STATEMENT OF BASIS
FOR
UNDERGROUND INJECTION CONTROL
CLASS V Draft Permit NUMBER: CO50924-04915

Colorado Division of Wildlife
Foothills Wildlife Health Laboratory
4330 La Porte Avenue
Fort Collins, Colorado 80521

CONTACT: Valois Shea
U. S. Environmental Protection Agency
Region 8, 8P-W-GW
999 18th Street, Suite 300
Denver, Colorado 80202-2466

Telephone: 1-800-227-8917 x6276

I. DESCRIPTION OF FACILITY AND BACKGROUND INFORMATION

On June 22, 2001, the Colorado Division of Wildlife (CDOW) office in Fort Collins, Colorado submitted to the Environmental Protection Agency (EPA) Region 8 office an application for an Underground Injection Control (UIC) permit to dispose of sanitary and laboratory waste fluids into a septic tank/leachfield (septic system) located at the Foothills Wildlife Health Laboratory (WHL), 4330 La Porte Avenue west of Fort Collins, in Larimer County, Colorado. When waste streams other than sanitary waste are disposed of in a septic system, the disposal system is a Class V Shallow Injection Well and is regulated by the UIC program.

The WHL uses the septic system for disposal of an estimated daily volume of up to 140 gallons per day depending on the time of year. The septic system serves an office building containing two laboratory rooms and a necropsy laboratory building. The WHL provides general wildlife health research services to the Terrestrial Section of the CDOW. Most of the work conducted in the WHL necropsy lab is related to ongoing studies of chronic wasting disease (CWD) and other wildlife diseases that are potentially zoonotic in nature. ~~These other diseases include rabies, plague, Tularemia, and West Nile Virus.~~ The WHL performs routine necropsy on any wild animal carcass submitted for necropsy to monitor the health of Colorado's wild animal populations. WHL work is not necessarily limited to zoonotic diseases, and in fact such diseases comprise only a subset of the wildlife health problems that may be studied. While diseases are among the things evaluated during a necropsy, the WHL does not specifically work with tissues that are infected with rabies, plague or tularemia in the laboratory. The WHL does screen various specific submissions for West Nile Virus.

CWD was identified at the Foothills WHL Facility and adjacent university properties more than 30 years ago. During hunting season staff at this laboratory perform necropsies on animal heads submitted by hunters, as part of the State's CWD surveillance program to determine the extent of the disease in Colorado.

CDOW has submitted all required information and data necessary for permit issuance in accordance with the Code of Federal Regulations (40 CFR) §144, §146 and §147, and a Draft Permit has been prepared. This Draft Permit is for the disposal of laboratory waste water, sanitary, and domestic waste into the septic system. The waste fluids are then released into the subsurface above or into underlying aquifers. This Statement of Basis presents the derivation of the site-specific permit conditions and the reasons for them.

Authorization to inject is issued for 10 years from the effective date of this permit (40 CFR §144.36) unless the permit is terminated (Part III, Section B). The permit will expire upon delegation of primary enforcement responsibility for the UIC Program to the State of Colorado. The permit may also be terminated for reasonable cause (40 CFR §144.40).

II. CHRONIC WASTING DISEASE

CWD belongs to the transmissible spongiform encephalopathy (TSE) family of diseases. CWD naturally affects mule deer ~~(*Odocoileus hemionus*)~~, white-tailed deer ~~(*Odocoileus virginianus*)~~, ~~and Rocky Mountain~~ elk ~~(*Cervus elaphus nelsoni*)~~ and moose in the United States and Canada (O'Rourke et al. 1999; Sigurdson et al. 1999). ~~CWD has not been found to date in humans (CDC 2003) and o~~Other animal species are not known to be naturally susceptible to CWD (Williams and Miller 2002), and there are no documented cases of CWD transmission to humans (Belay et al. 2004). The fate and transport of the CWD agent in the environment are poorly understood, although it may survive in the environment for extended periods of time (Miller et al. 2004)~~; Brown and Gajdusek 1991; Palsson 1979)~~. ~~In addition, it appears~~ It is believed that that CWD can be transmitted among deer and elk either through direct contact or indirectly through environmental contamination (Miller et al. 2004; Williams and Miller 2002; Miller et al. 1998).

CWD is the only TSE targeted for surveillance at Foothills WHL; therefore, CWD prions are the only TSE prions addressed in this document. However, the scientific literature focusing specifically on CWD is somewhat limited. For that reason, the Statement of Basis may include experimental information from other TSE diseases as the basis of general conclusions about the biology of the CWD agent. Many of the same scientific concerns and uncertainties associated with CWD-contaminated wastes are relevant to waste that may be contaminated with other TSE agents. No implication of unique risk from CWD should be drawn from this document.

Although the focus of this document is confined to CWD, EPA Region 8 recognizes that other animal TSE agents (e.g., scrapie) may occur in animal wastes and tissues that are handled by laboratories. Many of the same scientific concerns and uncertainties associated with CWD-contaminated wastes are relevant to waste that may be contaminated with these other animal TSE agents. EPA and several other Federal agencies are considering these scientific issues through coordinated efforts.

Within EPA Region 8, CWD has been found in free ranging deer and elk in Colorado, ~~Montana~~, Wyoming, South Dakota, and Utah. Animal testing laboratories, such as the WHL, are important in ensuring that infected carcasses are identified so that the disease can be accurately mapped by state and Federal agencies. To minimize the potential for more widespread distribution and re-circulation of CWD agents in the environment, EPA Region 8 recommends that laboratories implement reasonable, protective Best Management Practices (BMPs). EPA Region 8 recognizes and supports the need for the surveillance and testing programs and related research. Our intent is to help reduce environmental risks from potentially CWD-contaminated wastes associated with laboratory testing and thereby support the continuation and expansion of these programs, as necessary. Potentially CWD-contaminated wastes are waste materials derived from deer or elk from herds or areas where CWD is known to occur.

III. PERMIT REQUIREMENTS

The Underground Injection Control (UIC) Program, created under the authority of the Safe Drinking Water Act (SDWA), is a preventive program tasked with protecting existing and future underground sources of drinking water (USDWs). Shallow disposal systems that discharge certain types of fluids into the subsurface are 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 §144.3). Class V wells that have the potential to contaminate or degrade ground water 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.

A. Contaminants of Concern

1. ***Potentially CWD-contaminated wastes*****.** Researchers ~~think~~ believe that CWD and other TSEs are caused by ~~protein-based infectious particles, or~~ prions[1]: self-propagating, protein-based particles lacking genetic material (Prusiner 1982, Prusiner 1993, Aguzzi and Weissman 1997; Prusiner 1997). ~~Potentially CWD-contaminated wastes may contain prions. Unlike bacteria and viruses, prions do not contain genetic material. Prions cause the normal cellular PrP protein to convert to the abnormal or prion form. Prions are mainly found in the brain, central nervous system and lymph nodes of infected animals. They are also found in the eyes, tonsils, pancreas, spleen, and adrenal gland. In experimental studies with mice, prions have been observed in muscle tissue, and evidence from laboratory studies indicates that they can be found in blood. Prions are very resistant to inactivation and can survive for extended periods of time in the environment. No analytical tests are available for measuring prion concentrations in water or soil.~~ In deer, the CWD agent has been found in the brain, spinal cord and peripheral nervous tissue, retina, lymph tissue, pancreas, adrenal gland, and pituitary gland (Sigurdson et al. 2001). Laboratory waste material, derived from 1) operations processing deer or elk from herds or areas where CWD is known to occur or 2) research involving infected or exposed animals, is considered potentially contaminated.

It is not known whether the CWD agent in present in blood. Research indicates that some TSE agents can be present in blood. Blood transfusions from sheep experimentally

[1] Prions are abnormal, disease-causing forms of normal proteins that are naturally produced in mammalian cells. The normal form of the protein is referred to as PrPC (Prion Protein Cellular) or PrPSen (Prion Protein Sensitive). The abnormal, disease-causing forms occur when the normal cellular protein (PrPC) becomes folded in an abnormal way, resulting in resistance to normal cellular breakdown processes. The abnormal form is referred to as PrPRes (Prion Protein Resistant). By definition, a prion is "a small proteinaceous infectious particle which resists deactivation by procedures that modify nucleic acids," and, therefore, throughout the context of this document, the term prion will refer to the abnormal, disease-causing form only.

infected with scrapie or BSE to disease-free sheep demonstrated the possibility of transmission by the intravenous route (Houston et al. 2000; Hunter et al. 2002). Leukocytes from primates experimentally infected with BSE or GSS have been shown to be capable of transmitting disease to other primates (Bons et al. 2002; Cervenakova and Brown 2004). Two instances of transmission of vCJD in humans via transfusion of red blood cells have been reported (one case was manifested clinically and the second was identifed at autopsy following death from an unrelated cause (Llewelyn et al. 2004; Peden et al. 2004). It is generally believed that the amount of TSE agent in blood is far lower than the amount found in nervous tissue and other lymphatic tissue. Data from studies of experimental TSE infections in rodents indicate low levels of infectivity in the blood (Brown et al. 1998, 1999; Taylor et al. 2000; Brown et al. 2001).

The existing bioassay for prions is not suited for use with waste fluids or sludge, therefore, there is currently no direct chemical method to determine the presence or concentration of prions in waste fluids or septic tank sludge. For this reason, the [2005] UIC permit requires that the laboratory use Best Management Practices (BMPs) designed to minimize the release of prions into the septic system. The WHL currently has BMPs in place for handling and disposing of potentially CWD-contaminated tissues and fluids that minimize the potential for untreated prions to enter the septic system. The decontamination procedures included in these BMPs have been evaluated by EPA scientists. Based on review of research literature and collaboration with the Regional CWD senior policy council and workgroups, and the American Association of Veterinary Laboratory Diagnosticians, EPA considers these decontamination procedures to be effective in inactivating prions before they are washed into the septic system.

2. *Chemical contaminants:* The only 2 chemical components of the laboratory waste stream currently identified that have a health advisory limit are formaldehyde and phenol. Initial analysis of the waste stream will reveal any other chemical contaminants of concern that may be present in the waste stream. Permit limits have been established for any regulated contaminant under the SDWA and for any contaminant for which a Lifetime Health Advisory value has been assigned. Currently, used formaldehyde is collected and recycled on site. Any waste formaldehyde is collected on site and disposed of using approved methods and will not be placed in any conduit leading to the septic system.

Another concern is the effect on the septic system of the prion-inactivating agent and germicides that are used during the decontamination process in the lab. In sufficient concentrations, these constituents can also kill septic system microbes. Without a viable population of microbes present in the septic system, it is ineffective for treating the sanitary waste component of the waste stream. The continued use of the septic system for disposal of laboratory waste will be permitted as long as the septic system is verified to be operating properly.

The permit requires the collection and analysis of representative samples of waste fluids quarterly (every 3 months). To demonstrate compliance with permit conditions, analytical results of the fluid samples must verify that the concentrations of all constituents being analyzed are below the values established by permit conditions. The permit conditions have been established using maximum contaminant levels (MCLs) for drinking water, Region 8 limits, or health advisories to prevent contamination of underground sources of drinking water. These constituents are included in Appendix A of this document.

3. *Spills*. All accidental spills of constituents not authorized for disposal into the septic system, including formaldehyde, untreated animal tissues, and undiluted prion-inactivating agents, will be cleaned up with an appropriate absorbent material and disposed of in a manner compliant with Federal, State, and local regulations and requirements, preventing unauthorized contaminants from reaching the septic system.

B. Best Management Practices

The CDOW has developed BMPs that are designed to minimize the release of untreated potentially CWD-contaminated wastes into the environment by specifying decontamination requirements and collection and disposal procedures for solid and fluid wastes. These BMPs that relate to disposal into the septic system will be included in the permit and must be followed by laboratory personnel in order for the facility to be in compliance with the permit.

1. *Prion inactivation requirements*. The BMPs require treatment for prion inactivation of all lab surfaces, non-disposable instruments and equipment. Surfaces that must be treated include:

- necropsy tables
- floor (including the walk-in cooler and freezer)
- walls (including the walk-in cooler and freezer)
- shelves
- carts and plastic bins
- cement dropoff pad and walkway
- trailers and truck beds
- surfaces where spills have occurred

- biosafety cabinets
- countertops
- refrigerator
- freezers
- drain mesh, and
- trench drain

A 5% solution of Environ® LpH (LpH), when used on laboratory surfaces, instruments and equipment has been proven effective for inactivation of prions (Ernst and Race 1993, Fichet et al 2004). The LpH must remain wet on the surface being decontaminated for at least 30 minutes. If the surface dries before the 30 minute contact time, then additional solution must be reapplied. After 30 minutes, the LpH may be rinsed with large volumes of water to dilute it before going into the septic system.

If the permittee is able to provide documentation that other products are effective for the inactivation of prions, then the Director may authorize the use of these products as a minor modification of the permit. However, these other products must be used according to labeling directions and precautions or specific terms and conditions of an emergency exemption granted by EPA under the Federal Insecticide, Fungicide and Rodenticide Act and in a manner consistent with other requirements of this permit.

2. *Solid and fluid wastes*. The WHL BMPs specify methods for collecting and disposing of solid and liquid waste material that may contain prions. Collection procedures include the use of mesh over floor and sink drains to capture small pieces of tissue to prevent entry into septic system and the use of absorbent mats on the table tops in the laboratories to capture fluids released during sample extraction procedures.

a. Solid Waste Disposal Methods

i. The Colorado State University Digester

- The digester completely breaks down and inactivates all organic material into liquid using highly alkaline chemicals (including NaOH) with heat under high pressure.
- The liquid is evaporated, leaving a low-volume, non-infectious powder.

ii. Landfills for the following wastes:

- Carcass parts and tissues of animals not suspected of infectious or zoonotic disease,
- General waste from the necropsy lab including used gloves and aprons, plastic bags, paper towels, cardboard boxes, lab matting, drain collection, tissue fragments less than 1 gram, and plastic booties.

b. Solid Waste Disposal

- Carcass parts, and tissues from animals suspected of disease go to the digester.
- Sharps from all three labs go into sharps containers which are treated with 5% LpH for 30 minutes, drained, permanently sealed, autoclaved, sealed in a cardboard box clearly marked as 'decontaminated sharps" and sent to the landfill.
- Biohazard bags are autoclaved and sealed in a cardboard box. Cardboard boxes are disposed of via landfill.
- Any protective clothing that has been subject to spillage and paper towels that have been used to soak up infectious or zoonotic spills are placed in biohazard bags, autoclaved and sealed in a cardboard box. Cardboard boxes are disposed of via landfill.
- Lab waste from the Molecular Biology lab, including gloves, paper towels, lab matting, and disposable instruments or equipment must be placed in a biohazard bag, autoclaved and sealed in a cardboard box, which is disposed of via landfill.
- Lab waste from the DNA/PCR lab is placed into biohazard bag, autoclaved and sealed in a cardboard box, which is disposed of via landfill.

c. Fluid Waste Disposal

In the Molecular Biology Lab, waste fluids that are collected must be decontaminated to inactivate any prions before disposal into the septic system.

In the DNA/PCR lab, all containers holding biological fluids (blood, urine, etc.) must be placed in a biohazard waste container to be autoclaved. CWD-contaminated fluids must be treated the same as those in the Molecular Biology Lab. Non-biological fluids may be poured down the sink with running water.

IV. SAMPLING AND REPORTING OF RESULTS

A. Shallow Injection Well Sampling Program

Quarterly (every 3 months) the permittee is required to collect waste fluid samples at a point prior to the waste fluid entering the leachfield and at a point below the leachfield at the WHL facility. The sampling techniques utilized must be adequate to provide a representative sample of the waste stream and allow the fluid sample to be analyzed using EPA approved methods. The constituents analyzed as conditions of this permit are based on chemicals of concern used at the facility that could potentially be components of the waste stream. If there is a change in chemicals used at the facility, the Director, at his discretion, may add additional analytes to the list of constituents for which analyses are required as conditions of this permit. Appendix A shows the list of analytes with permit limits.

1. ***Total Metals*****.** A fluid sampled collected from the septic tank will be analyzed for total metals for each metal listed in Appendix A. If analytical results from the first 2 years of monitoring

indicate that a metal is not detectible in the waste stream, then that metal may be removed from the list of analytes at the discretion of the UIC Director by minor modification of the permit.

2. ***Volatile Organic Compounds*****.** Formaldehyde does not have an established MCL, but has a lifetime health advisory of 1 mg/l. This value will be used as the permit limit for formaldehyde concentration in the waste stream entering the septic system. A fluid sample collected from the septic tank will be analyzed to determine the concentration of Volatile Organic Compounds in the waste stream.

3. ***Semivolatile Organic Compounds.*** A fluid sample collected from the septic tank will be analyzed to determine the concentration of Semi-Volatile Organic Compounds in the waste stream. If analytical results from the first 2 years of monitoring indicate that no regulated semi-volatile compounds are detectible in the waste stream, then this analysis may be removed from the monitoring requirements under the permit by minor modification of the permit at the discretion of the UIC Director.

4. ***Biological Oxygen Demand Analyses*****.** Septic systems treat sanitary waste in the septic tank and by filtration of waste fluids from the leachfield through a microbial mat that resides at the base of the leachfield. In the septic tank , physical separation of liquid from solids occurs and the build-up of solids is offset somewhat by microorganisms that reside in the tank. The waste fluids then move out of the tank into the leachfield, which is a series of perforated pipes lying horizontally and buried under the ground. Fluids flow slowly from the leachfield and percolate downward through the microbial mat, which provides the final phase of treatment. If the microbes in the septic system are killed by disinfectants entering the septic system, then sanitary waste is not properly treated. Biological Oxygen Demand (BOD) is an indicator that the microbes are alive and functioning to effectively treat sanitary waste. To verify proper functioning of the septic system, two separate samples must be collected and analyzed to determine the BOD:

- a fluid sample collected from the septic tank
- a fluid sample collected 2 feet below the leachfield.

For the purposes of determining compliance with the permit condition that the septic system be fully functional with respect to viable microbial activity, the sample collected below the leachfield should demonstrate a BOD concentration of 20mg/L or less or a reduction in BOD by at least 90%.

All samples will be sent to a laboratory that uses EPA approved methods for analyses. The analyzing laboratory will provide a written report of all the results including quality control procedures employed during the handling and analyses of the samples. Whenever there will be a change in chemical components that could be part of the fluid waste stream, EPA must be notified in advance. Then, within 30 calendar days of any change, another fluid sample must be

collected from the septic tank, analyzed for the constituents of concern, and the results submitted to the Director.

B. Reporting of Results

The permittee shall submit the analytical results to EPA at 3 month intervals. The first set of samples from the septic tank must be collected **no later than 30 calendar days after the Final Permit is effective**[2]. **In order to allow time for construction of the subsurface sample collection structure beneath the leachfield, sampling from below the leachfield must be done not later that 90 calendar days after the Final Permit is effective.** The first report of the analytical results will be sent to the Director no later than 4 weeks after the sample has been collected, with the subsequent reports due no later than January 1, April 1, July 1, and October 1 of each year. If sampling results show no violation of permit limits after 1 year of sampling, the frequency sampling and reporting of results may be changed, at the discretion of the UIC Director as a minor modification of this permit.

V. AREA HYDROLOGY

A. Underground Sources of Drinking Water (USDWs)

Underground Sources of Drinking Water (USDWs) are defined by the UIC Regulations as aquifers, or portions thereof, which contain less than 10,000 milligrams per liter total dissolved solids, and which are being used, or could be used, as a source of drinking water. Two boreholes were drilled at the site to provide geologic information in the area of concern for the construction of the laboratory buildings and the septic system. The leachfield is constructed in silty, clayey sand that extends to a depth of approximately 10 feet below the ground surface. Underlying the 10 feet of unconsolidated material is weathered bedrock of claystone/siltstone. The weathered zone extends to approximately 12.5 feet below the ground surface. No ground water was encountered during the drilling of the boreholes to a depth of about 19.5 feet below the ground surface. The conditions of this permit will contribute to the protection of any underlying underground source of drinking water.

B. Surface Water Features

The Horsetooth Reservoir is located west of the CDOW laboratory facility. Regional flow of ground water is generally east from of Horsetooth Reservoir as shown in Figure 1. The hogback west of the CDOW facility serves as the eastern boundary of Horsetooth Reservoir. From the hogback, the geologic strata dip to the northeast, steeply at the hogback and at a more shallow angle where the CDOW lab is located. Influenced by the dipping strata, the regional

[2] If EPA receives public comments on the Draft Permit, then the effective date of the Final Permit is 30 days after the Final Permit is issued.

flow of groundwater in the area is to the northeast. Locally, at the CDOW lab there are four surface drainages:

1) The nearest surface drainage is the canal that flows north from the Ft. Collins Drinking Water Treatment Plant (FCDWTP) property, through the CDOW animal pens located east of the laboratory building. The topographic map shows the canal as an intermittent drainage beginning about ½ mile to the north of the CDOW property. The canal actually originates at the FCDWTP property. The canal flows north toward, but not into, Claymore Lake, and joins an outflow from Claymore Lake that enters the Pleasant Valley and Lake Canal.
2) The Dixon Canal is located about 0.4 mile to the southwest of the facility. The canal splits off of a drainage from Soldier Creek Dam on the eastern side of Horsetooth Reservoir and flows south.
3) An intermittent drainage splits off the Dixon canal and flows south into College Lake.
4) A drainage is located approximately 0.2 mile due south of the CDOW lab and flows due east for about 3/4 mile and then south to join the Pleasant Valley and Lake Canal.

C. Nearby Wells

Well records from the State Engineer's Office show that there are 27 wells located within one mile of the CDOW lab. Of these wells, 21 are for domestic use, two are used for crop irrigation, three are monitoring wells, and one is designated for other uses. The Fort Collins Drinking Water Treatment Plant has six monitoring wells located up-gradient of the site. Besides these monitoring wells, the nearest well is a crop irrigation well about 3/4 miles away from the lab in an east-southeast direction. The well is located in SW1/4 NE1/4 Section 8 and is completed at a depth of 76 feet. The next closest well is domestic well completed at a depth of 250 feet in NW1/4 SE1/4 Section 8. The remaining wells are about 1 mile or more away. They are all located in NE1/4 NE1/4 Section 8 and are completed at depths of 26, 23 and 24 feet respectively. The CSU physical plant well is completed at a depth of 16 feet and is located in SW1/4 SE1/4 Section 8, about a mile to the southeast of the facility.

D. Drinking Water Treatment Plant

The Fort Collins Drinking Water Treatment Plant is located at 4316 West La Porte Avenue, just south and adjacent to the WHL property. The treatment plant obtains source water from the Horsetooth Reservoir and from the Cache la Poudre River. The raw water from these sources enter the treatment plant through underground pipelines. There are two storage ponds on the treatment plant property which hold water that was used for backwashing of the treatment plant filters. A portion of this water is recovered, treated and used as drinking water.

Because the septic system is located down gradient relative to ground water flow, the discharge from the septic system will not affect either the incoming raw water pipelines or the storage ponds on the treatment plant site. The septic tank is located east of the office building and north of the necropsy laboratory. The leachfield extends eastward from the tank, toward the canal that flows from the treatment plant property. The canal is probably fed by ground water inflow. By the time outfall from the leachfield reaches the canal, it is expected to have no negative impact on ground water or surface water quality in the canal. Water quality will be verified at the sampling location beneath the leachfield.

VI. PLUGGING AND ABANDONMENT

Plugging and Abandonment Plan

As the laboratory is a newly constructed building, CDOW has no plans to close the facility in the foreseeable future, and, therefore, submitted no closure plan for the septic system. In the event that the septic system is closed permanently, the permittee shall plug and abandon the septic system according to the procedures provided in Appendix D of the Final Permit. The permittee may submit an alternative Plugging and Abandonment Plan for EPA review and approval as a modification to the Final Permit. The Plugging and Abandonment method must be approved by EPA prior to the plugging and abandonment the septic system, if a method other than that included in Appendix D of the Final Permit is used. EPA reserves the right to change the manner in which the shallow leachfield will be plugged if it is deemed that the designated closure method is not protective of underground sources of drinking water (USDW).

VII. CITED REFERENCES

AAVLD. Best Management Practices for Handling Suspect Biosafety Level 2 Animal Transmissible Spongiform Encephalopathy (TSE) Diagnostic Samples (Scrapie, Chronic Wasting Disease and Transmissible Mink Encephalopathy) in Animal Health Laboratories http://wyovet.uwyo.edu/WSVL/updates/AAVLD%20BMP%20CWD%20scrapie%20FINAL%2018%20Feb%202004.pdf

Aguzzi A, Weissmann C. (1997) Prion research: the next frontiers. *Nature* 389: 795-798.

Belay et al. (2004) Chronic Wasting Disease and Potential Transmission to Humans. *Emerging Infectious Diseases* 10:977-984.

Bons N, Lehmann S, Mestre-Francès N, Dormont D, Brown P. (2002) Brain and buffy coat transmission of bovine spongiform encephalopathy to the primate Microcebus murinus. *Transfusion* 42:513-516.

Brown P, Rohwer RG, Dunstan BC, MacAuley C, Gajdusek DC, Drohan WN. (1998) The distribution of infectivity in blood components and plasma derivatives in experimental models of transmissible spongiform encepthalopthy. *Transfusion* 38:810-816.

Brown P, Cervenakova L, McShane LM, Barber P, Rubenstein R, Drohan WN. (1999) Further studies of blood infectivity in an experimental model of transmissible spongiform encephalopathy, with an explanation of why blood components do not transmit Creutzfeldt-Jakob disease in humans. *Transfusion* 39:1169-1178.

Brown P, Cervenakova L, Diringer H. (2001) Blood infectivity and the prospects for a diagnostic screening test in Creutzfeldt-Jakob disease. *Journal of Laboratory and Clinical Medicine* 137:5-13.

~~Brown P, Gajdusek DC. (1991) Survival of scrapie virus after 3 years' interment. *Lancet* 337:269-270.~~

~~Centers for Disease Control and Prevention (CDC). (2003) Fatal degenerative neurologic illnesses in men who participated in wild game feasts – Wisconsin 2002. *Morbidity and Mortality Weekly Report* 52:125-127. February 21, 2003~~.

Cervenakova L, Brown P. (2004) Advances in screening test development for transmissible spongiform encephalopathies. *Expert Review of Anti-infective Therapy* 2:873-330.

Ernst DR , Race RE. (1993) Comparative analysis of scrapie agent inactivation methods. *Journal of Virological Methods* 41:193-202.

Fichet G, Comoy E, Duval C, Antloga K, Dehen C, Charbonnier A, McDonnell G, Brown P, Lasmézas C, Deslys J. (2004) Novel methods for disinfection of prion-contaminated medical devices. *The Lancet* 364: 521-526.

Houston F, Foster JD, Chong A, Hunter N, Bostock CJ. (2000) Transmission of BSE by blood transfusion in sheep. *The Lancet* 356:999-1000.

Hunter N, Foster J, Chong A, McCutcheon S, Parnham D, Eaton S, MacKenzie C, Houston F. (2002) Transmission of prion diseases by blood transfusion. Journal of General Virology 83:2897-2905.

Llewelyn CA, Hewitt RE, Knight RSG, Amar K, Cousens S, MacKenzie J, Will RG. (2004) Possible transmission of variant Creutzfeldt-Jakob disease by blood transfusion. *The Lancet* 363:417-421.

Miller MW, Wild MA, Williams ES. (1998) Epidemiology of chronic wasting disease in Rocky Mountain elk. *Journal of Wildlife Diseases* 34:532-538.

Miller MW, Williams ES, Hobbs NT, Wolfe LL. (2004) Environmental sources of prion transmission in mule deer. *Emerging Infectious Diseases* 10:1003–1006.

O'Rourke KI, Besser TE, Miller MW, Cline TF, Spraker TR, Jenny AL, Wild MA, Zebarth GL, Williams ES. (1999) PrP genotypes of captive and free-ranging Rocky Mountain elk (*Cervus elaphus nelsoni*) with chronic wasting disease. *Journal of General Virology* 80:2765-2769.

~~Palsson PA. (1979) Rida (scrapie) in Iceland and its epidemiology. In: Prusiner SB, Hadlow WJ (Eds.) Slow transmissible diseases of the nervous system, Vol. I. Academic Press, New York NY; pp. 357-366~~.

Peden AH, Head MW, Ritchie DL, Bell JE, Ironside JW. (2004) Autopsy detection of preclinical vCJD transmission following blood transfusion from a PRNP codon 129 heterozygote. *The Lancet* 364:527-529.

Prusiner SB. (1982) Novel proteinaceous infectious particles cause scrapie. *Science* 216:136-144.

Prusiner SB. (1993) Genetic and Infectious Prion Diseases. *Archives of Neurology* 30:1129-1153.

Prusiner SB. (1997) Prion diseases and the BSE crisis. *Science*, 278:245-251.

Sigurdson CJ, Williams ES, Miller MW, Spraker TR, O'Rourke KI, Hoover EA. (1999) Oral transmission and early lymphoid tropism of chronic wasting disease PrP^{res} in mule deer fawns (*Odocoileus hemionus*). *Journal of General Virology* 80:2757-2764.

Sigurdson CJ, Spraker TR, Miller MW, Oesch B, Hoover EA. (2001) PrP^{CWD} in the myenteric plexus, vagosympathetic trunk and endocrine glands of deer with chronic wasting disease. *Journal of General Virology* 82:2327-2334.

Taylor, D.M. (2000) Inactivation of Transmissible Degenerative Encephalopathy Agents: A Review. *The Veterinary Journal* 169:10-17.

Williams ES, Miller MW. (2002) Chronic wasting disease in deer and elk in North America. *Review Scientifique et Technique, Office International des Epizooties* 21:305-316.

APPENDIX A

List of Constituents to be Analyzed
with Permit Limits and EPA Testing Methods

Total Metals				
Parameter Name	**Permit Limit (mg/L)**	**Detection Limit(mg/L)**	**Standard Type**	**Analytical Methods**
Antimony	0.006	0.003	MCL	200.8, 200.9
Arsenic	0.01	0.005	MCL	200.7, 200.8, 200.9
Barium	2	1	MCL	200.7, 200.8
Beryllium	0.004	0.002	MCL	200.7, 200.8, 200.9
Boron	1.4	0.7	HA-Lifetime	200.7, 212.3
Cadmium	0.005	0.0025	MCL	200.7, 200.8, 200.9
Chromium(total)	0.1	0.05	MCL	200.7, 200.8, 200.9
Copper	1.3	0.65	MCL-TT	200.7, 200.8, 200.9
Iron	5	2.5	Region 8 Permit Limit	200.7, 200.9
Lead	0.015	0.0075	MCL-TT	200.8, 200.9
Manganese	0.8	0.4	Region 8 Permit Limit	200.7, 200.8, 200.9
Mercury (inorganic)	0.002	0.001	MCL	245.1, 245.2, 200.8
Molybdenum	0.04	0.02	HA-Lifetime	200.7, 246.1, 246.2
Nickel	0.1	0.05	HA-Lifetime	200.7, 200.8, 200.9
Selenium	0.05	0.025	MCL	200.8, 200.9
Silver	0.1	0.05	HA-Lifetime	200.7, 200.8, 200.9
Strontium	4	2	HA-Lifetime	272.1, 272.2, 200.7
Thallium	0.002	0.001	MCL	200.8, 200.9
Zinc	2	1	HA-Lifetime	200.7, 200.8

Volatile Organic Compounds*			
Parameter Name	**CAS No**	**Permit Limit (mg/L)**	**Standard Type**
1,1,1,2-Tetrachloroethane	630-20-6	0.07	HA-Lifetime
1,1,1-Trichloroethane	71-55-6	0.2	MCL
1,1,2,2-Tetrachloroethane	79-34-5	0.0003	HA-Lifetime
1,1,2-Trichloroethane	79-00-5	0.005	MCL
1,1-Dichloroethylene	75-35-4	0.007	MCL
1,2-(cis)Dichloroethylene	156-59-2	0.07	MCL
1,2-(trans)Dichloroethylene	156-60-5	0.1	MCL
1,2,3-Trichloropropane	96-18-4	0.04	HA-Lifetime
1,2,4-Trichlorobenzene	120-82-1	0.07	MCL
1,2-Dibromomethane (Ethylene Dibromide EDB)	106-93-4	0.00005	MCL
1,2-Dichlorobenzene o-	95-50-1	0.6	MCL
1,2-Dichloroethane	107-06-2	0.005	MCL
1,2-Dichloropropane	78-87-5	0.005	MCL
1,3-Dichlorobenzene m-	541-73-1	0.06	HA-Lifetime
1,4-Dichlorobenzene p-	106-46-7	0.075	MCL
2-Chlorotoluene (o-)	95-49-8	0.1	HA-Lifetime
4-Chlorotoluene (p-)	106-43-4	0.1	HA-Lifetime
Acetone	67-64-1	7.0	Region 8 Permit Limit
Acrylonitrile	107-13-1	0.006	10^{-4} Cancer Risk
Benzene	71-43-2	0.005	MCL
Bromobenzene	108-86-1	4	HA-Ten Day
Bromochloromethane	74-97-5	0.09	HA-Lifetime
Bromodichloromethane (THM)	75-27-4	0.08	MCL
Bromoform (THM)	75-25-2	0.08	MCL
Bromomethane	74-83-9	0.01	HA-Lifetime
Carbon tetrachloride	56-23-5	0.005	MCL
Chlorobenzene (Monochlorobenzene)	108-90-7	0.1	MCL
Chlorodibromomethane (Dibromochloromethane) (THM)	124-48-1	0.08	MCL
Chloroform (THM)	67-66-3	0.08	MCL
Chloromethane	74-87-3	0.003	HA-Lifetime
Cyanogen Chloride	506-77-4	2	HA-DWEL
Dichlorodifluoromethane	75-71-8	1	HA-Lifetime
Dichloromethane (Methylene chloride)	75-09-2	0.005	MCL
Ethylbenzene	100-41-4	0.7	MCL
Hexachlorobutadiene	87-68-3	0.001	HA-Lifetime
Hexachloroethane	67-72-1	0.001	HA-Lifetime
Isopropylbenzene (cumene)	98-82-8	4	HA-DWEL
Methyl Ethyl Ketone	78-93-3	4	HA-Lifetime
Naphthalene	91-20-3	0.1	HA-Lifetime
Perchloroethylene (PCE) (Tetrachloroethylene)	127-18-4	0.005	MCL

Styrene	100-42-5	0.1	MCL
Toluene	108-88-3	1	MCL
Total Trihalomethanes		0.08	MCL
Trichloroethylene (TCE)	79-01-6	0.005	MCL
Trichlorofluoromethane	75-69-4	2	HA-Lifetime
Vinyl chloride	75-01-4	0.002	MCL
Xylenes	1330-20-7	10	MCL

***Method 524.2 or 8260 is recommended for analyses of these constituents**

Semivolatile Organic Compounds*				
Parameter Name	**CAS No**	**Permit Limit (mg/L)**	**Method Detection Limit (mg/L)**	**Standard Type**
1,2,4-Trichlorobenzene	120-82-1	0.07	0.0019	MCL
1,2-Dichlorobenzene	95-50-1	0.6	0.0019	MCL
1,3-Dichlorobenzene	541-73-1	0.6	0.0019	HAL
1,4-Dichlorobenzene	106-46-7	0.075	0.0044	MCL
2,4,6-Trichlorophenol	88-06-2	0.01	0.0027	DWEL
2,4-Dichlorophenol	120-83-2	0.02	0.0027	HAL
2,4-Dinitrotoluene	121-14-2	0.1	0.0057	DWEL
2,6-Dinitrotoluene	606-20-2	0.04	0.0019	DWEL
2-Chlorophenol	95-57-8	0.04	0.0033	HAL
4-Nitrophenol	100-02-7	0.06	0.0024	HAL
Acenaphthene	83-32-9	2	0.0019	DWEL
Aldrin	309-00-2	0.001	0.0019	DWEL
Anthracene	120-12-7	10	0.0019	DWEL
Benzo(a)pyrene	50-32-8	0.0002	0.0025	MCL
bis(2-Ethylhexyl) phthalate	117-81-7	0.006	0.0025	MCL
Butyl benzyl phthalate	85-68-7	7	0.0025	DWEL
Chlordane	57-74-9	0.002	N/A	MCL
Dieldrin	60-57-1	0.04	0.0025	DWEL
Diethyl phthalate	84-66-2	30	0.0019	DWEL
Di-n-butyl phthalate	84-74-2	4	0.0025	DWEL
Endrin	72-20-8	0.002	N/A	MCL
Fluorene	86-73-7	1	0.0019	DWEL
Heptachlor	76-44-8	0.0004	0.0019	MCL
Heptachlor epoxide	1024-57-3	0.0002	0.0022	MCL
Hexachlorobenzene	118-74-1	0.001	0.0019	MCL
Hexachlorobutadiene	87-68-3	0.001	0.0009	HAL
Hexachlorocyclopentadiene	77-47-4	0.05	N/A	MCL
Hexachloroethane	67-72-1	0.001	0.0016	HAL
Isophorone	78-59-1	0.1	0.0022	HAL
Lindane	58-89-9	0.0002	N/A	MCL
Naphthalene	91-20-3	0.1	0.0016	HAL
Pentachlorophenol	87-86-5	0.001	0.0036	MCL
Phenol	108-95-2	2	0.0015	HAL
Pyrene	129-00-0	1.05	0.0019	Calculated from RFD
Toxaphene	8001-35-2	0.003	N/A	MCL

***Method 8270 is recommended for analyses of these constituents**

Biological Oxygen Demand				
Parameter Name	**Permit Limit (mg/L)**	**Method Number**	**Source**	**Detection Limit (mg/L)**
Biochemical Oxygen Demand	20 or 90% reduction from value measured in septic tank	405.1	EPA-NERL	N/A
BOD: 5-Day Test	20 or 90% reduction from value measured in septic tank	5210B	Standard Methods	2 mg/L

MCL: Maximum Contaminant Level. The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLG as feasible using the best available analytical and treatment technologies and taking cost into consideration. MCLs are enforceable standards.

MCLG: Maximum Contaminant Level Goal. A non-enforceable health goal which is set at a level at which no known or anticipated adverse effect on the health of persons occurs and which allows an adequate margin of safety.

HA: Health Advisory. An estimate of acceptable drinking water levels for a chemical substance based on health effects information; a Health Advisory is not a legally enforceable Federal standard, but serves as technical guidance to assist Federal, State, and local officials.

HA-Lifetime: The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 liters of water per day. The Lifetime HA for Group C carcinogens includes an adjustment for possible carcinogenicity.

HA-DWEL: Drinking Water Equivalent Level. A lifetime exposure concentration protective of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from drinking water.

Region 8 Permit Limit: Permit limit calculated by Region 8 Drinking Water Toxicologist based on human health criteria.

10^{-4} Cancer Risk: The concentration of a chemical in drinking water corresponding to an excess estimated lifetime cancer risk of 1 in 10,000

HA-Ten Day: The concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for up to ten days of exposure for a 10 kg child consuming 1 liter per day.

TT: Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.

SDWR: Secondary Drinking Water Regulations. Non-enforceable Federal guidelines regarding cosmetic effects (such as tooth or skin discoloration) or aesthetic effects (such as taste, odor, or color) of drinking water.

FIGURE 1 **SITE LOCATION ★**

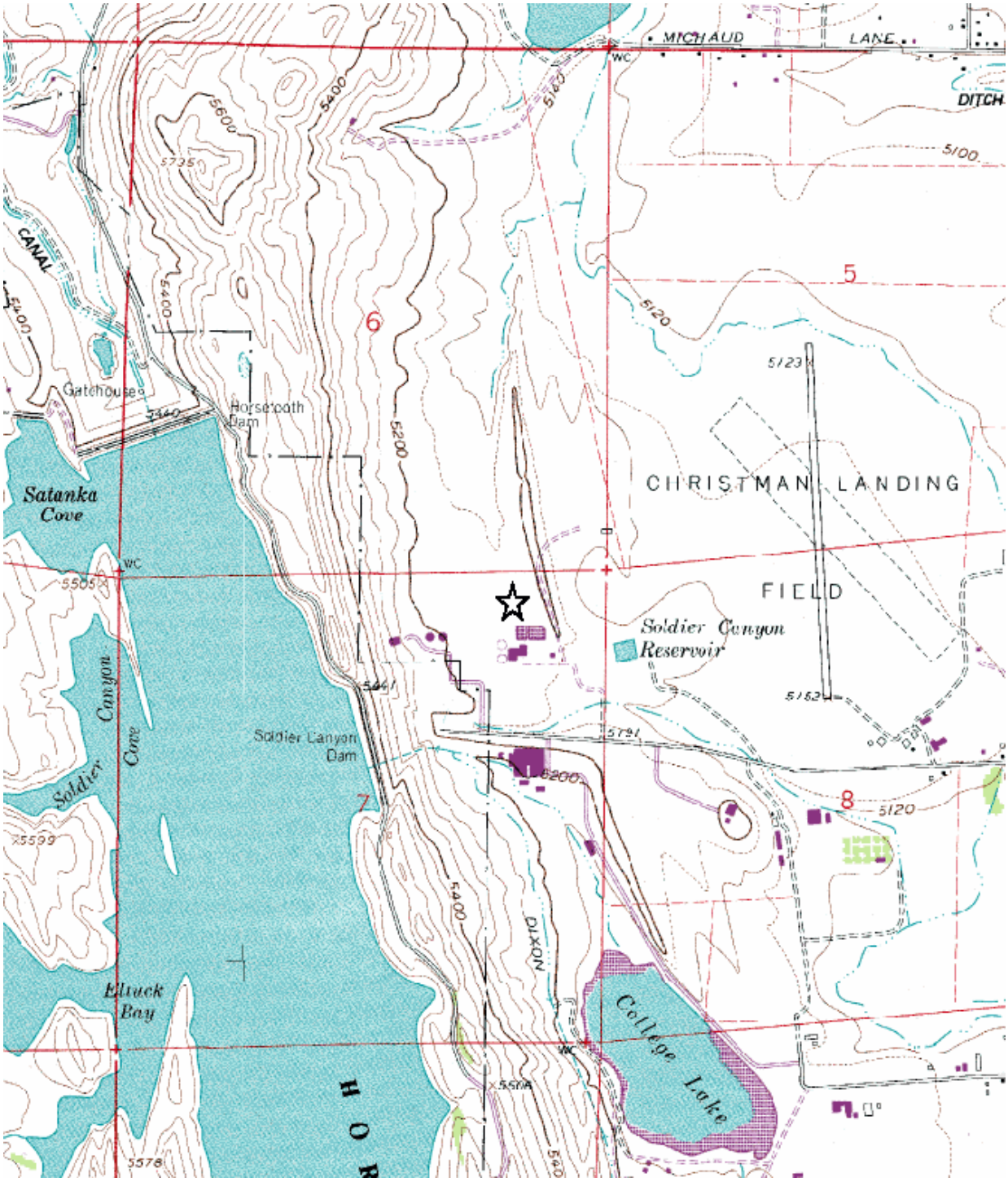

Figure 1 Location of Colorado Division of Wildlife Foothills Wildlife Health Laboratory