Teton Pass Ski Area, Inc.
Source Water Delineation and Assessment Report

Public Water Supply: **Teton Pass Ski Area, Inc. (PWSID #MT0002076)**
Report Date: **July 12, 2004**
Contact Person: **Bob McCarthy**
Teton Pass Ski Area
HC 58 P.O.Box 34A
Choteau, MT 59422
(406) 278-7855

Introduction

This delineation and assessment report is intended to meet the technical requirements of the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). Julie Harvey, Hydrogeologist with the Montana Department of Environmental Quality (DEQ) prepared the final report with assistance from intern Bethany Haines. Information on land use and potential contaminant sources comes from a variety of sources including a preliminary land cover data layer produced by the United States Geological Survey (USGS), DEQ Public Water Supply files (including sanitary surveys), and other public sources of information. A web-based GIS application was also used to query and generate maps to support writing this report. This application is called the Source Water Protection Program Query System and is available at the following web address or URL: http://nris.state.mt.us/wis/swap/swapquery.asp. The application was developed by the DEQ Source Water Protection Program (SWPP) and provides access to data from the U.S. EPA, DEQ, Montana Bureau of Mines and Geology (MBMG) and other sources.

Purpose

The purpose of this delineation and assessment report is to assess threats to the Teton Pass Ski Area public water supply using information obtained from personnel managing the site, the most recent sanitary survey, which was completed in September 2002 by Scott Anderson of Anderson-Montgomery, which is a subcontractor to the Cadmus Group, and from published reports. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water are identified on a map. These areas are referred to as source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Public Water Supply Information

Teton Pass Ski Area is a ski hill, which includes a lodge that provides food service, restrooms, and a bar. The lodge, which is, located about 27 miles west of Choteau in

Teton County (Figure 1). Well #1 is located west of the lodge and is currently unused (Appendix A). A second well (Well #2) is also west of the lodge. A third well (Well #3) is located north of the lodge. All of the wells are pumped into a common header in the basement of the lodge (Appendix A). At the time of the sanitary survey, only Well #2 and Well #3 were used by the water system The system serves a transient population of 100 people per day in the winter through one active service connection. 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 1000 gallons per day depending on the season, assuming water use is 10 gallons per day per patron (EPA, 1991).

Three well logs for "East Slope Recreation Ltd." were identified in the MBMG Groundwater Information Center database for the public water supply. All of the wells were completed in 1993 and the well logs are provided in Appendix B. The information provided on GWIC#137222 matches the information in the sanitary survey for Well #2. The well logs for GWIC# 139915 and #139916 are likely for Wells #1 and #3 and indicate these wells were drilled to depths of 67 and 108 feet below ground surface (bgs).

GWIC# 139915 (Well #1 or #3) is completed with 4.5-inch PVC casing and has a screened interval from 47 to 67 feet in fractured or broken rock and water. The static water level was 38 feet at the time of drilling. GWIC #139916 (Well #1 or #3) is also completed with 4.5-inch PVC and has a screened interval of 88 to 108 feet in "rock". The static water level was 25 feet at the time of drilling. Both of the wells have a bentonite annular seal to a depth of 18 feet below surface. These two wells are likely completed in shallow fractured bedrock, which is interpreted to be semi-confined to unconfined. This type of aquifer has a high sensitivity to potential contamination sources at the land surface (MT. DEQ, 1999).

The well log for Well #2 (GWIC #137222, Appendix B) describes a well drilled to 466 feet below ground surface (bgs) with a static water level at 90 feet bgs. Well yield for this well is 14 gallons per minute with 166 feet of draw down. The lithology for this well includes a 5 feet layer of brown dirt and gravel, 7 feet of brown clay and boulder underlain by "rock", shale, and sandstone. Water was encountered in the well between 60 and 85 feet bgs and again between 410 and 446 feet bgs. The well is screened between 440 and 460 feet bgs in "black and brown rock". The lithology and static water level in this well suggests the aquifer is confined. Deep fractured bedrock aquifers have a low sensitivity to potential contamination sources at the land surface (MT. DEQ, 1999).

Each of the wells has a 1-horsepower submersible pump that moves water into a common header located at the lodge. The water from the wells is then pumped directly into two 50-gallon air pressure control tanks, then on to the distribution system. The water is currently not treated prior to distribution.

The 2002 sanitary survey for the ski hill made six recommendations for the water system. Several of these recommendations have been implemented and the remaining ones are in process by the water system (personal communication with Jonathan Stokes, PWS,

8/4/04). Recommendation #1 to fix Well #2's broken conduit line to prevent foreign materials from entering the wellhead has been completed. Recommendation #2 was to Secondly, the sanitary survey recommended the yard hydrant adjacent to Well #3 be located at least 20 feet from the wellhead so that contaminated water is not introduced into the top of the well casing. The PWS stated that the yard hydrant is only operated in the presence of staff (since it also requires the operation of a generator) and that they are planning on adding a backflow prevention device. The third recommendation to keep the small room where the pressure tanks are located clean, to keep protective covers in place, and to regularly change the small sediment filter has been implemented. Finally it was recommended that file background data such as well logs, pump data, etc. be collected if possible.

Teton Pass Ski Area is required to test for microbiological contaminants and nitrate. The ski hill's monitoring data indicates there have been no confirmed coliform bacteria detections in the past five years. The highest level of nitrate detected in the well in the last five years is 0.30 mg/L in 2002, 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 Teton Pass Ski Area. They include 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 can occur. The inventory region encompasses the area from which water or contaminants can flow into the ski area'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 the Teton Pass Ski Area provides a site map for the water system (Appendix A). No potential sources of contamination were identified in the control zone. The on-site septic system and drainfield are both located outside of the 100-foot control zone (personal communication with Jonathan Stokes, PWS, 8/4/04).

Analysis of the area surrounding Teton Pass Ski Area reveals that the predominant land covers are primarily mixed forest, grassland/shrubland, and bare rock/sand/clay see Figure 2 for a summarization of this data. The percentage of these land use areas are not considered threats to the water supply.

Low septic density land makes up 100% of the inventory region. This region is not a significant threat to the aquifer. However, the ski hill's on-site septic system and

drainfield are located within the inventory region and could present a threat to the aquifer. However, the septic tank and drainfield are located topographically down gradient of the wells and are also likely hydraulically down gradient.

Susceptibility Assessment

Natural conditions, engineered structures, or management actions can be considered as barriers that would lower the susceptibility to contamination within the inventory region. The depth of Well #2 serves as a barrier for this well and the down gradient location of the septic system and drainfield serves as a barrier.

The Teton Pass Ski Area water system has low susceptibility to nitrate and bacterial contaminants from surrounding land uses (i.e. grasslands and forests).

The ski hill's own drain field poses the greatest threat to the well and is considered to represent a high hazard (Montana DEQ, 2000, Table 6b) for Well #1 and #3 since it is a point source within the inventory region and the aquifer for these wells is confined. The down gradient location is a barrier so the susceptibility to the drain field is classified as moderate (Montana DEQ, 2000, Table 5). The drainfield poses a low hazard to Well #2 since the aquifer for Well #2 is confined and the well and surrounding wells are adequately sealed (grouted).

Management Options

Options for managing potential contamination from individual septic systems include ensuring proper operation and maintenance of septic tanks, distribution lines, and drainfield. 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
Ski Hill's On-Site Septic Tank(s) (Location(s) unknown)	Pathogens, nitrate	High for Well #1 and #3 Low for Well #2	Septic tank and drainfield are down-gradient of Well #1, #2, and #3. Aquifer depth >100 feet below ground surface (bgs) serves as a barrier for Well #2	Moderate for Well #1 and #3. Very Low for Well #2	Properly operate and maintain on-site septic tank, drainfield and distribution lines (see attached Fact Sheet – Appendix E).

References:

DEQ Permitting and Compliance Division, 2002. Sanitary Survey for Teton Pass Ski Area, PWS- PWS ID: #MT0002076.

Montana Bureau of Mines and Geology, 1982. Occurrence and Characteristics of Ground Water In Montana, Volume 1, pp 68-73.

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

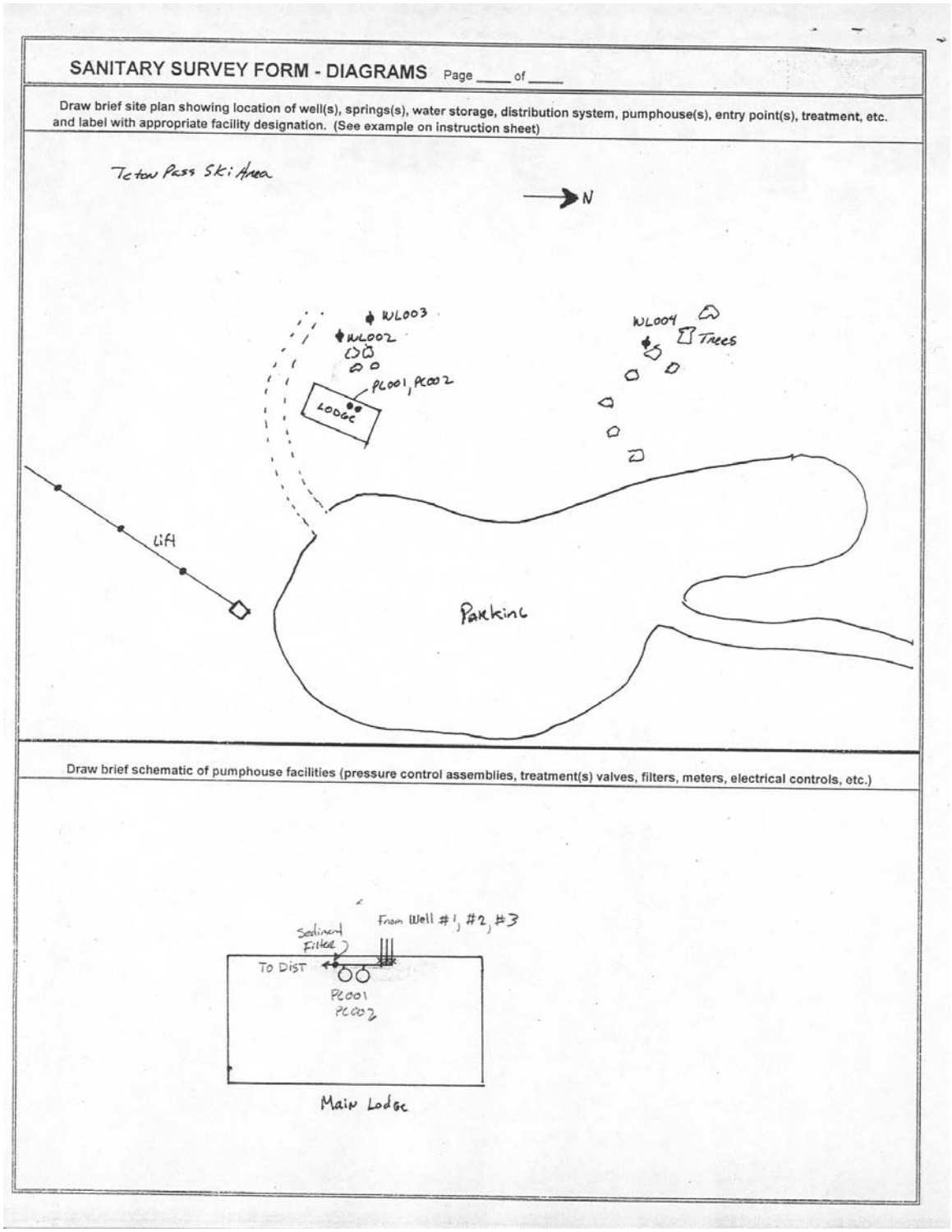
Montana DEQ, 2000. Montana Source Water Protection Program, Template for Non-Community Transient Public Water Supplies, Revised 2002.

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.

Appendix A: Site map of Teton Pass Ski Area



*Drawing by Scott Anderson, PE. Taken from 2002 sanitary survey of Teton Pass Ski Area.

Appendix B: Domestic Well Log (Well #2)

Montana Bureau of Mines and Geology [Plot this site on a topographic map]
Ground-Water Information Center Site Report
EAST SLOPE RECREATION LTD

Location Information

GWIC Id:	137222	Source of Data:	LOG
Location (TRS):	25N 09W 07 D	Latitude (dd):	47.9336
County (MT):	TETON	Longitude (dd):	-112.8046
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	466.00	How Drilled:	ROTARY
Static Water Level (ft):	90.00	Driller's Name:	BILLMAYER
Pumping Water Level (ft):	300.00	Driller License:	WWC335
Yield (gpm):	14.00	Completion Date (m/d/y):	8/11/1993
Test Type:	PUMP	Special Conditions:	
Test Duration:	4.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):	90.00	Geology/Aquifer:	Not Reported
Recovery Time (hrs):	1.00	Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	20.0	10.0
20.0	52.0	7.0
52.0	466.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	52.0	6.0	0.250			STEEL
180.0	460.0	4.5				PVC

Annular Seal Information

From	To	Description
0.0	20.0	BENTONITE

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
440.0	460.0	4.5			1/8X2IN FACTORY PERF

Lithology Information

From	To	Description
0.0	5.0	BROWN DIRT AND GRAVEL
5.0	13.0	BOULDER AND BROWN CLAY
13.0	52.0	LIGHT TAN ROCK
52.0	60.0	DARK GRAY ROCK
60.0	86.0	LIGHT GRAY FRACTURED ROCK AND WATER 2.5 GPM
86.0	300.0	DARK GRAY ROCK
300.0	370.0	GREEN ROCK
370.0	410.0	BLACK AND BROWN SHALE
410.0	446.0	LIGHT GRAY ROCK SANDSTONE WATER
446.0	466.0	BLACK AND BROWN ROCK

[1] - All diameters reported are **inside** diameter of the casing.

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted. Note: non-reported casing, completion, and lithologic records may exist in paper files at GWIC.

Appendix B: Domestic Well Log

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
EAST SLOPE RECREATION LTD.

Plot this site on a topographic map

Location Information

GWIC Id:	139915	Source of Data:	LOG
Location (TRS):	25N 09W 07 D	Latitude (dd):	47.9336
County (MT):	TETON	Longitude (dd):	-112.8046
DNRC Water Right:	C086806-00	Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	67.00	How Drilled:	ROTARY
Static Water Level (ft):	38.00	Driller's Name:	BILLMAYER
Pumping Water Level (ft):	60.00	Driller License:	WWC047
Yield (gpm):	8.00	Completion Date (m/d/y):	9/26/1993
Test Type:	PUMP	Special Conditions:	
Test Duration:	6.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):	40.00	Geology/Aquifer:	Not Reported
Recovery Time (hrs):	0.50	Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	18.0	10.0
18.0	67.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	48.0	6.0	0.250			STEEL
27.0	67.0	4.5				PVC

Annular Seal Information

From	To	Description
0.0	18.0	BENTONITE

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
47.0	67.0	4.5			FACTORY PVC PERFS

Lithology Information

From	To	Description
0.0	3.0	DIRT AND GRAVEL
3.0	18.0	BROWN CLAY AND GRAVEL
18.0	45.0	GREEN BROKEN ROCK AND CLAY
45.0	50.0	LIGHT TAN BROKEN ROCK
50.0	65.0	FRACTURED LIGHT GRAY ROCK AND WATER
65.0	67.0	DARK GRAY ROCK

[1] - All diameters reported are **inside** diameter of the casing.

Plot this site on a topographic map

Appendix B: Domestic Well Log
Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report

EAST SLOPE RECREATION LTD.

Location Information

GWIC Id:	139916	Source of Data:	LOG
Location (TRS):	25N 09W 07 D	Latitude (dd):	47.9336
County (MT):	TETON	Longitude (dd):	-112.8046
DNRC Water Right:	C086806-00	Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	108.00	How Drilled:	ROTARY
Static Water Level (ft):	25.00	Driller's Name:	BILLMAYER
Pumping Water Level (ft):		Driller License:	WWC047
Yield (gpm):	2.50	Completion Date (m/d/y):	9/24/1993
Test Type:	AIR	Special Conditions:	
Test Duration:	2.00	Is Well Flowing?:	
Drill Stem Setting (ft):	100.00	Shut-In Pressure:	
Recovery Water Level (ft):	25.00	Geology/Aquifer:	Not Reported
Recovery Time (hrs):	0.25	Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	18.0	10.0
18.0	108.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	48.0	6.0	0.250			STEEL
28.0	108.0	4.5				PVC

Annular Seal Information

From	To	Description
0.0	18.0	BENTONITE

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
88.0	108.0	4.5			FACTORY PVC PERFS

Lithology Information

From	To	Description
0.0	5.0	BROWN DIRT AND BOULDERS
5.0	15.0	BROWN CLAY AND BOULDERS
15.0	47.0	LIGHT TAN ROCK
47.0	88.0	LIGHT GRAY FRACTURED ROCK AND WATER 2.5 GPM
88.0	108.0	DARK BLUE GRAY ROCK

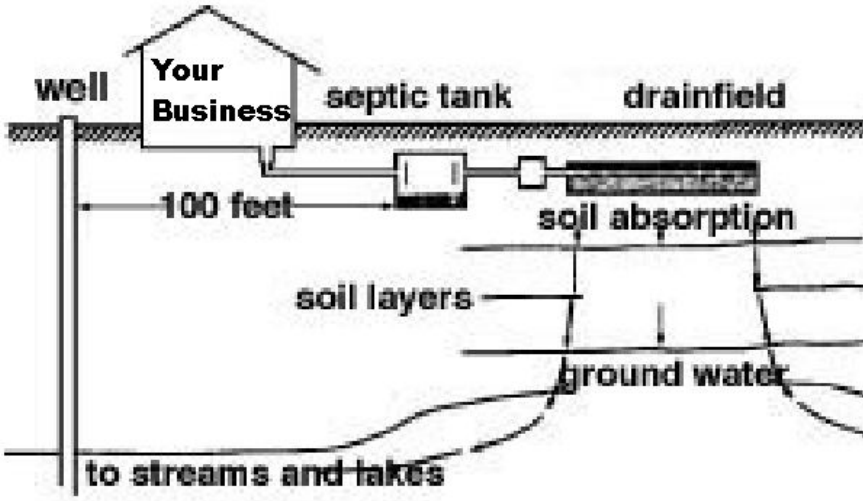
[1] - All diameters reported are **inside** diameter of the casing.

Appendix C: Concurrence Letter

Large Capacity Septic System Operation and Maintenance

FACT SHEET SWP-105 **September 2003**

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.



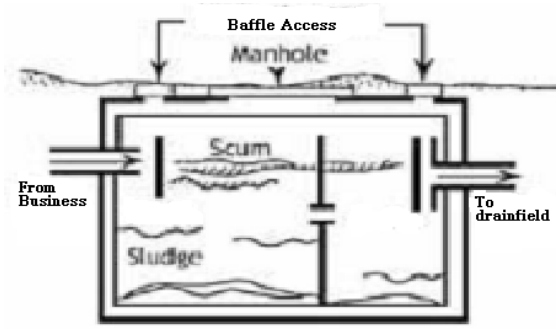
Large capacity septic systems fall under the EPA designation of "Class V Injection Wells" and are regulated by Underground Injection Control (UIC) programs set up by the EPA. In broad terms, this means commercial systems are subject to more stringent oversight than residential systems--out of heightened 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