WELL LOG Depth (ft.) From To Formation <u>0</u> <u>35</u> <u>Clay, gravel</u> <u>35</u> <u>47</u> <u>Brown sandstone and water</u> <u>47</u> <u>60</u> <u>Gray shale</u> <u>60</u> <u>80</u> <u>Gray oil shale</u> <u>6" Drive shoe</u></p>																								
<p>6. WELL CONSTRUCTION AND COMPLETION</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Size of drilled hole</th> <th rowspan="2">Size and weight of casing</th> <th rowspan="2">From (feet)</th> <th rowspan="2">To (feet)</th> <th colspan="3">Perforations <input checked="" type="checkbox"/> yes and/or _____</th> </tr> <tr> <th>Screen</th> <th>Kind Size</th> <th>From (feet) To (feet)</th> </tr> </thead> <tbody> <tr> <td>7"</td> <td>6-5/8" .280 wall</td> <td>+2</td> <td>33</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6"</td> <td>Sch 4" PVC</td> <td>20</td> <td>180</td> <td></td> <td>1/2x6"</td> <td>100 125</td> </tr> </tbody> </table> <p>Was casing left open end? <input checked="" type="checkbox"/> Yes _____ No Was a packer or seal used? <input checked="" type="checkbox"/> Yes _____ No If so, what material <u>k-packer and shale trap</u> Was the well gravel packed? _____ Yes <input checked="" type="checkbox"/> No Was the well grouted? <input checked="" type="checkbox"/> Yes _____ No To what depth? <u>20 feet</u> Material used in grouting <u>Cement</u> Well head completion: <u>Pitless adapter</u> _____ Yes _____ No Top of casing 12 in. or greater above grade _____ Yes _____ No</p>	Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations <input checked="" type="checkbox"/> yes and/or _____			Screen	Kind Size	From (feet) To (feet)	7"	6-5/8" .280 wall	+2	33				6"	Sch 4" PVC	20	180		1/2x6"	100 125	<p>13. DRILLER'S CERTIFICATION This well was drilled under my jurisdiction and this report is true to the best of my knowledge. <u>8/20/86</u> Date <u>Billmeyer's Water Supply</u> Firm Name <u>115 Kelly Road</u> <u>Kalispell, MT, 59901</u> Address _____ 365 Signature _____ License No. _____</p>
Size of drilled hole					Size and weight of casing	From (feet)	To (feet)	Perforations <input checked="" type="checkbox"/> yes and/or _____																	
	Screen	Kind Size	From (feet) To (feet)																						
7"	6-5/8" .280 wall	+2	33																						
6"	Sch 4" PVC	20	180		1/2x6"	100 125																			
<p>7. WHAT IS THE TEMPERATURE OF THE WATER? _____ Degrees Fahrenheit <input type="checkbox"/> Measured <input type="checkbox"/> Estimated</p>																									

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Appendix E: Concurrence Letter