Minnesota Department of Health

STATEMENT OF NEED AND REASONABLENESS

Proposed Amendments to Rules Relating to Wells and Borings Minnesota Rules, Chapter 4725

November 9, 2007

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MINNESOTA DEPARTMENT OF HEALTH

I. INTRODUCTION AND BACKGROUND

The Minnesota Department of Health (MDH) is proposing to amend Minnesota Rules, Chapter 4725, the Rules Relating to Wells and Borings. Statutory authority is contained in Minnesota Statutes, Chapter 103I. The rules were first promulgated in 1974, and last substantially amended in 1993.

The purpose of establishing rules pertaining to wells, borings, and underground uses, as stated in the legislative intent of Minnesota Statutes, Chapter 103I, is to protect citizens' health and general welfare by providing a means for developing groundwater resources in an orderly, healthful, and reasonable manner. Groundwater, which is water contained in pore spaces of sediment, and pores and fractures of bedrock, is the principal source of drinking water for two-thirds of the state's residents. Over 90 percent of Minnesota's cities have wells for public water supply, and virtually all rural residents drink groundwater from wells. Wells also provide water for irrigation, food processing, and numerous commercial and industrial purposes; are used for monitoring and remediating contamination; and are used for dewatering to allow for installation of utilities and construction of buildings. Borings provide information on groundwater and geology, are used to facilitate the operation of certain types of elevators, and are used for geothermal space heating and cooling.

The purpose of this proposed rule is to assure safe drinking water, protect groundwater quality by preventing the introduction of contaminants into groundwater through improper wells and borings, and prevent wells and borings from acting as conduits for spreading contaminants. This proposed rule will help preserve groundwater resources and prevent a waste of groundwater from occurrences such as uncontrolled flowing wells and borings. This proposed rule is also designed to protect the health and safety of persons who construct, repair, seal, or use wells and borings by establishing safety requirements, and establishing minimum qualifications of contractors.

This proposed rule modifies the rule definitions, updates referenced national standards, revises the licensing process, streamlines the permit process, reduces annular space requirements, reduces flowing well and boring requirements, revises minimum setback distances to some contamination sources, and strengthens requirements for public water-supply wells. These changes are necessary to incorporate new construction materials and methods, improve public and worker safety, protect groundwater quality, allow design flexibility and eliminate unnecessary restrictions, and reorganize existing rules for clarity and consistency.

Minnesota Statutes, Chapter 103I, requires the MDH to adopt rules including: issuance of licenses for persons who construct, modify, repair, or seal wells or borings; registration of monitoring well contractors; establishment of conditions for examination and review of license and registration applications, and for revocation and suspension of licenses and registrations; establishment of minimum standards for design, location, construction, repair, and sealing of wells and borings; and establishment of criteria for submission of reports, logs, and samples.

"Wells" are drill holes or excavations in the earth that locate, divert, recharge, or acquire groundwater. Well types include water-supply wells, dewatering wells, and monitoring wells. "Water-supply wells" are pumped wells used for such purposes as drinking, irrigation, or

commercial supply. "Dewatering wells" are used to lower groundwater levels for purposes such as installation of underground utilities. "Monitoring wells" are used to obtain a sample of groundwater for testing, often to investigate groundwater contamination.

"Borings" are drill holes or excavations that do not extract groundwater. Types of borings include environmental bore holes, vertical heat exchangers, elevator borings, and exploratory borings. "Environmental bore holes" are used to measure or monitor earth properties without extracting groundwater, or to remove gaseous contamination or pollution. "Vertical heat exchangers" are pipes placed in a bore hole, containing a circulating fluid that extracts heat from the ground for use in space heating or cooling. "Elevator borings" are bore holes that contain a hydraulic piston or cylinder used to push an elevator up and down. "Exploratory borings" are holes drilled to prospect or explore for metallic minerals, oil, natural gas, or kaolin clay.

Minnesota Rules, Chapter 4725, pertains to all wells and borings as defined by Minnesota Statutes, Chapter 103I, except for exploratory borings. Exploratory borings are regulated under Minnesota Rules, Chapter 4727.

II. ALTERNATIVE FORMAT

Upon request, this Statement of Need and Reasonableness can be made available in an alternative format, such as large print, Braille, or cassette tape. To make a request, contact:

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III. STATUTORY AUTHORITY TO ADOPT RULES

The commissioner of health is granted authority to make rules pertaining to wells and borings in Minnesota Statutes, Chapter 103I.

Minnesota Statutes, section 103I.101, subdivison 2, requires the commissioner to regulate wells and borings; examine, license, and register persons conducting well and/or boring work; establish design, location, construction, repair, and sealing standards; and issue permits.

"Subd. 2. Duties. The commissioner shall:
(1) regulate the drilling, construction, modification, repair, and sealing of wells and borings;

(2) examine and license well contractors; persons constructing, repairing, and sealing vertical heat exchangers; persons modifying or repairing well casings, well screens, or well diameters; persons constructing, repairing, and sealing drive point wells or dug wells; persons constructing, repairing, and sealing dewatering wells; persons sealing wells; persons installing well pumps or pumping equipment; and persons excavating or drilling holes for the installation of elevator borings or hydraulic cylinders;

(3) register and examine monitoring well contractors;

(4) license explorers engaged in exploratory boring and examine individuals who supervise or oversee exploratory boring;

(5) after consultation with the commissioner of natural resources and the Pollution Control Agency, establish standards for the design, location, construction, repair, and sealing of wells and borings within the state; and

(6) issue permits for wells, groundwater thermal devices, vertical heat exchangers, and elevator borings."

Minnesota Statutes, section 103I.101, subdivisions 3 and 5, require the commissioner to establish rules including issuance, suspension, and revocation of licenses and registrations, minimum well standards, reporting requirements, standards in areas of contamination, wellhead protection measures, record submission, and minimum standards for borings.

"Subd. 3. Procedures for permits. The commissioner shall establish procedures for application, approval, and issuance of permits by rule."

"Subd. 5. Commissioner to adopt rules. The commissioner shall adopt rules including:

(1) issuance of licenses for:

(i) qualified well contractors, persons modifying or repairing well casings, well screens, or well diameters;

(ii) persons constructing, repairing, and sealing drive point wells or dug wells;

(iii) persons constructing, repairing, and sealing dewatering wells;

(iv) persons sealing wells;

(v) persons installing well pumps or pumping equipment;

(vi) persons constructing, repairing, and sealing vertical heat exchangers; and

(vii) persons constructing, repairing, and sealing elevator borings;

(2) issuance of registration for monitoring well contractors;

(3) establishment of conditions for examination and review of applications for license and registration;

(4) establishment of conditions for revocation and suspension of license and registration;

(5) establishment of minimum standards for design, location, construction, repair, and sealing of wells to implement the purpose and intent of this chapter;

(6) establishment of a system for reporting on wells and borings drilled and sealed;

(7) establishment of standards for the construction, maintenance, sealing, and water quality monitoring of wells in areas of known or suspected contamination;

(8) establishment of wellhead protection measures for wells serving public water supplies;

(9) establishment of procedures to coordinate collection of well and boring data with other state and local governmental agencies;

(10) establishment of criteria and procedures for submission of well and boring logs, formation samples or well or boring cuttings, water samples, or other special information required for and water resource mapping; and

(11) establishment of minimum standards for design, location, construction, maintenance, repair, sealing, safety, and resource conservation related to borings, including exploratory borings as defined in section 103I.005, subdivision 9."

Minnesota Statutes, section 103I.111, subdivision 1, authorizes the commissioner of health to delegate portions of the duties authorized under Minnesota Statutes, Chapter 103I.

"Subdivision 1. Delegation of duties of commissioner.

(a) The commissioner of health may enter into an agreement with a board of health to delegate all or part of the inspection, reporting, and enforcement duties authorized under provisions of this chapter pertaining to permitting, construction, repair, and sealing of wells and elevator borings."

Minnesota Statutes, section 103I.205, subdivisions 2, 4, 5, 6, and 9, authorizes the commissioner to adopt rules for emergency permits and notifications, qualifications of well contractors, at-grade wells, isolation distances from contamination sources, and submission of reports.

"Subd. 2. Emergency permit and notification exemptions.

The commissioner may adopt rules that modify the procedures for filing a well notification or well permit if conditions occur that:

(1) endanger the public health and welfare or cause a need to protect groundwater; or

(2) require the monitoring well contractor, limited well/boring contractor, or well contractor to begin constructing a well before obtaining a permit or notification."

"Subd. 4. License required. (A) Except as provided in paragraph (b), (c), or (d), section 103I.401, subdivision 2, or section 103I.601, subdivision 2, a person may not drill, construct, repair, or seal a well or boring unless the person has a well contractor's license in possession.

(b) A person may construct a monitoring well if the person:

(5) meets the qualifications established by the commissioner in rule."

"Subd. 5. At-grade monitoring wells. At-grade monitoring wells are authorized without variance and may be installed for the purpose of evaluating groundwater conditions or for use as a leak detection device. An at-grade monitoring well must be installed in accordance with the rules of the commissioner. The at-grade monitoring wells must be installed with an impermeable double locking cap approved by the commissioner and must be labeled monitoring wells."

"Subd. 6. Distance requirements for sources of contamination. (a) A person may not place, construct, or install an actual or potential source of contamination any closer to a well than the isolation distances prescribed by the commissioner by rule unless a variance has been prescribed by rule."

"Subd. 9. Report of work. Within 30 days after completion or sealing of a well or boring, the person doing the work must submit a verified report to the commissioner containing the information specified by rules adopted under this chapter."

Minnesota Statutes, section 103I.221, subdivision 2, authorizes the commissioner to make rules relating to plastic well casing.

"Subd. 2. Rules. The commissioner may adopt rules relating to the installation of plastic well casing."

Minnesota Statutes, section 103I.301, subdivision 4, authorizes the commissioner to adopt rules relating to sealing wells and borings.

"Subd. 4. Sealing procedures. Wells and borings must be sealed according to rules adopted by the commissioner."

Minnesota Statutes, section 103I.401, subdivision 3, authorizes the commissioner to adopt rules relating to sealing an elevator boring.

"Subd. 3. Sealing. A well contractor or elevator boring contractor must seal a hole or excavation that is no longer used for an elevator boring. The sealing must be done according to rules adopted by the commissioner."

Minnesota Statutes, section 103I.451, authorizes the commissioner to adopt rules relating to sealing an environmental bore hole.

"An environmental bore hole must be constructed, sealed, and reported as prescribed by rule of the commissioner by a well contractor or a monitoring well contractor."

Minnesota Statutes, section 103I.501, requires the commissioner to regulate and license persons working on wells, well pumps and pumping equipment, elevator borings, environmental bore holes, and vertical heat exchangers.

"(a) The commissioner shall regulate and license:
(1) drilling, constructing, and repair of wells;
(2) sealing of wells;
(3) installing of well pumps and pumping equipment;
(4) excavating, drilling, repairing, and sealing of elevator borings;
(5) construction, repair, and sealing of environmental bore holes; and
(6) construction, repair, and sealing of vertical heat exchangers.
(b) The commissioner shall examine and license well contractors, limited well/boring contractors, and elevator boring contractors, and examine and register monitoring well contractors.
(c) The commissioner shall license explorers engaged in exploratory boring and shall examine persons who supervise or oversee exploratory boring."

Minnesota Statutes, section 103I.525, subdivision 8, authorizes the commissioner to establish rule requirements for continuing education.

"Subd. 8. (c) The renewal application must include information that the applicant has met continuing education requirements established by the commissioner by rule."

Minnesota Statutes, section 103I.531, subdivision 4, authorizes the commissioner to establish rules for a dewatering limited license.

"Subd. 4. Issuance of license. If an applicant meets the experience requirements established in rule, passes the examination as determined by the commissioner, submits the bond under subdivision 5, and pays the license fee under subdivision 6, the commissioner shall issue a limited well/boring contractor's license. If the other conditions of this section are satisfied, the commissioner may not withhold issuance of a dewatering limited license based on the applicant's lack of prior experience under a licensed well contractor."

Minnesota Statutes, section 103I.535, subdivision 8, requires the commissioner to establish rules for continuing education for certified representatives of elevator boring contractors.

"Subd. 8. (c) The renewal application must include information that the applicant has met continuing education requirements established by the commissioner by rule."

Minnesota Statutes, section 103I.541, subdivision 1, requires the commissioner to establish rules for continuing education for certified representatives of monitoring well contractors.

"Subdivision 1. Initial registration after July 1, 1990. After July 1, 1990, a person seeking initial registration as a monitoring well contractor must meet examination and experience requirements adopted by the commissioner by rule."

"Subd. 4. (c) The renewal application must include information that the applicant has met continuing education requirements established by the commissioner by rule."

Minnesota Statutes, section 103I.621, authorizes the commissioner to make rules pertaining to groundwater thermal exchange devices.

"Subd. 4. Rules. The commissioner may adopt rules to administer this section."

IV. REGULATORY ANALYSIS

A. Description of the Classes of Persons who Probably will be Affected by the Proposed Rule, Including Classes that will Bear the Costs of the Proposed Rule and Classes that will Benefit from the Proposed Rule.

The proposed rule will affect licensed and registered contractors who construct, repair, or seal wells and borings, and the owners of wells and borings - the same persons affected by the

existing rules. Approximately 650 persons are certified, representing 400 licensees or registrants. The majority of licenses and registrations are issued to a business, not to a human being. Some businesses hold multiple licenses, primarily "limited" licenses for various aspects of repair, service or sealing. Approximately 12,000 wells and borings are constructed each year, and approximately 12,000 wells and borings are sealed each year. Wells provide the individual water supply for approximately 450,000 residences. The typical life expectancy of a private well ranges from 25 to 75 years. The proposed amendments do not add or delete new classes of licenses. The proposed rules do not establish fees.

The proposed rules will result in cost savings in some areas, and increased costs in other areas. Cost savings or increases will be borne by the same persons affected by the existing rule-contractors and well or boring owners. Of the proposed amendments that alter a regulatory requirement, approximately 60 percent are less stringent, or provide more alternatives, than the existing rule. Examples include the proposals to reduce the amount of continuing education required for certified representatives of limited well/boring contractors; reduce information requirements for vertical heat exchanger permit applications; reduce inner/outer minimum casing sizes; reduce the "wait on cement" time; allow some less stringent requirements for flowing wells and borings; allow alternative sealing materials for all large diameter wells and borings; and reduce some isolation distances. The MDH has determined that the less restrictive amendments are adequate to protect groundwater, public health, and safety, while easing the regulatory burden and reducing the costs to the contractors and owners.

In other instances, the MDH has determined that more restrictive rule requirements are necessary to provide greater protection, such as the proposed requirement to increase the minimum grouting depth from 30 feet to 50 feet. Some of the more stringent requirements are being proposed because new techniques or materials are available to provide better protection of groundwater. The MDH believes that the overall effect of the proposed rule will be to add a small increase to the cost of a typical domestic water well, from $10 to $100 for a well commonly costing between $4,000 and $6,000, due to the cost of grouting an additional 20 feet. ("Grouting" is the process of sealing the steel or plastic well casing to the bore hole by pressure injecting cement or a slurry of special clay into the "annular" space between them.) It should be noted that some contractors are already grouting 50 feet or more, and some are grouting the entire length of the casing.

Full length grouting of those public water-supply wells that would not now be full length grouted, will likely constitute the largest cost increase, likely in the hundreds of dollars, but it will affect fewer than 300 wells each year. It should be noted that these wells serve larger numbers of the people, and, in the cases of some facilities such as schools, childcare facilities, and nursing homes, they serve vulnerable populations.

Cost savings will be large for a small number of wells and borings, such as large diameter wells or borings that may use alternative (less expensive) sealing materials, or flowing wells or borings that will no longer be required to be cement grouted.

Overall, the increased costs are estimated to balance the reduced costs, resulting in no net cost increase.

The proposed rule will benefit the general public by providing increased protection of the groundwater and environment. As mentioned above, groundwater is a valuable resource that serves as the principal source of drinking water for two thirds of the state's population. Better wells will benefit well owners by reducing the need for drilling some replacement wells, or installing expensive treatment systems to remove contaminants. Long-term savings should offset small initial cost increases for some wells. Groundwater is also a vulnerable resource, in that a mistake has the potential to contaminate the drinking water supply over a large area. The proposed rule is intended to reduce the likelihood that a well or boring will become a conduit for contamination, either because of poor construction techniques or poor sealing practices. This increased protection is a clear benefit to the general public, and of particular benefit to those who use groundwater as a source of drinking water, both now and in the future.

B. Probable Costs to the MDH and to Other Agencies of the Implementation and Enforcement of the Proposed Rule and any Anticipated Effect on State Revenues.

The proposed rule does not change fees assessed to the regulated industry, or MDH administrative costs. Also, the number and difficulty of MDH inspections will not be impacted. Therefore, the MDH does not anticipate any additional administrative costs. The MDH is the only state agency responsible for administering this rule, and no other state agency will bear any costs of rule administration.

Some state agencies conduct regulated well or boring activities themselves. State agencies are exempt from payment of license, permit, or other fees, but are not exempt from rule compliance. The Minnesota Department of Natural Resources (DNR), the Minnesota Department of Transportation (MnDOT), and the Minnesota Pollution Control Agency (MPCA) are registered as monitoring well contractors. These agencies construct and seal a limited number of monitoring wells and environmental bore holes. Since this proposed rule provides for only minor changes to the monitoring well and environmental bore hole standards, no additional state costs will be borne by these agencies.

Small additional construction costs will be incurred for the few wells drilled each year for state parks, highway rest stops, or other facilities. Cost savings will occur for some wells constructed or sealed by state agencies. Cost savings resulting from this proposed rule should offset any construction cost increases.

C. Determination of Whether there are Less Costly Methods or Less Intrusive Methods for Achieving the Purposes of the Proposed Rule.

The MDH believes that this proposed rule incorporates the least costly and intrusive methods that still provide adequate protection for public health and groundwater. Based on many discussions with industry representatives, the MDH has determined that the proposed rule incorporates many less costly or less intrusive methods, including:

- Excluding the Cretaceous formations and some weathered portions of bedrock from the bedrock grouting requirements.
- Reducing the amount of continuing education required for certified representatives of limited well/boring contractors.

- Reducing the information requirements for vertical heat exchanger permit applications.
- Removing the 25-foot setback to electric lines over 50 KV, and some other electric setbacks.
- Reducing the inner/outer minimum casing sizes.
- Reducing the minimum annular space size, and therefore the hole diameter and drill bit size.
- Reducing the "wait on cement" time.
- Allowing cement-sand grout below the water level, between casings, and wherever neat-cement grout is allowed.
- Allowing a longer screen leader and gravel pack.
- Allowing alternative welded and threaded casing fittings.
- Reducing a number of requirements for flowing wells and borings including allowing driven casing and lighter weight outer casing.
- Reducing some casing perforation requirements.
- Allowing alternative (considerably less expensive) sealing materials and methods for all large diameter wells and borings.
- Allowing alternatives to the option of extending the casing above flood levels in flood areas.
- Reducing some isolation distances to contamination sources.

As an example, one proposed rule amendment allows the use of "cement-sand grout" wherever "neat-cement grout" is now required. Neat-cement grout is a mixture of Portland cement and water. A cubic yard of neat cement, with 22 bags of Portland cement, costs between $150 and $350. A domestic well in southeastern Minnesota may require 3 to 5 cubic yards of grout, with some requiring in excess of 10 cubic yards. Allowing sand to substitute for up to half of the Portland cement will cut material costs nearly in half, resulting in substantial cost savings.

D. Description of any Alternative Methods for Achieving the Purpose of the Proposed Rule that were Seriously Considered by the Agency and the Reasons why they were Rejected in Favor of the Proposed Rule.

The MDH seriously considered requiring full length grouting of all wells and borings, rather than allowing placement of drilling mud and drill cuttings in the annular space below 50 feet. The purpose of grouting is to completely fill all space around the casing with a material that provides a resistance to flow that is the same or lower than the natural, undisturbed materials. Grouting:

- Stops surface water or surface contaminants from taking the path of least resistance, and moving along the casing.
- Prevents water in a contaminated aquifer penetrated by the well or boring from mixing with water in another aquifer also penetrated by the well.
- Supports the casing.
- Prevents collapse and subsidence.
- Protects the casing from corrosion, extending the life of the well or boring.

MDH observation of well and boring construction, MDH investigation of contaminated wells, and research conducted in other states has shown that problems can occur when drilling mud and cuttings are shoveled into the annular space from the ground surface. Problems can include high permeability, settlement, voids, collapse, and bridging:

- Permeability. The permeability of the resultant drill cuttings mixture can be considerably greater (meaning that water or contaminants are transmitted faster) than the permeability of the natural mixture, since in the drilling process, the fine-grained materials that reduce permeability may be separated and discarded instead of returned to the drill hole.
- Settlement. In the process of falling through the annular space, the coarser materials will fall considerably faster, resulting in separation and higher permeability. The settling velocity of coarse sand is approximately 1000 feet per hour, while the settling velocity of clay is less than 1 foot per hour. The sand falls to the bottom, the clay stays at the top or is washed out of the hole, and the mixture of various sizes that gives the low permeability, is lost.
- Voids. Drilling mud contains only approximately 5 percent bentonite and the remaining 95 percent is water. Through time, the water is drawn out of the bentonite drilling mud into the surrounding geologic formation, leaving cracks and voids in the grout, especially in the dry portion of the annular space.
- Collapse. The process of shoveling or washing the cuttings mixture into the annular space may dislodge or collapse portions of other strata, typically the looser sands and gravels, that can collapse and create a higher permeability envelope around the casing.
- Bridging. The Wisconsin Department of Natural Resources and Professor Tuncer Edil of the University of Wisconsin, investigated wells filled with drilling mud and drill cuttings, using an ultrasonic probe. Their work demonstrated that use of the cuttings resulted in subsidence, permeabilites that in some mixtures were 10 to 100 times too high, and the presence of voids in the annular space.

Full length grouting has definite water quality, environmental, and public health benefits. However, in some geologic conditions, such as very loose sand formations, high water levels, or loose boulders, it may be physically necessary to use a different drilling technique or an outer casing in order to grout the entire length of the inner casing. In these limited circumstances, the cost of the well could increase by hundreds or even thousands of dollars. Some well contractors have expressed great concern about the increased cost, and technical difficulties. As a compromise, the MDH is proposing to increase the minimum grouting depth from 30 feet to 50 feet. This will provide increased protection for the well and groundwater, and not substantially increase drilling costs or practical difficulties.

E. Probable Costs of Complying with the Proposed Rule.

The existing rule establishes minimum requirements for wells and borings to provide safe water supplies, prevent contamination of groundwater, and protect public health and safety. The proposed rule contains some less costly, some equivalent, and some more costly requirements than the existing rule. Many of the proposed rule amendments are clarifications and do not affect the cost of complying with the proposed rule. Very few proposed rule amendments affect direct, or even indirect, costs to the regulated industry. Cost savings and increases will largely be borne by the well or boring owner, not the regulated industry. Some of the proposed rule amendments that will reduce costs, significantly in some cases, are included in "C" above. Proposed rule amendments that may increase costs include:

- The requirement that notifications be received during normal business hours.
- The change from the 30-foot to the 50-foot grouting requirement.
- Regulation of borings in special well and boring construction areas.

- Some chemical treatment requirements.
- Some increased contamination source isolation distances (primarily for additional trenching, electric cable and waterline).
- The silt and clay standard.
- Some hydrofracturing requirements.
- The requirement to test for arsenic.
- The grouting and disinfection requirements for public water-supply wells.
- The hydraulic fluid protective requirements for repair of elevators.

The public health benefits of the proposed rule are detailed in the specific rule part discussions in the Statement of Need and Reasonableness.

Typically, a new domestic well in an unconsolidated formation will see a nominal increase in cost, due to increased grouting and an arsenic test. New noncommunity public wells in unconsolidated formations will also see an increase due to improved grouting. Flowing wells and borings, bedrock wells and borings, and sealing of wells and borings will generally see decreases, some substantial. Taken as a whole, the proposed rule should result in no net increase in costs in the state.

F. Probable Costs or Consequences of not Adopting the Proposed Rule.

Not adopting the proposed rule will have, as a whole, minimal cost impact on government units, businesses, and individuals. As indicated above, costs will be reduced in some situations, while costs will increase in other situations, but the net result will be neutral.

Consequences of not adopting the proposed rule include less protection of drinking water and groundwater, continued use of outdated standards, failure to address newer technologies such as hydrofracturing, less design flexibility, continued misinterpretation and compliance errors by the regulated parties due to inconsistent or unclear requirements, and less protection of public health and safety.

G. Assessment of any Difference between the Proposed Rule and Existing Federal Regulations and a Specific Analysis of the Need for and Reasonableness of each Difference.

Federal regulations do not address the licensing of persons constructing or sealing wells or borings, or the methods of constructing and sealing wells and borings.

V. COMMISSIONER OF FINANCE REVIEW

Minnesota Statutes, section 16A.1285, does not apply because there are no charges related to this proposed rule. This proposed rule does not establish or modify fees.

In accordance with Minnesota Statutes, section 14.131 a copy of this Statement of Need and Reasonableness, along with the proposed rule was sent to the Commissioner of Finance for review. In a memorandum dated June 26, 2007, the Minnesota Department of Finance reported that the proposed rule would have minimal fiscal impact for local units of government.

VI. COMMISSIONER OF AGRICULTURE REVIEW

In accordance with Minnesota Statutes, section 14.111 a copy of the proposed rule was sent to the Commissioner of Agriculture for review.

VII. COST THRESHOLD, MINN. STAT. 14.127, SUBDIVISION 1

Section 14.127, 2005 requires an agency to determine if the cost of complying with a proposed rule in the first year after the proposed rule takes effect will exceed $25,000 for any one business that has less than 50 full-time employees, or any one statutory or home rule charter city that has less than ten full-time employees.

The MDH believes that the cost of complying with the proposed rule in the first year after the proposed rule takes effect will not exceed $25,000.

- The proposed rule does not establish or increase fees. All fees are established in statute.
- The proposed rule does not require annual expenditures, except for licensing and registration renewal, and annual maintenance permits for some wells.
- The total cost of a new well (labor, materials, profit, regulatory requirements) serving 50 people ranges from approximately $5000 to $20,000 depending on geology, and water needs of the population served. A well will typically last for 25 to 75 years. The typical cost of sealing a well serving 50 people ranges from $750 to $5000.
- The proposed rule, taken as a whole, should not result in any net cost increase to the regulated industry or the public.
- The proposed rule amendment most likely to result in some cost increases is the requirement for full-length grouting of restaurant, school, park, city or other public supply wells that are constructed with the rotary drilling method. It should be noted that wells constructed by "driven-casing" rather than "rotary" methods will not be required to be full-length grouted, and will not see any cost increases due to this proposed rule. Market costs, such as a recent 50 percent to 100 percent steel pipe cost increase, may have a greater impact on costs than the proposed rule. Many owners and engineers already voluntarily full-length grout public wells, for sanitary protection and to extend the life expectancy of the well. The existing rule

already requires grouting of multiple cased wells and wells constructed through bedrock. However, full length grouting of a public rotary drilled well in an unconsolidated formation, could increase the cost from a low of approximately $100, to a typical increase of a few hundred dollars.

VIII. PERFORMANCE-BASED RULES

Minnesota Statutes, section 14.002, requires that "whenever feasible, state agencies must develop rules and regulatory programs that emphasize superior achievement in meeting the agency's regulatory objectives and maximum flexibility for the regulated party and the agency in meeting those goals." The MDH's goals in regulating wells and borings are to protect public health and safety and to protect Minnesota's groundwater resources. With these goals in mind, the MDH has analyzed the drilling processes used by the industry, and has determined that uniform rules based on industry standard procedures and materials are the best method for achieving public health goals with the least cost and burden to the regulated industry and the public.

Drilling procedures have been refined over 100 years, and are usually very similar from contractor to contractor, and from well to well with similar hydrogeologic conditions. The same equipment, techniques, and materials are generally used. Standards and specifications were developed in the industry long before regulations were put in place. For example, well casing is made in a limited number of standardized sizes and thread configurations so that drill bits will fit inside a casing (without standardization, a bit even 1/32 inch too big won't fit), and so components bought at different times, or from different manufacturers, will fit together. A performance-based rule would require the regulated parties to test these materials themselves, instead of simply using a standardized product. Another example involves the use of drilling water. Instead of just using a known potable water source or adding approximately $2 of chlorine to the drilling water, a performance based standard would require water analysis of each water batch. This could cost tens or hundreds of dollars, and result in days of delay waiting for the results. Given these types of disincentives, the vast majority of contractors would likely continue to use standardized procedures even if given the opportunity to use performance-based standards. Well contractors frequently say that the rule should be simple and set a "level playing field."

Both the existing and the proposed rule are preventive in nature. The purpose is to prevent contamination from occurring both now, and in the future. A well may have a usable life of tens or even hundreds of years. A performance standard such as a water test, only determines whether contamination has already occurred, and can be highly dependant on timing. Contamination is not necessarily predictable or consistent. If precautions are not taken, contamination can occur at irregular times, such as after a flood, heavy rain, sewer break, or pesticide application. Accordingly, even the most diligent use of water testing would not prevent contamination, and would likely not prevent illness in many scenarios. Moreover, frequent testing would need to be done for a wide enough array of contaminants to limit health risks. This

type and frequency of testing would cost well owners tens of thousands of dollars over the life of the well. Although testing is a critical part of maintaining a well, it is not a substitute for structural integrity and proper design that prevent contaminants from entering the well in the first place.

Since performance based standards would be more costly and time consuming to the contractor and owner, without providing the long term protection necessary for the life of the well or boring, they are not common in the existing rule. However, the rule has incorporated performance-based standards in those instances where appropriate. For example, a provision in part 4725.3850, subpart 5a. sets thresholds for the use of less costly grout or fill materials based on the effectiveness of grouting. Part 4725.4650 establishes a performance standard as a numerical sediment concentration, instead of prescriptive criteria specifying screen slot size, screen placement, screen materials, and development methods.

Flexibility in unique situations is incorporated into this proposed rule through the variance process established in Minnesota Rules, parts 4717.7000 through 4717.7050.

IX. ADDITIONAL NOTICE

Minnesota Statues, section 14.131 requires that an agency either include in the Statement of Need and Reasonableness a description of its efforts to provide notification to person or classes of persons who may be affected by the proposed rule, or explain why the efforts were not made.

The MDH has made considerable effort to provide notice and involve affected persons, through direct mailings, public meetings, speaking opportunities, interactions during inspections and other program activities, articles in newsletters and periodicals of the MDH and affected populations, and information posted on the MDH website. The proposed rule has resulted from discussions with, and recommendations from, a wide variety of interested individuals both inside and outside the affected regulated industries. The following discussion includes a summary of efforts to provide notice; notice and comments received in response to publishing the Request for Comments; notice and comments received in response to mailing notifications and posting information on the web site; and the Additional Notice to be given when the Notice to Intent to Adopt Rules is published.

PROVIDING NOTICE

Newsletter articles announcing the process to revise the rule were published in the Winter 2001, Summer 2002, Fall/Winter 2002/2003, Spring 2003, Fall/Winter 2003/2004, Spring/Summer 2004, Fall/Winter 2005/2006, and Spring/Summer 2006 issues of the *Well Management Newsletter* (the newsletter changed from being published quarterly, to semi-annually in 2003). This newsletter has been mailed to approximately 1,440 persons, including all MDH-licensed drilling contractors, numerous federal, state, and local officials, and other persons who have requested to be on the mailing list. The published notices requested that rule comments and suggestions be forwarded to the MDH.

A newsletter article about rule making, and a summary of issues, was published in the *"Well Advised,"* July/August 2003, the newsletter of the Minnesota Water Well Association. The Minnesota Water Well Association membership consists of approximately 200 well contractors, well suppliers and manufacturers, and groundwater and water supply technical persons.

Newsletter articles concerning the proposed rules were published in the *"Minnesota Ground Water Association Newsletter,"* in September 2002, and December 2004. The Minnesota Groundwater Association membership consists of approximately 550 technical, legal, regulatory, educational, government, public, and other members with an interest in ground water.

The Water Well Journal, published monthly by the National Ground Water Association, reported on the proposed rule in the September 2005 issue, Volume 59, Number 9. The Water Well Journal is sent to the more than 15,000 members of the National Ground Water Association. Membership consists of groundwater scientists and engineers, regulatory officials, well and groundwater contractors, and manufacturers and suppliers.

The MDH has held eight to nine evening district meetings around the state each year, for the last five years, to discuss rule issues and possible amendments. Attendees included well contractors, limited well/boring contractors, suppliers, local delegated well program staff, other state agency personnel, engineering consultants, county personnel, and members of the public.
Non-MDH attendance at the district meetings totaled 123 people in 2002, 158 people in 2003, 140 people in 2004, 116 people in 2005, 133 people in 2006, and 121 people in 2007.

Presentations discussing, and receiving comments on, possible rule amendments were held at the Minnesota Water Well Association annual conferences in 2002, 2003, 2004, 2005, and 2006.

A presentation concerning the proposed rule was made at a University of Minnesota workshop for persons interested in individual sewage treatment systems held in Owatonna on January 26, 2005.

A presentation concerning the proposed rule was made at the Noncommunity Public Water Systems Training Program on March 1, 2005, attended by state and local government water program staff.

Presentations discussing this proposed rule were also given at educational seminars for well contractors at:

St. Hilaire Supply Company, St. Hilaire, April 7, 2006
Goodin Company, Minneapolis, March 30, 2006
Ferguson Enterprises, Duluth, March 23, 2006
First Supply Company, Brainerd, March 15, 2006
Preferred Pump Company, St. Cloud, March 10, 2006
Goodin Company, St, Paul, April 5, 2005
First Supply Company, Brainerd, March 24, 2005
Preferred Pump Company, St. Cloud, March 19, 2005
Ferguson Enterprises, Albert Lea, March 9, 2005
Ferguson Enterprises, Worthington, March 8, 2005
Ferguson Enterprises Inc., Albert Lea, April 14, 2004,
Preferred Pump Company, St. Cloud, March 19, 2004

Goodin Company, Minneapolis, March 9, 2004,
First Supply Company, Brainerd, March 24, 2004,
St. Hilaire Supply Company, St. Hilaire, April 2, 2004
Preferred Pump Company, St. Cloud, March 21, 2003,
First Supply Company, Brainerd, March 19, 2003,
St. Hilaire Supply Company, St. Hilaire, April 4, 2003
American Water Works Association, annual meeting, Brainerd, October 3, 2002
Preferred Pump Company, St. Cloud, March 15, 2002
Preferred Pump Company, Brainerd, March 22, 2002
University of Minnesota, ISTS Workshop, Little Falls, March 22, 2002

The Advisory Council on Wells and Borings has provided considerable input and review during the rulemaking process. The Advisory Council is an 18-member council established under Minnesota Statutes, section 103I.105. Council membership includes two public members; ten contractor representatives, from the well, monitoring well, exploration, elevator, and vertical heat exchanger drilling industries; and state agency members, including the Minnesota Department of Natural Resources, the Minnesota Department of Health, the Minnesota Geological Survey, the Minnesota Pollution Control Agency, the Minnesota Department of Transportation, and the Minnesota Board of Water and Soil Resources. Proposed rule revisions were discussed with the Advisory Council at meetings held on June 1, 2005; March 2, 2005; December 1, 2004; September 1, 2004; May 5, 2004; March 3, 2004; October 2, 2003; September 3, 2003; June 4, 2003; December 5, 2002; June 12, 2002; December 5, 2001; June 6, 2001; March 7, 2001; December 6, 2000; and September 6, 2000.

REQUEST FOR COMMENTS

A Request for Comments on the proposed rule was published in the State Register on Monday, March 22, 2004. Written comments were received from the following:

- Vanessa DeMuth, Dakota County Environmental Management Environmental Specialist, recommended that the rules require a tag or other identifier on sealed wells. The MDH responds that the proposal was considered, but not implemented, due to the practical problems of maintaining a tag or identifier indefinitely, and the infrequent need to identify sealed wells.
- Steve Campbell, PE of SEH Inc. recommended that isolation distances from wells be measured from the center of the well. The MDH considered this recommendation but is not proposing to amend the rule for consistency, and because the significant distance is where a contaminant source enters a well, not the center of the well. Mr. Campbell recommended listing the names and concentrations of contaminants in the rule. The MDH responds that the names of the contaminants are listed in the well rule, and for public wells, in the public water supply rule (which is not open for amendment). Mr. Campbell recommended that the definition of "confining unit" be amended to include formation thicknesses. The MDH responds that the proposed rule has been amended per his comment. Lastly, he recommended that all wells be constructed with an access port to measure the ground water elevations. The MDH responds that this comment was considered but not implemented since some wells cannot be physically constructed with an access port (flowing wells, certain jet pump and other pump installations) and because the requirement is not related to health or ground water protection.

- Remi Stone, Public Policy Director of the Builder's Association of the Twin Cities expressed concern about the proposed amendment to increase the setback from 50 feet to 300 feet between a contamination source (large septic drainfield) and a water supply well. She indicated that Laurent Development was engaged in the matter and asked for a meeting with the MDH. A meeting was held on August 11, 2004. The requesting parties indicated that a large development in Credit River Township, Scott County, had been given local approval and construction had started with a planned 50-foot setback. They expressed concern that the rule would affect this project. The parties were informed that the rule would not be retroactive, and if construction started prior to final rule adoption, the 50-foot setback would apply. The development has since been constructed.
- Joseph Thein of Preferred Pump, recommended that splined joints be allowed for plastic well casing. The MDH responds that the plastic casing standard used by the MDH and most other regulatory agencies is ASTM F-480. This ASTM standard does not permit splined joints. In addition, concerns exist as to the leakage potential of this type of casing connection. For these reasons, the MDH is not proposing to amend the rule. Mr. Thein also proposed that computer, communication, and other business courses be allowed to meet the continuing education criteria for certification renewal. The MDH responds that while contractors should be commended for furthering their general education, the minimal continuing education requirements for certification are to assure that persons keep abreast of specific well-related subjects.
- Leona Jondahl, a member of the public, recommended that chlorine be prohibited, and hydrogen peroxide be allowed. She submitted a copy of a petition addressed to the Secretary of Health and Human Services, and the Commissioner of the Food and Drug Administration to ban chlorine for use in purifying wells in the United States. The MDH responds that chlorine has a long history of use as a disinfectant in wells, water treatment systems, and water supplies, and is used for many other sanitation purposes. While chlorine presents some risks, such as the formation of trihalomethanes, the benefits of its use to prevent disease far outweigh its limitations. The MDH is proposing to amend the rule to allow well disinfectants such as hydrogen peroxide, if the disinfectant meets ANSI/NSF Standard 60.
- William Canty of Aqua-Plus, Inc. provided some technical information concerning welding, and recommended that the rule require at least one side of a casing butt weld to have a 60-degree bevel. The MDH responds that welding can be a very technically complicated activity. The proposed rule amendment was based on the minimal, simple requirements of the states of Michigan and Wisconsin. The MDH believes the proposed rule establishes a minimal and necessary standard.

DEPARTMENT OF NATURAL RESOURCES COMMENTS

Comments were received from the Minnesota Department of Natural Resources (DNR), Division of waters.

- The DNR asked why the specific formations are listed in the definition of "bedrock". The MDH responds that the formations listed are examples of bedrock, and are those formations that some contractors have thought were not bedrock since they may in part be only semi-consolidated.

- The DNR commented that the St. Lawrence formation, designated in the rule as a confining layer, is used as an aquifer. The MDH responds that in some circumstances the St. Lawrence will supply minimal quantities of water to a well, but in the available scientific studies by the Minnesota Geological Survey, and the United States Geological Survey, is shown to be a confining layer. However, the MDH has amended proposed rule part 4725.2020 to accommodate this variability.
- The DNR asked if electronic filing of reports was considered. The MDH responds that proposed rule part 4725.1851 contains a proposed amendment to allow the submission of records in alternative formats.

MINNESOTA POLLUTON CONTROL AGENCY COMMENTS

The Minnesota Pollution Control Agency (MPCA) submitted comments pertaining to isolation distances from sources of contamination that are included as an appendix. The majority of the MPCA recommendations have been incorporated into the proposed rule.

MINNESOTA WATER WELL ASSOCIATION COMMENTS

Comments were received from the Minnesota Water Well Association (MWWA) in writing, and at a presentation given by MWWA members at a meeting of the Advisory council on Wells and Borings on March 3, 2004.

- The MWWA recommended changes to the term "hydrofracturing." The MDH has revised the definition in response.
- The MWWA recommended removal of the proposed requirement that corrections of non-complying installations be equivalent to the original work. The MDH has removed the proposed requirement
- The MWWA recommended that a hardship clause be included for licensees or registrants who do not renew within one year. The MDH responds that a hardship clause is likely to be arbitrary and difficult to implement fairly. Instead, the MDH has proposed to extend the time period from one year, to two years.
- The MWWA recommended that all measurements be made from the top of the casing. The MDH believes that outside of a more fixed datum such as Mean Sea Level, the ground surface is a practical and more appropriate reporting datum since geology is measured from the ground surface.
- The MWWA recommended amendments to the "well house" proposed language, and recommended that the requirement for a concrete slab in a well house not be repealed. The MDH has amended the well house criteria in response, and retained the requirement for a concrete slab.
- The MWWA recommended that casings not be allowed to terminate six inches above a slab. The MDH has amended the proposed rule to allow termination six inches above the slab only where the slab terminates at least 6 inches above the ground and where a hand pump is installed. This is designed to accommodate persons in a wheelchair.
- The MWWA recommended that a larger annular space be required for all casing larger than 12 inches in diameter, not only for those deeper than 250 feet as proposed. After discussion with the MWWA and the Advisory Council on Wells and Borings, the MDH has proposed to amend the rule to require the larger annular space for casings deeper than 100 feet.

- The MWWA recommended that bentonite drilling fluid have a 10 mg/L chlorine residual. The MDH comments that the concentration of the chlorine is not critical, only that chlorine exists to eliminate bacteria, and that maintenance of an exact residual is extremely difficult due to changes in drilling conditions. The proposed amendment simply requires a chlorine residual.
- The MWWA recommended that full-length grouting be required of wells completed in bedrock. While the MDH supports full-length grouting of all wells, as explained in the discussion on grouting and elsewhere in this statement, the MDH feels that at this time, the rule should not be amended to require full-length grouting.
- The MWWA recommended that bentonite grout be allowed in bedrock except for limestone or dolomite. The MDH believes that the fluid nature of bentonite grout is not appropriate for a consolidated formation.
- The MWWA recommended that the isolation distance to a vertical heat exchanger be 20 feet. The MDH responds that the current isolation distance is 50 feet and the MDH is proposing to reduce this to 35 feet. The MDH believes that because vertical heat exchangers are often drilled into aquifers, and bypass the natural filtration afforded by soils that can mitigate surface contaminants, a 20-foot separation is not appropriate.
- The MWWA recommended that the isolation distance between a tested and approved sewer be reduced from 20 feet to 10 feet. Even though the sewer is made of better quality materials and has been tested to verify water-tightness, the MDH is concerned about leakage of untreated sewage 10 feet from a well due to a future failure of the sewer from a construction activity or from pipe corrosion.
- The MWWA recommended that the proposal to require verbal notification before drilling a public water-supply well be deleted. The MDH responds that public water supplies provide water to large population such as cities, and vulnerable populations such as day-care facilities and nursing homes. It is very important that a public well be properly constructed. Also, in lieu of requiring plan submission and approval for non-community public wells, the MDH has committed to the Environmental Protection Agency that all non-community public wells will be inspected. The notification is simple and a minimal burden to assure inspection of these critical wells. For these reasons the MDH is proposing to require notification.
- The MWWA recommended that the MDH notify the well contractor when a well is in a special well construction area. The MDH comments that this is not a rule requirement, but that the MDH has added this to the well construction notification, and has placed the special well construction area maps and technical data on the MDH website.

ADDITIONAL NOTICE: WEB POSTING AND MAILING

On May 3, 2005, copies of the March 22, 2004 Request for Comments, and a draft of the proposed amended Minnesota Rules, Chapter 4725, were mailed to:

1. Persons on the MDH's rulemaking mailing list established by Minnesota Statutes, section 14.14, subdivision 1a.
2. Members of the Advisory Council on Wells and Borings, established under Minnesota Statutes, section 103I.105.
3. Water well contractors licensed under Minnesota Statutes, Chapter 103I, and other persons who expressed interest or responded to the Request for Comments published in the State Register on March 22, 2004.
4. Delegated well program managers who administer local county or city water well programs.
5. The Minnesota Water Well Association in care of Mr. Dave Shulenberg, Director.

On May 4, 2005, the MDH posted on the MDH internet site a draft copy of the proposed rule, a copy of the Request for Comments as published in the State Register on March 22, 2004, a page of information and instructions about the proposed rule making, and a comment page allowing persons to directly comment via the Web page. The posting was highlighted on the MDH home page, Environment Health home page, and Well Management Section home page. The information was posted for 60-days and extended until July 18, 2005, due to the partial government shutdown. The posting provided details, and encouraged comments by mail, phone, FAX, E-mail, or via the internet.

Faxed, E-mailed, and verbal comments were received during the comment period from May 3, 2005, until July 18, 2005, from four persons:

- Jack Henrich of Bergerson-Caswell, Inc. recommended that collapsed material be allowed to remain in the annular space of a well within 50 feet of the surface if the contractor cannot successfully jet the annular space clean. The MDH responds that collapsed material may not be appropriate for grout, containing contaminated soil or highly permeable sediment, and enforceability of a discretionary rule is difficult.
- Brian Stangret of Midwest Drilling, suggested that the rule not allow 10 feet of fill material to remain in an elevator boring when sealing. The MDH has so amended the proposed rule.
- Bruce Jagunich of Bruce Jagunich Well and Pump, suggested clarifications to the definitions of "confining layer" and "hydrofracturing," elimination of iron drive shoes, and allowing stainless steel casing to be used for water-supply wells. The MDH has proposed amendments to the definitions of "confining layer" and "hydrofracturing in response to the comments. The MDH has not proposed an amendment to prohibit iron drive shoes. Even though iron drive shoes are infrequently used, some contractors still use them in certain applications. The MDH has not proposed to widely allow stainless steel casing for water-supply wells since the standard allows considerably thinner and weaker casing as compared to steel casing.
- Tim Haeg, of Watab, Inc., a septic system designer, recommended that the isolation distance between a replacement sewer and a well be reduced from 20 feet to 10 feet. As indicated earlier, long-term concerns for leakage of untreated sewage as close as 10 feet to what may be a shallow, or compromised old well is not appropriate. Where appropriate, the MDH has issued variances where the construction, conditions, geology, and controls can be evaluated in detail.

The website posting has remained active. Written and verbal comments have been received from July 18, 2005, until the present from:

- Tom Stevens, of T. L. Stevens Well Company Inc, recommended that plastic casing be protected with a steel outer casing or steel pitless unit. The MDH responds that this requirement existed in previous rule. It was removed due to information from plastic casing installers who reported no widespread damage problems from unprotected plastic casing, and technical problems using steel protection.
- Ray Flugie, City of East Bethel Building Official, recommended that the rules require a vacuum breaker on a pressure tank, allow a 20-foot isolation distance to an untested sewage sump basket, and allow replacement of a sewer less than 20 feet from a well. The MDH responds that the vacuum breaker issue involves freeze-protection issues, and both well rules and plumbing rules. Discussion about the issue has failed to arrive at a consensus. The well rules reduce the 50-foot isolation distance to 20 feet for a sewer that is constructed of better quality materials and has been successfully air-tested to demonstrate that the sewer does not leak. An untested sewage sump presents the same, or possibly greater risk of leakage as

compared to a sewer, since the sump has plumbing and electrical connections penetrating the sump. The MDH also does not think it appropriate to reduce the replacement sewer isolation distance as explained earlier.

- Don Swart of Don's Plumbing and Heating recommended that the rule be changed to no longer require a license bond for persons with a limited license who retire, but wish to maintain a company license. The MDH responds that Minnesota Statutes, Chapter 103I requires that a licensed contractor hold a bond, except the statute does not require a person with an individual well contractor license to hold a bond. A law change, not a rule change, would be required to establish an "emeritus" type license or a limited individual license without a bond.
- Jack Henrich, of Bergerson-Caswell Inc., recommended that the maximum time limit for submission of well records be extended from the existing 30 days, to 60 or 90 days, and to require a 5-foot isolation distance to all electric lines, LP tanks, and gas lines. The MDH responds that the 30-day time limit is required by statute. The MDH also responds that a 5-foot isolation distance does simplify the existing rule, but does not consider the different risks and protective measures unique to each hazard.

Representatives of the Irrigators Association of Minnesota, University of Minnesota Extension, and Minnesota Department of Agriculture met with the MDH on March 20, 2006 to discuss a recommendation from the Irrigators Association to allow temporary fertilizer chemigation tanks without secondary containment to be 20 feet from an irrigation well used for chemigation. The MDH agreed to amend the proposed rule to allow this if the chemigation tank is in conformance with Minnesota Department of Agriculture rules.

ADDITIONAL NOTICE - NOTICE OF INTENT TO ADOPT RULES

Based on the long history, varied groups contacted, and multiple outreach methods, the MDH believes that most persons interested in the rules are aware of the rulemaking process. The MDH proposes to mail a copy of the Notice of Intent to Adopt Rules, the proposed rule, and the Statement of Need and Reasonableness to:

1. Persons on the MDH's rulemaking mailing list established by Minnesota Statutes, section 14.14, subdivision 1a. This list contains 17 persons
2. Members of the Advisory Council on Wells and Borings, established under Minnesota Statutes, section 103I.105. The Advisory Council on Wells and Borings has ten contractor members representing the professions licensed or registered under Minnesota Statutes, Chapter 103I and Minnesota Rules, Chapter 4725; six persons representing state agencies with responsibilities and expertise with groundwater; and two public members.
3. Persons who commented on, responded to, or expressed interest in the Request for Comments published in the State Register, or the later web posting and direct mailing. Seventeen individuals, organizations, or agencies submitted comments.
4. Persons who requested at meetings, by telephone, or by other means to receive a certified copy of the rules. Forty persons, not otherwise listed above, requested a copy of the rules when proposed.
5. Delegated local well program managers who administer local county or city water well programs. Two cities, and eight counties have been delegated responsibilities for permitting and inspection within their jurisdictions.
6. The Minnesota Water Well Association in care of Mr. Dave Shulenberg, Director.
7. The Legislature pursuant to Minnesota Statutes, section 14.116.

The MDH proposes to mail a copy of the Notice of Intent, containing information as to how a copy of the proposed rule and the Statement of Need and Reasonableness may be obtained, to:

1. All MDH licensed contractors. The MDH licenses or registers persons who construct, repair, or seal wells or borings. Approximately 400 businesses are currently licensed or registered.
2. Persons on the Well Management Newsletter mailing list.

The Well Management Newsletter has been published since 1977, and mailed to all licensed or registered contractors, as well as to other person who have an interest in wells, borings, groundwater, and public health. Currently, print distribution of the newsletter has been stopped to shift distribution electronically. However, the mailing list will be used to mail copies to persons in local, state, and federal governments, contractors in associated fields such as septic system or plumbing installation, engineers and consultants who design wells, or monitor, manage, or remediate groundwater, and other individuals including water treatment specialists, attorneys, and the public. The mailing list includes approximately 730 persons (including well contractors)

The MDH proposes to post on the MDH web site, a copy of the proposed rule, Statement of Need and Reasonableness, a page of information and instructions about the proposed rule making, and a comment page allowing persons to directly comment via the web page. Analysis of the visits to the website using "Webtrends" reported that during calendar year 2006, the Well Management home page was visited 17,730 times, the proposed rule site containing the Request for Comments, instructions for submission of comments (including on-line submission), and a draft proposed rule was visited 863 times, and the draft proposed rule was downloaded 566 times.

The MDH has provided considerable notice to affected persons, as indicated above, and has received considerable input from the regulated community, industry groups, and the Advisory Council on Wells and Borings.

X. LIST OF WITNESSES AT HEARING

If this proposed rule goes to a public hearing, the MDH anticipates having the following witnesses testify in support of the need for and reasonableness of the proposed rule:

1. Daniel Wilson, manager of the Well Management Section of the Environmental Health Division, MDH.
2. Ronald Thompson, a supervisor in the Well Management Section of the Environmental Health Division, MDH.
3. Other MDH staff of the MDH Environmental Health Division will be able to testify as deemed necessary and appropriate.

XI. STATEMENT OF NEED AND REASONABLENESS

A. Definitions, Incorporations by Reference.

4725.0100. DEFINITIONS.

4725.0100, Subpart 1a. Absorption area. This definition is proposed to be added to clarify measurement of the separation distance required between a well and septic system. Minnesota Rules, Chapter 7080, establishes the standards for Individual Sewage Treatment Systems (ISTS). Minnesota Rules, Chapter 7080, is administered by the Minnesota Pollution Control Agency (MPCA) and local governments. The proposed rule references the MPCA definition in part 7080.0020, subpart 1 and as proposed for amendment by the MPCA in 31 SR 1025, part 7080.1100, subpart 2. The existing and proposed well rules require that minimum separation or "isolation" distances be maintained between a well and ISTS components. MPCA rules have already established in part 7080.0170, subpart 1, (and as proposed in 31 SR 1051, Minnesota Rules, part 7080.2150, subpart 2, G.) that separation distances from property lines or other components required by MPCA rules are measured from the soil absorption area--that is, the soil or engineered fill materials receiving sewage wastes. The definition of "absorption area", and its use in the proposed rule, is needed to be consistent with MPCA rules.

4725.0100, Subpart 1b. Agricultural chemical. Existing rule part 4725.4450, Subpart 1, item A, subitem (1) references the statutory definition. The reference has been moved to this rule part so that the definitions are in a common location.

4725.0100, Subpart 1c. Animal Unit. It is important to maintain an isolation distance or "setback" between sources of contamination and wells. Animals, and specifically animal fecal wastes, provide a real risk to water-supply wells. In May 2000, a community well serving the town of Walkerton, Ontario, became contaminated by cattle wastes, and ten people died from E coli 0157:H7. Although, maintaining the setback from animal wastes is important, it is not practical, or necessary, to prohibit all animals, including pets and birds, from ever approaching a well. MPCA feedlot rules, Minnesota Rules, Chapter 7020, define an "animal unit" as a minimum number of animals, based on the fecal wastes produced by the animal. This proposed amendment adopts this standard to maintain consistency with the MPCA, and allow establishment of a minimum standard, and hence a minimum risk, for compliance purposes.

4725.0100, Subpart 21. Aquifer. The term "aquifer" is proposed for amendment to reflect a more precise scientific definition. The term "bedrock" is now defined under subpart 21b, and will be used consistently elsewhere in the proposed rule to mean consolidated, coherent rock in the ground. The proposed definition better describes an aquifer in terms of its physical properties of being saturated or full of water, having a recognizable or measurable surface, and being quantifiable in terms of its ability to produce enough water to supply a well.

4725.0100, Subpart 21b. Bedrock. The term "bedrock" is proposed for addition to clarify the existing rule. The existing rule uses the term "rock' to mean both a description of a specific mineral, such as a specimen of granite which may be mixed within an unconsolidated formation, and a deposit or mass of solid granite in the earth. This proposed amendment will more properly

refer to the latter as "bedrock," a term in scientific publications, and in common usage. Additionally, a reference is made to sandstone formations that are geologically considered bedrock, but may be semi-consolidated (partly soft) leading some contractors to erroneously believe they are not bedrock. During the Cretaceous time period in Minnesota, shallow seas deposited generally discontinuous, thin, and irregular deposits of loose sandstone, shale, and limestone. From a geologic standpoint, the deposits are considered bedrock. From a well and boring construction standpoint, these deposits vary considerably, from some that are similar to unconsolidated deposits, to some that are similar to semi-consolidated bedrock. At times, it can be difficult for a contractor to identify these types of deposits. Because of the variability and lack of predictability, the MDH proposes to require the less stringent standard of considering the Cretaceous deposits as unconsolidated deposits for regulatory purposes.

4725.0100, Subpart 21c. Bentonite. Bentonite is a clay formed from decomposition of volcanic ash, and is largely composed of a clay mineral called "montmorillonite." When exposed to water, bentonite has the ability to absorb or adsorb water and swell. High grade bentonites may expand more than ten times their initial volume. Bentonite is used in the drilling industry as a drilling fluid component to educe friction at the drill bit, keep the drill hole from collapsing, and suspend the drill cuttings in order to carry them out of the drill hole. Because bentonite will expand when wet to fill voids, and because it resists the movement of water (and contaminated water), bentonite is used as a grout to fill the open space around a casing, or to fill and seal a well or boring in order to "seal" it.

Bentonite is produced in many grades with many swelling capacities. The American Petroleum Institute (API) standard in the existing rule is from 1985. This proposed amendment updates the reference to the most current standard.

4725.0100, Subpart 21d. Bentonite grout. The term "bentonite grout" is proposed for amendment to establish a single grout product with a minimum of 15 percent bentonite solids (from the existing "high-solids bentonite grout" standard), and to allow, but not require, additional sand, cuttings, or granular bentonite in the mixture if the contractor so chooses. The existing rule defines two types of bentonite grout, "bentonite grout" and "high-solids bentonite grout." High-solids bentonite grout is defined to be a mixture of water and a minimum of 15 percent bentonite. "Bentonite grout" is defined to be a mixture of water, a minimum of 10 percent bentonite, and 10 percent washed sand, cuttings, or granular bentonite. Few contractors use the bentonite grout minimum formula. The minimum difference in bentonite content is 5 percent and the rule does not establish a maximum. "Bentonite grout" becomes "high-solids bentonite grout" if additional bentonite is added. To simplify the rule, the MDH is proposing to delete the term "high-solids bentonite grout" and revise the definition of "bentonite grout" to combine both definitions.

The amendment also proposes to require the bentonite grout product be designed as a grout, to prevent use of inappropriate bentonites, and to require adherence to the manufacturers' mixing requirements. For example, some grouts are designed to be mixed to a 30 percent solids content. Diluting the solids in half by doubling the water content results in a mixture that does not set properly. The manufacturer recommends against this, but the present rule does not prohibit it. In order to achieve a grout, which properly seals, and does not settle, shrink, or crack, this

proposed use is needed to maintain the minimum solids content, and to follow any special mixing standards or formula established by the manufacturer.

Bentonite has historically been used by the drilling industry, in a mixture of approximately 5 percent bentonite and 95 percent water, as a fluid to drill and stabilize a hole. These "high-yield" bentonites provide a viscous (thick) mixture, with a minimum amount of solids. Drilling fluid, with 5 percent high-yield bentonite, has been used in the past to attempt to seal or grout the drill hole. However, this product has proven to be a poor sealant. Drilling fluid bentonites are designed to carry drill cuttings out of the drill hole and leave low concentrations of solids. High concentrations of solids in well construction are not desirable since they can plug or seal the aquifer.

The purpose of grout is the opposite of a drilling fluid--to leave solids in the ground, in order to plug and seal the formation. As such, drilling fluid, or "high-yield" bentonites used as grouts commonly lead to shrinking, cracking, and settlement. If the percentage of drilling fluid bentonite is increased much above 7 or 8 percent, the mixture becomes too thick to pump, yet still experiences shrinking and cracking as it dries out. In response to these problems, and the need for a bentonite-based sealant, numerous manufacturers have developed bentonite products designed specifically for use as grout. It should also be noted that bentonite is produced and sold for other purposes such as in animal feed additives, and in cosmetics. These bentonite products have different physical characteristics, and may not be appropriate for use as a grout.

4725.0100, Subpart 21e. Boring. The term "boring" is defined in Minnesota Statutes, section 103I.005, subdivision 2. Since this term is frequently used in this rule, this proposed amendment simplifies rule language by referencing the statutory definition, and provides examples of environmental bore holes for added clarification.

4725.0100, Subpart 22. Casing. This proposed amendment adds the adjective "bore hole" for clarity. The meaning is not changed.

4725.0100, Subpart 22a. Casing vent. This proposed amendment adds the terms "cap, or cover" for clarity. The meaning is not changed.

4725.0100, Subpart 22b. Cement-sand grout. The term "concrete grout" is used in the existing rule to mean a grout comprised of Portland cement, sand, and water. However, "concrete" is more properly a product containing gravel or aggregate, in addition to cement, sand and water. This has led to some confusion. The MDH also proposes to define, and allow "concrete" (a product with gravel or aggregate) in some instances. The term "cement-sand grout" is used in well regulations of other states, such as Wisconsin, to refer to a mixture of Portland cement, sand, and water. For clarity, this proposed amendment renames "concrete grout" as "cement-sand grout." The American Society for Testing and Materials (ASTM) C150 reference has been updated to the current standard.

4725.0100, Subpart 22c. Certified representative. The term "representative" has been previously defined to mean a human being who meets specified qualifications, obtains continuing education on an annual basis, and acts on behalf of the licensee or registrant for such activities as supervising operations, obtaining permits, and signing records. In 2005, Minnesota

Statutes, section 103I.005, subdivision 2a, was amended to change "representative" to "certified representative." This proposed amendment will to make the rule language comport with the amended statutory language.

4725.0100, Subpart 23a. Community water system. This term is used in existing rule part 4725.5850, and the definition in the Code of Federal Regulations is referenced in part 4725.5850, subpart 2. This proposed amendment simplifies this rule by moving the definition to a common, and easily locatable, location. The term "public" is deleted to be consistent with the definition in federal regulations. An explanation of the term is added, since the regulatory requirements for a community public water system well are somewhat different from other water-supply wells, and the term is often misunderstood.

4725.0100, Subpart 23b. Completion of work. This term is defined in order to establish a time line for complying with regulatory requirements and completing certain actions. Minnesota Statutes, section 103I.205, subdivision 9, requires that a verified report of construction or sealing be submitted "within 30 days after completion or sealing of the well or boring." The report is needed to verify compliance with the regulated work done by the contractor. Water sample test results are needed to assure sanitary quality. The term "completion of work" is not defined in statute. This proposed definition gives end points for a number of different situations, all relating to the substantial finish of the well work, but not including incidential activities not regulated by this chapter, including clean up and plumbing, nor contractual issues such as payment.

4725.0100, Subpart 23c. Concrete. The MDH is proposing to allow concrete to be used to seal large diameter wells and borings to reduce costs for the well or boring owner. Concrete is one-third or less the cost of neat cement. Concrete is a common material sold by "ready/mix" companies for construction projects. Concrete can be made using a wide range of formulas, and with a wide range of materials. Standards are needed to assure that the materials and mixture are appropriate for wells and for contact with potable water. This proposal establishes a minimum Portland cement content in order to assure that all aggregate particles are coated with cement to achieve a proper bond, and a low hydraulic conductivity (ability to prevent water movement). A maximum water content is needed to assure a proper set and cure, and provide a low hydraulic conductivity.

4725.0100, Subpart 24a. Confining layer. Confining layers are comprised of bedrock, such as shale, or unconsolidated materials, such as clay, that stop or severely restrict water movement. Confining layers separate aquifers. Aquifers are bedrock or unconsolidated materials that store and transmit water such as sand, gravel, or porous limestone. This proposed amendment defines "confining layer" to be geologically accurate, eliminate interpretation, adopt a quantifiable standard, and exclude small or minor layers of rock or unconsolidated materials that restrict water movement to an insignificant degree.

Methods used to classify geologic materials as to their ability to transmit water, or to retard water movement include:

- Textural classification.
- Field or laboratory test of the material's hydraulic conductivity.

- Aquifer (pumping) tests.
- Tracer or age dating.
- Water level measurement.
- Water quality analysis.

The MDH has established three criteria to determine the existence of a confining layer: a vertical hydraulic conductivity measurement of 10^{-6} centimeters per second (cm/sec) or less; the presence of sediment meeting the United States Department of Agriculture textural classification of clay, sandy clay, or silty clay; or the presence of a sedimentary bedrock mapped and described in the scientific literature as a confining layer. These three criteria are the most commonly available, and include a simple field identification method, a specific measurable numeric standard, and published scientific literature.

4725.0100, Subpart 24a, Item A. "Hydraulic conductivity" is a physical measurement of the ability of a porous medium to transmit water, and is the most direct method used to distinguish confining layers from aquifers. While the method is the most scientifically accurate, it is expensive and is done usually only during scientific investigations. Davis and Dewiest in their book Hydrogeology (Krieger Publishing, 1991), describe good aquifers as having hydraulic conductivities between 10^{-3} and1 cm/sec and poor aquifers as having hydraulic conductivities between 10^{-6} and 10^{-3} cm/sec. The Minnesota Pollution Control Agency and the Minnesota Department of Agriculture have established permeability (conductivity) values for clay or soil liners used to confine the movement of contaminants. The Department of Agriculture rules, Minnesota Rules, part 1505.3080, subpart 5, require a minimum 10^{-6} cm/sec permeability for soil liners to prevent leakage of pesticides in a containment facility. The Pollution Control Agency has established a 10^{-7} cm/sec permeability requirement for landfill barrier liners in Minnesota Rules, part 7035.2815, subpart 6. The 10^{-6} cm/sec number presents a reasonable amount of protection, and is not changed from the standard in the existing rule, part 4725.0100, subpart 24a. This is also the criterion adopted by other state programs to confine movement of fluids through the subsurface, and is consistent with minimum conductivities measured in layers considered by the scientific community to be confining layers.

4725.0100, Subpart 24a, Item B. "Sandy clay," " silty clay," and "clay" are sediment types that are encountered relatively commonly in unconsolidated formations in Minnesota. Well and boring contractors can identify these materials in the field by simple visual inspection of drill cuttings, and by the way the drill behaves when it penetrates the unconsolidated formation. Drilling records, geologic logs, and geophysical testing can also be used to identify these confining layers. The ease of clay identification eliminates the need for expensive and time consuming testing. These sediment types have hydraulic conductivities typically less than 10^{-6} cm/sec. The hydraulic conductivity values for unweathered marine clay reported in Groundwater, by R. Allen Freeze and John A. Cherry, (Prentice Hall, 1979), range from 10^{-6} to 10^{-10} cm/sec.

The proposed minimum thickness of ten feet for items A and B has been added to exclude from regulation thin or insignificant layers. Layers ten feet or more in thickness provide sufficient thickness at the site to confine water movement. Layers of this thickness typically extend for considerable distances beyond the site. Ten feet also represents a quantity measurable by contractors and inspectors working in the field.

4725.0100, Subpart 24a, Item C. The sedimentary confining layers specified in item C exist over a large area in southeastern Minnesota, extending from Chisago County to the Iowa border, and from the Wisconsin border west to Blue Earth County. These confining layers have considerable horizontal extent, and their hydraulic conductivities remain fairly constant across tens or hundreds of miles. Geologic maps provide notice of the confining layer's occurrence, and where a county atlas or other detailed investigation has been done, provide specific information on the depth and thickness of the confining layers. The Decorah and Glenwood confining layers consistently have the lowest vertical hydraulic conductivities, and the most consistent lithology. This means that Decorah or Glenwood thicknesses of less than 10 feet act as significant confining layers. Because of the importance of these confining formations, and the relative ease of identification, this proposed rule establishes a 2-foot minimum thickness for these two confining layers. Hydraulic conductivity values of regional sedimentary confining layers published by the United States Geological Survey in: "Water Resources Investigations Reports 90-4001 and 90-4081, Open file report 84-867," and in "Anisotropy in the Ironton and Galesville Sandstones Near a Thermal-Energy-Well, St. Paul, Minnesota," indicate vertical hydraulic conductivities of 1.2×10^{-9} cm/sec for the Decorah, 3×10^{-9} cm/sec for the Glenwood, 7×10^{-5} cm/sec to 3.5×10^{-9} cm/sec for the St. Lawrence, and 3.5×10^{-7} cm/sec to 2.6×10^{-9} cm/sec for the Eau Claire.

These values are sufficient to prevent significant flow of water between the aquifers separated by the confining layers.

4725.0100, Subpart 24b. Confining materials. Part 4725.4450, subpart 2, requires that the isolation or "setback" distances be doubled between a sensitive water-supply well, and a contaminant discharged or disposed of into the soil. A "sensitive well" is a well that is more likely to be impacted by surface contaminants because the well does not penetrate geologic materials that slow water movement or attenuate contaminants, and the well is obtaining it's water from very near the surface. Geologic materials that stop or slow water movement help to protect the well. Multiple thin layers of these confining materials can have the same effect as a single thick layer. This proposed amendment defines "confining materials" to the same technical criteria as a "confining layer," but allows multiple layers, each less than 10 feet thick, to be added together.

4725.0100, Subpart 24e. Cuttings. This proposed amendment defines "cuttings." The existing rule uses this term without defining it. This has led to some persons shoveling undesirable materials including native soil, dirt, landscape rock, organic materials, and debris into the well. The intent of allowing cuttings to be placed back into some wells and borings is to enable materials removed from a drill hole to be returned to the same drill hole, without adding undesirable materials.

4725.0100, Subpart 24f. Dewatering well. This proposed amendment refines the definition of the term "dewatering well" as broadly defined in Minnesota Statutes, section 103I.005, subdivision 4a., as a nonpotable well used to lower groundwater levels for construction and use of underground space. The statutory definition goes on to list exemptions for wells less than 25 feet deep used for temporary dewatering during construction, and wells that are used to lower groundwater levels for contaminant removal. There has been some misunderstanding concerning temporary dewatering wells greater than 25 feet deep, and permanent dewatering wells regardless of depth. Neither of these types of dewatering wells is exempted.

It has become common practice for new buildings with basements, including homes, to install perforated, horizontal drain tile around the building footing. The drain tiles are connected to a sump or pit, with a sump (water) pump. Thousands of these systems are installed each year to prevent water from entering the basement. While most of the water encountered is direct surface infiltration along the building wall, it could be argued that these meet the definition of "well" and "dewatering well," and are therefore regulated as wells. These systems are not wells in the conventional sense of the term. The water removed is largely due to the presence of the building. Regulating these systems as wells would provide little protection for the environment and it is reasonable to exempt them.

4725.0100, Subpart 24g. Dewatering well contractor. The terms "elevator boring contractor," "limited well contractor," "monitoring well contractor," and "well contractor" are defined in statute. "Dewatering well contractor" is not defined, but is used in both statute and rule. This proposed amendment defines "dewatering well contractor" to clarify that the person must be licensed, and provides a term similar to other licensees without having to repeat the language "a person issued a well/boring contractor's license to construct, repair, and seal dewatering wells" every time the license is mentioned.

4725.0100, Subpart 26a. Drilling machine. The term "drilling machine" is used in Minnesota Statutes, chapter 103I, but is not defined in the statute. Registration of drilling machines is required by statute. The proposed amendment to the existing rule definition is intended to exclude small hand-held devices such as hammers, which may be used to drive small wells or borings. Registration of these would serve little purpose. This proposed definition also adds "crawler" to the list of vehicles on which a drilling machine can be mounted, since track mounted vehicles have become more common.

4725.0100, Subpart 26b. Drive-point well. This proposed amendment refers the reader to the definition of "drive-point well" in statute.

4725.0100, Subpart 26c. Drive-point well or dug well contractor. The terms "elevator boring contractor," "limited well contractor," "monitoring well contractor," and "well contractor" are defined in statute. The term "drive-point well or dug well contractor" is not specifically defined, in statute. It is one category of "limited well contractor" referred to in statute as a "limited well/boring contractor constructing, repairing and sealing drive-point wells or dug wells." This proposed definition clarifies that a person working as a drive-point well or dug well contractor is licensed.

4725.0100, Subpart 26d. Driven casing. The term "driven casing" has been used in the rule to differentiate the practice of forcing casing into the ground while drilling inside the pipe ("driving"), from the practice of drilling a larger hole to the desired depth, and then lowering the casing into the larger diameter hole. Driven casing is believed to be moderately well sealed to the surrounding geological materials in some geologic circumstances. Casing installed in an oversized hole has an open "annular" space surrounding the casing that must be filled with grout. This proposed definition describes the practice as it is being used in the industry.

Traditionally, casing was driven with a "cable tool machine." A cable tool machine uses a bit, smaller in diameter than the inside diameter of the casing, that is alternately raised and lowered through the casing. The bit hits into the sediment or rock, and grinds up the geologic materials. After a period of pounding, the bit is removed, a bailer is inserted to remove the cuttings, the casing is driven into the newly opened segment, and the process is then repeated. Today, alternatives to the cable tool (sometimes referred to as "drill and drive") have been developed that advance the casing while drilling a hole equal to, or in some cases larger than, the outside diameter of the casing. The proposed definition establishes the distinction between a driven casing, and one placed in an oversized hole (that requires grouting) when a hole is drilled larger than the outside diameter of the casing, coupling, or drive shoe. Additional discussion is found in part 4725.3050, subpart 5.

4725.0100, Subpart 27. Dug well. The existing definition of "dug well" defines the well in terms of the materials, not the method of construction. The method of construction is as distinctive and important, as the materials. This proposed amendment adds a description of the unique methods of constructing dug wells to differentiate from conventional well construction methods such as rotary or cable tool.

4725.0100, Subpart 27a. Elevator boring. Elevators commonly work in one of two very different ways. One type of elevator uses a hydraulic cylinder (piston) installed in a boring drilled into the ground below the elevator car that pushes the elevator car up. The other type of elevator uses cables and winches to pull the elevator car up. Minnesota Statutes, Chapter 103I, pertains to wells, borings, and underground uses. The legislative intent expressed in section 103I.001 is to develop and protect groundwater. The law regulates wells or borings in the ground. Cable elevators do not have a well or boring in the ground. Therefore, it is reasonable to clarify in this proposed amendment that cable elevators are not regulated by this rule.

The statutory definition of "elevator boring" refers to a bore hole, jack hole, drilled hole or excavation constructed to install an elevator hydraulic cylinder. Hydraulic cylinders are commonly installed at automobile service stations to lift or "elevate" an automobile approximately 6 feet above the floor level. These are not "elevators" in the common usage of the term, and the drilled hole is very shallow. Therefore, it is reasonable to exempt service station automobile lifts from regulation.

"Holeless" elevators utilize a hydraulic cylinder. However, the cylinder for a "holeless" elevator is installed in a dug pit, other than a drilled boring. Holeless elevators are also installed for very short lifts. MDH is proposing to exempt "holeless" elevators from regulation.

4725.0100, Subpart 27b. Elevator boring contractor. For simplification and clarity, this proposed amendment references the statutory definition of "elevator boring contractor."

4725.0100, Subpart 27c. Environmental bore hole. "Environmental bore hole" is defined in statute. The existing rule definition was adopted in 1993 to provide examples of borings that meet the definition of environmental bore hole, because the definition in statute was misunderstood by many. Because questions and confusion still occur, MDH proposes to further clarify the conditions of statute in a more logical order (a boring encountering groundwater, that is 25 feet deep or penetrates a confining layer, and that does not remove groundwater). A "piezometer" is the name commonly given to an environmental bore hole used to measure a groundwater level.

4725.0100, Subpart 28a. Feedlot. This proposed amendment simplifies this rule by moving the feedlot definition currently found in part 4725.4450, subpart 1, item E, subitem (2), to this subpart.

4725.0100, Subpart 29a. Groundwater. The term "groundwater" is defined in Minnesota Statutes, section 115.01, as "water contained below the surface of the earth in the saturated zone..."

Many construction activities not related to wells or borings result in the excavation of pits or holes in the ground that are excavated, lined with an impermeable membrane or material, and then filled with sand or soil. The excavations could include building pads, basins for petroleum tanks at gas stations, and even to the extreme, a child's sandbox. These artificial basins fill with rainfall, which become in a broad sense "groundwater." However, since these are not connected to groundwater outside the basin, the water that accumulates inside the basin has little impact on groundwater resources or public health. Therefore, it is reasonable to exclude these from the definition in this proposed amendment.

4725.0100, Subpart 29b. Groundwater thermal exchange device. The term "groundwater thermal exchange device" is defined in statute to be "a heating or cooling device that depends on extraction and reinjection of groundwater from an independent aquifer to operate." This proposed definition references the statutory definition and clarifies that the device includes both the withdrawal and injection wells.

4725.0100, Subpart 30. Grout. This proposed amendment revises the term "grout" to be consistent with the change of terminology from "concrete grout" to "cement-sand grout," and to delete the term "high-solids bentonite grout." The descriptive term, "low permeability," is added to clarify that the purpose of the grout is to restrict the movement of fluids and contaminants.

4725.0100, Subpart 30a. High-solids bentonite grout. This proposed amendment deletes the term "high-solids bentonite grout" and incorporates the definition into the amended definition of "bentonite grout."

4725.0100, Subpart 30c. Hazardous substance. This proposed amendment moves the reference to the statutory definition of "hazardous substance" from part 4725.4450, subpart 1, to this subpart to simplify this rule.

4725.0100, Subpart 30d. Hoist. The term "hoist" is used in Minnesota Statutes, section 103I.545. The statute does not specifically define hoist, but requires registration of hoists used for activities requiring a license, used for sealing, or used for installing pumps. This proposed amendment clarifies that a hoist is not a drilling machine.

Technically, a rod, pipe, or pipe wrench is a simple "machine" and would require registration. In this proposed amendment, the modifier "motorized" eliminates hand tools, the registration of which would serve no purpose.

This proposed amendment adds the term "crawler" to the list of the types of vehicles a hoist may be mounted on. For example, hoists may be mounted on a tracked vehicle, or "crawler," to access swampy locations.

4725.0100, Subpart 30d, Item D is proposed for addition to include the range of activities covered in statute.

4725.0100, Subpart 30f. Hydrofracturing. This proposed amendment adds a definition of "hydrofracturing." Hydrofracturing has been used in oil wells for tens of years to fracture oil reservoir rock and increase oil yields. More recently, hydrofracturing has been used in igneous and metamorphic rocks such as granite, to increase water yield of low producing aquifers. Water is injected under high pressure to expand existing fractures in bedrock, create new fractures, and interconnect fractures, to increase water yield. However, water may also be injected into wells under low pressure for such purposes as the development of a screen, or the cleaning of incrustation or scale. Hydrofracturing does not include these low pressure applications that do not fracture bedrock.

4725.0100, Subpart 30h. Interceptor. The term "interceptor" is defined in existing rule part 4725.4450, subpart 1, item E, subitem (5). This proposed amendment moves the definition to this part to simplify the rule by combining all definitions in one location.

4725.0100, Subpart 30i. Licensee. The term "limited contractor" was changed during the 2005 legislative session in Minnesota Statutes, Chapter 103I, to "limited well/boring contractor." This proposed amendment is a technical change to reflect the change in the statute.

4725.0100, Subpart 30j. Limited well/boring contractor. The term is defined in statute as a person possessing a limited well/boring contractor license. The statutory definition does not provide further explanation. There has been some confusion with respect to which license categories are included in the definition. For example, elevator boring contractors are not included, while vertical heat exchanger contractors are included. To eliminate this confusion, this proposed amendment lists the types of limited licenses included in the definition of "limited well/boring contractor" as identified in Minnesota Statutes, section 103I.531.

4725.0100, Subpart 30k. Manure storage area. The term "manure storage area" is defined in Minnesota Rules, section 7020.0300, subpart 14. It is also referenced in existing rule part 4725.4450, subpart 1, item C, subitem (1). This proposed amendment simplifies this rule by placing all definitions in one location.

4725.0100, Subpart 30l. Manure storage basin. This proposed amendment adds a definition of "manure storage basin." The advent of large confined animal feedlots, referred to as Confined Animal Feeding Operations (CAFO), has resulted in the construction of large manure storage basins, some containing thousands of gallons of liquid manure. Recent studies by the MPCA have demonstrated that plumes of contaminants from some manure storage basins exceed the drinking water standard far beyond the 50-foot setback in present rule. As such, a larger setback from manure storage basins is proposed, as compared to manure storage areas. The definition distinguishes manure storage basins from manure storage areas based on the storage being below ground in an excavation.

4725.0100, Subpart 30n. Neat-cement grout. This proposed amendment modifies the existing definition of "neat cement" to acknowledge that additional water is needed to make a fluid, pumpable mixture when bentonite is added to neat cement. The amendment also clarifies that densities decrease with the addition of bentonite. This proposed amendment also establishes a minimum density so that contractors and inspectors working on the jobsite can determine if the grout meets the minimum standards by using a common measuring device--a mud balance. The minimum density standards are those of Type 1 Portland neat-cement grout published by the State of Michigan in the Michigan Water Well Grouting Manual, (Michigan Department of Health, January, 1988).

Neat cement is either mixed in multiple batches by the well or boring contractor on the job site, or delivered already mixed in a "ready/mix" cement truck by a cement supplier. Containers used to mix the grout are not always cleaned or drained between batches, quantities are not always measured, and off the site mixing make it difficult to verify that the grout meets minimum standards. Accordingly, a simple on-site test is needed to verify that the minimum standards have been met. Density can be easily determined in the field by taking a small sample and measuring the sample on a mud scale. A mud scale is a simple, inexpensive device specifically made for this purpose.

4725.0100, Subpart 30o. Noncommunity water system. Existing rule parts 4725.5825 and 4725.5850 differentiate between community and noncommunity water systems, and include requirements that are different from other water-supply wells. This proposed definition is consistent with the definition in Minnesota Rules, Chapter 4720, relating to public water supplies, and the Safe Drinking Water Act definition of a "noncommunity water system."

4725.0100, Subpart 30p. Ordinary high water level. This proposed amendment moves the existing definition from part 4725.4350, subpart 1, to simplify the rule by combining all definitions in one location.

4725.0100, Subpart 30q. Pasture. This proposed amendment moves the definition from part 4725.4450, subpart 1, item E, subitem (3), to simplify the rule by combining all definitions in one location.

4725.0100, Subpart 30r. Person. For simplification and clarity, this proposed amendment references the statutory definition of "person."

4725.0100, Subpart 30s. Petroleum. This proposed amendment moves the existing definition from part 4725.4450, subpart 1, to simplify the rule by combining all definitions in one location.

4725.0100, Subpart 33. Pitless unit. A pitless unit is a pitless adapter with the addition of casing that extends to the surface. The proposed amendment adds language from the pitless adapter definition describing how the device functions.

4725.0100, Subpart 34. Pollution or contamination. This proposed amendment clarifies that pollution or contamination can have a deleterious effect on not only the user of a well, but also on the user of a boring, and on the ground water resource itself.

4725.0100, Subpart 34a. Portland cement. This proposed amendment is a technical change to update the citation to the current ASTM standard.

4725.0100, Subpart 35a. Potable water-supply well. The existing rule parts 4725.45550 and 4725.5650, use the term "potable water-supply well," but the term is not defined in the existing rule. This proposed amendment adds a definition to differentiate a well that supplies water for consumption, and where a higher level of protection is needed, from a well used for other water supply purposes, such as industrial processing.

4725.0100, Subpart 37a. Public water-supply well. This amendment is proposed to differentiate a public water-supply well from a public water system. A "public water system" includes the well, water treatment and storage facilities, and water distribution pipes. The definition of "public water system" must be consistent with the federal Safe Drinking Water Act, and the definition of "public water-supply well" is needed to address specific requirements for this type of well.

4725.0100, Subpart 37b. Public water system. This proposed amendment clarifies that the term "public water system" includes both community and noncommunity water systems.

4725.0100, Subpart 40a. Rapid setting cement. This proposed amendment clarifies the definition in existing rule. The amount of time necessary for cement to set and to reach final strength can be reduced by special processing of the cement, or by addition of small quantities of various chemical accelerators. The existing rule part 4725.3050, subpart 2, and the proposed modification in part 4725.3050, subpart 2a, require a waiting period after cementing, before drilling activities can resume. This is necessary to prevent cracking or other damage to the cement. The "wait on cement" time, as it is commonly referred to, can be reduced by using a rapid setting cement. However, the addition of too much chemical accelerator, or the wrong chemical, can negatively affect the final grout properties. Calcium chloride, sodium chloride, and gypsum are common accelerators, and have the lowest toxicity.

Virtually all manufactured rapid-setting (or "high-early") cements are made under one of two standards; the American Society for Testing and Materials (ASTM), or the American Petroleum Institute (API). The rapid setting cement designation of ASTM is "Type III," and the API designation is "class C." The ASTM standard is also updated.

4725.0100, Subpart 41b. Remedial well. This proposed amendment clarifies that a remedial well is a type of water-supply well. The definition in existing rule excludes horizontal trenches. Some remedial systems include shallow horizontal trenches connected to a pit or sump to collect contaminants. It is difficult and unnecessary to apply well construction standards to an excavated sump or pit less than 10 feet deep.

4725.0100, Subpart 41c. Representative. The definition of "representative" is proposed for deletion since the term "representative" has been modified in Minnesota Statutes, section 103I.005, subdivision 2a, to "certified representative."

4725.0100, Subpart 41d. Rock. The definition of the term "rock" is proposed for amendment. In the present rule, "rock" is used to mean either a distinct mineral or group of minerals, such as quartz, basalt, or limestone (calcium carbonate), or a large mass of minerals formed in the earth. The latter meaning is commonly, and more descriptively, termed "bedrock," and is proposed for definition in part 4725.0100, subpart 21b. The modifiers "consolidated or coherent," and "hard" are deleted since some rocks may be less consolidated or soft.

This proposed amendment also deletes the examples of unconsolidated materials that are not rock, since the examples are more appropriately included in the definition of "bedrock."

4725.0100, Subpart 41e. Sand. The term "sand" is used in existing rule, but is not defined. This proposed amendment adds a definition to differentiate the natural mineral material from other same-sized particles such as organic material, metal chips, or plastic shavings. Existing rule, part 4725.1851, subpart 4, item A, establishes a sand standard based on particle size. The proposed definition includes the particle size standard, specifies that the material consists of unconsolidated minerals, and specifies that the minerals are predominately quartz (the mineral in common sand).

4725.0100, Subpart 41f. Scrap yard. This proposed amendment to part 4725.4450, subpart 1, item E, subitem (21), adds an isolation distance between a water-supply well and a scrap yard. This proposed definition is being added to define "scrap yard." Scrap yards, particularly those that accept automobiles or other power equipment containing gasoline, antifreeze, and other petroleum products, represent a source of contamination for a well. The proposed definition is taken from Dakota County Solid Waste Management Ordinance 110, section 2.99.

4725.0100, Subpart 41g. Screen. The existing rule uses the terms "screen" or "well screen" without definition. A definition of "screen" is proposed for clarity. There has been some disagreement as to the definition of a screen, with some individuals going as far as to say that a defective casing with holes is really a screen, and therefore not a rule violation. The proposed definition describes the physical nature of the screen as a designed, perforated structure at the

bottom of a watertight casing, and describes the purposes of the screen, to allow water entry and prevent the entry of sediment. The term "screen," not "well screen," is used in this proposed amendment, and elsewhere in the rule, since a boring may also have a screen.

4725.0100, Subpart 41h. Screen leader or riser. This proposed definition describes a screen leader or riser, because the term is used in existing and proposed rule and is not currently defined. The existing rule uses the terms "leader" or "blank screen" to denote what is now proposed to be consistently called a "screen leader or riser." This is the term in common usage in the water-supply well and monitoring well industries.

4725.0100, Subpart 41i. Screen sump. Similar to a screen leader of riser, the term is used in the existing rule without definition. This definition is therefore proposed for clarity. A screen sump is a piece of casing attached to the bottom of a screen to allow a "trap" in which sediment can accumulate, instead of filling the screen and causing a reduction in water flow.

4725.0100, Subpart 42. Sewage. This proposed amendment moves the definition of "sewage" into alphabetical order.

4725.0100, Subpart 43. Seepage pit, leaching pit, or dry well. Seepage pits, leaching pits, and dry wells are considered failing systems under the Individual Sewage Treatment System rules, Minnesota Rules, Chapter 7080. However, numerous old systems still exist, and are in use. Most of these systems were installed before construction regulations (or prohibitions) existed. The systems are excavated or buried in the ground, and constructed of numerous materials including steel, wood, concrete, brick, and stone. Sewage enters the pit or excavation and seeps, sometimes very quickly, into the soil. This proposed amendment adds the terms "tank" and "receptacle," since many seepage pits, leaching pits, or dry wells often have a frame or structure, and are not just a dug pit.

4725.0100, Subpart 43a. Sensitive water-supply well. Existing rule part 4725.4450, subpart 2, requires that the isolation distances be doubled between a contamination source actually entering the soil, and a well with less than 50 feet of casing that does not penetrate a confining layer. These types of wells are often referred to as "shallow" wells, since most are. However, a deep well with minimal casing (for example, a 300-foot deep well that encounters bedrock at 20 feet, and therefore only has 20 feet of casing) is included in this class. These wells are more vulnerable or "sensitive" to contamination due to the lack of confining materials, and the short depth to the well intake. In order to avoid repeating the lengthy description, "a water-supply well with less than 50 feet of watertight casing where the casing does not penetrate a confining layer, or penetrate multiple layers of confining materials with an aggregate thickness of 10 feet or more," this proposed amendment creates the term "sensitive water-supply," consistent with the criteria formerly in part 4725.4450, subpart 2.

4725.0100, Subpart 44a. Sewage. This proposed amendment moves the definition of "sewage" from subpart 42 and places it in alphabetical order. "Grey-water" discharge from laundry and bath is a type of water-carried waste product. While the broad definition of "sewage" in statute

would include grey-water, the MDH is proposing to specifically identify grey-water, since some persons have misunderstood sewage to only include toilet wastes, and some facilities have separate grey-water systems.

4725.0100, Subpart 44b. Sewage sump. There are numerous terms used to denote a tank or receptacle into which sewage drains, usually by gravity, and from which sewage is pumped, typically to some type of sewage treatment system. This proposed definition establishes that for the purposes of this rule, all of these tanks will be referred to as "sewage sumps."

4725.0100, Subpart 45a. Soil treatment system. This proposed amendment replaces the existing term, "subsurface disposal system" with the term, "soil treatment system" to be consistent with rules of the Minnesota Pollution Control Agency. The statewide rule requirements for Individual Soil Treatment Systems (ISTS) are contained in Minnesota Rules, Chapter 7080. The ISTS rule now uses the term "soil treatment system" to mean what the term "subsurface disposal system" means in the existing well and boring rule.

4725.0100, Subpart 46. Subsurface disposal system. This proposed amendment deletes this definition, since the term is proposed for replacement with "soil treatment system" in subpart 45a.

4725.0100, Subpart 47. Static water level. This term is proposed for amendment to include "boring" in addition to the term "well," since the static water level may also be measured in a boring.

4725.0100, Subpart 47a. Storm water drain pipe. The existing rule requires a setback between storm water drain pipe and a water-supply well, since a storm water drainpipe can carry petroleum products, fertilizers, and other contaminants in runoff. The existing rule does not define "storm water drain pipe." A number of questions have been raised about various pipes carrying water, such as rain-water down spouts, agricultural drainage tile, or culverts across driveways. This proposed definition limits the storm water drain pipes to those most likely to carry storm water runoff with significant levels of contaminants, and excludes others that present a minor risk or are regulated elsewhere.

4725.0100, Subpart 49. Suction line. This proposed amendment clarifies the definition of "suction line" to include borings, since suction lines are commonly installed on environmental bore holes for vapor remediation.

4725.0100, Subpart 49d. Unconsolidated materials. Proposed amendments to part 4725.0100, subparts 21b and 41d modify the terms "rock" and "bedrock." The definition of the term "unconsolidated materials" is proposed to be amended to provide additional examples of unconsolidated materials to help the reader differentiate, identify, and report this type of geological material.

4725.0100, Subpart 49f. Vertical heat exchanger contractor. The term "(licensed) vertical heat exchanger contractor" is used in Minnesota Statutes, section 103I.105, paragraph (a), clause (12), but is not defined in statute. This proposed definition establishes a term consistent with other licenses and registrations in the rule.

4725.0100, Subpart 49g. Vertical heat exchanger piping. This proposed definition is added to clarify that this rule pertains only to the vertical portion of the piping. The definition of "vertical heat exchanger" in Minnesota Statutes, section 103I.005, subdivision 20, refers to a sealed piping system installed vertically in the ground. The entire heat exchanger system (not regulated as a vertical heat exchanger) also includes the horizontal piping that connects the vertical pipes together, the piping in the heat pump, and the piping that distributes the heated or cooled heat transfer fluid to its intended destination.

4725.0100, Subpart 49h. Wastewater treatment unit. This proposed definition refers the reader to the definition of "wastewater treatment unit" in MPCA rules for clarity and simplification. The term is proposed to be used in part 4725.4450, subpart 1, item D, subitem (7).

4725.0100, Subpart 50a. Water-supply well. The existing definition of "water-supply well" is proposed to be amended for clarity. A water-supply well is one type of well. The statutory definition of "well" includes excavations that locate, divert, recharge, or acquire groundwater. Minnesota Statutes, Chapter 103I was amended in 2005 to add a definition of "water-supply well." "Test wells" drilled to determine the feasibility of completing a (usually large) production well are drilled to locate, and if possible, acquire groundwater. Therefore, they meet the statutory definition of "well."

4725.0100, Subpart 51. Well. The existing definition of "well" references the statutory definition. This proposed amendment lists the three types of wells regulated by the statute, but not listed in the statutory definition.

4725.0150. INCORPORATIONS BY REFERENCE AND ABBREVIATIONS.

The MDH is proposing to amend this rule by consolidating various documents, specifications, and standards into a single rule part for ease of reference and to shorten the overall length of the rule. The justifications for the individual specifications and standards are contained in the rule part where they are referenced. The standards referenced are national or international standards of wide applicability and acceptance. The incorporated documents are readily available from the source listed, such as the American Society for Testing and Materials (ASTM), through the MDH library, or the Minitex interlibrary loan system.

Governmental bodies or other organizations set standards by establishing criteria for performance; establishing specifications of manufacturing, design, or use; and defining terms. Standards establish consistency, such as assuring that a light bulb made in New York, fits in a light socket made in California, much less one made in a foreign country. There are many organizations that make standards. The American National Standards Institute (ANSI) has

established criteria for the standard-making process to maintain consistency between the various standard-making organizations. As such, some of the standards in the existing rule, such as those of NSF International, are now joint ANSI/NSF standards.

The proposed rule has been updated to correctly cite the new joint standards with ANSI, the API address has been changed, and the most recently published standards have been incorporated.

B. Applicability, Enforcement, Fees, Variance.

4725.0200 APPLICATION TO ALL WELLS AND BORINGS.

4725.0200, Subpart 3. This subpart, following subpart 2 that pertains to well or boring owner responsibility, is proposed to establish the responsibilities of the licensee or registrant. Minnesota Statutes, section 144.99, subdivision 2, allows the commissioner of health to examine books and data, and to obtain information from a person who has the duty to provide information under the statutes and rules cited, including Minnesota Statues, Chapter 103I. Minnesota Statutes, section 144.99, subdivision 8, allows the commissioner to deny or refuse to renew a license, permit, registration, or certificate of a person who provides false material information. The licensee or registrant is the entity deemed competent to understand and comply with statutory and rule requirements. Minnesota Statutes, Chapter 103I and this rule require the licensee to be or have a person who has the requisite practical experience, and who has taken and passed an examination. The examination is principally on statute and rule requirements. It is reasonable to expect the licensee, the person responsible for compliance, to verify conditions, and therefore compliance.

4725.0200, Subpart 4 is proposed to provide a reference to the information and property access provisions of the Health Enforcement Consolidation Act, Minnesota Statutes, Chapter 144. This allows the commissioner to examine records and enter property for the purposes authorized in statute.

4725.0200, Subpart 5 is proposed to reference Minnesota Statutes, section 103I.111, which allows the commissioner to delegate portions of the commissioner's authority over wells and borings to a board of health. The statute allows the board of health to adopt an ordinance that may be different from, but not less stringent than, Minnesota Rules, Chapter 4725.

4727.0250 ENFORCEMENT.

4725.0250, Subpart 1. This proposed amendment lists enforcement options available to the commissioner under Minnesota Statutes, Chapter 103I, Minnesota Statutes, Chapter 14, and Minnesota Statutes, sections 144.99 and 144.992.

4725.0250, Subpart 2. This subpart is proposed to specify the responsibilities of the person who creates a violation of this rule. Minnesota Statutes, section 144.99, subdivision 3, allows the commissioner to issue correction orders that require a person to correct a violation of the statutes, rules, or other actions listed in section 144.99, subdivision 1. In some cases, correction of the violation may only be possible, or cost effective, by permanently sealing the noncomplying well or boring. Sealing the noncomplying well or boring leaves the owner without a water supply or

other asset that the well or boring provided. It is reasonable to require the person who committed the violation, and who put the well and owner at risk, to provide a complying well or boring to the owner.

A portion of the work on a well or boring may be subcontracted to another contractor. The physical work on a job may be done by one or more of the licensee's representatives, an employee of the representative, or another person hired by the licensee. Subcontractors may be, and often are, licensed themselves. The original licensee submits the notification or obtains the permit, and makes the business arrangements, including billing the client. Since the licensee who files the notification or obtains the permit is licensed and bonded, and the state does not have control over who physically does the work, it is reasonable to require the licensee who obtains the permit to be responsible for compliance.

4725.0250, Subpart 3. A typical well or boring takes one to three days to complete. A noncomplying well puts the well owner at risk, and in some cases leaves the property owner without a water supply. It is important that the person who created the violation makes the correction of the violation a priority. Thirty days is a reasonable time to complete the correction, or if extenuating circumstances arise, to develop a plan for correction.

4725.0350 FEES APPLICABLE TO THIS CHAPTER.

Minnesota Statutes, Chapter 103I, has been amended to remove the ability of the commissioner to establish fee amounts. The fees are now established in statute.

4725.0300, Subpart 1 references the statutory fee exemption for government agencies, and the delegation to local boards of health. An amendment proposes to refund the notification fee for water-supply wells that are not constructed. The notification does not require MDH to review or expend large amounts of time and money to process, and it is reasonable to refund the application fee when work is not done.

4725.0300, Subpart 2 contains the first use of terms that were amended in statute during the 2005 legislative session. The terms are therefore modified here, and in numerous other rule parts.

The term "representative" has been changed in Minnesota Statutes, section 103I.005, subdivision 2a, to "certified representative." That change has been made in this rule part and other rule parts. The phrases "certification as a representative" and "certified representative" have been added to clarify that a representative, the human being who takes the exam, signs the permits and records, and supervises work on behalf of the licensee or registrant, is certified.

The term "elevator shaft" and the phrase "excavation for an elevator hydraulic cylinder" have been changed to "elevator boring" in Minnesota Statutes, section 103I.005, subdivision 6.

The term "elevator shaft contractor" has been changed in Minnesota Statues, section 103I.005, subdivision 7, to "elevator boring contractor."

The term "limited well contractor" has been changed in Minnesota Statutes, section 103I.005, subdivision 12, to "limited well/boring contractor." Therefore, the term has been consistently modified.

The remaining proposed amendments to Subpart 2 simply reflect the change from the fees being in rule, to being in statute.

4725.0300, Subpart 5 is proposed for amendment to reflect the changes in Minnesota Statutes, section 103I.208, which changed the dewatering well permit to a notification, and established a reduced fee for multiple monitoring wells.

4725.0300, Subpart 8 is proposed for amendment to remove the modifier "pump" from the term "hoist." Minnesota Statutes, section 103I.545, has been amended to remove the modifier "pump." The statute requires registration of machines such as "hoists" used for activities that require a license to repair or seal wells or borings, or install pumps. While the vernacular term is usually "pump hoist," the term "hoist" is more correct in that it includes the broader activities and equipment that are regulated by statute.

4725.0410 VARIANCE.

Minnesota Statutes, section 103I.101, subdivision 6 requires that the commissioner of health charge a non-refundable variance application fee. The MDH has adopted a general variance rule in Minnesota Rules, chapter 4717. This rule part contains specific criteria for variances related to wells and borings. The MDH is proposing amendments to this rule to reference the general MDH variance rule and the statutory fee requirement, to aid the reader in determining applicable requirements. This proposed amendment also establishes specific, factual information required in the variance application, including any precautions that must be taken, and the location, ownership, and physical condition of the well or boring.

This proposed rule amendment is necessary because it provides the MDH with the facts needed to establish ownership, evaluate the need for the variance, and determine the potential effects on public health and the environment. It is reasonable because it asks for relatively minimal and basic information and makes it clear to the applicant what information is needed.

4725.0410, Subpart 1 is proposed for amendment to include an 18-month time limit on variance applications and completion of conditions required in a variance, unless the variance specifies otherwise. The existing rule requirements pertaining to variances contain no such time limit. Variances have been granted, but the authorized work was never completed. The 18-month time period is consistent with the amount of time a notification or permit is valid.

4725.0410, Subpart 2 is proposed for amendment to reduce the location reporting requirement from four to three quarter sections, which is consistent with the reporting requirements for permits and records. Item J asks for additional information about circumstances that would provide protection, and therefore supports the issuance of the variance.

4725.0410, Subpart 4 as proposed pertains to variances that are required to be placed on the property deed. Currently, this involves only variances to sealing inaccessible or obstructed wells. These are cases where the well cannot be sealed at the present time, often because a building has been constructed over the well. In these cases, where the only way to seal the well at the present time would be to remove the home or other building, the MDH has issued a variance to postpone sealing until the well becomes accessible. Since many real properties are sold relatively often, and the well and requirements for sealing may constitute an encumbrance on the property, it is important that a permanent record of the variance be available to a prospective property buyer and others with an interest in the property.

4725.0410, Subpart 5 as proposed pertains to emergency variances. The existing rule identifies emergency conditions in part 4725.1838, where rapid completion of a well or boring is necessary, and may proceed prior to submitting a notification or permit. The language in this proposed subpart adopts the same emergency conditions as in part 4725.1838, where an emergency variance may also be granted. Because a variance is typically a lessening of a standard, it is important that the application be completed and signed to specify what variance is being requested, and to assure that the parties agree to the request. It is also important that the conditions of the variance be followed. The emergency variance is granted only when there is in fact an emergency and work must proceed as soon as possible. If the applicant or contractor cannot, or will not, commence the work within three days, it is likely not truly an emergency, and the variance should be processed through the normal procedures.

C. Licensing, Registration, Certification.

4725.0475 ACTIVITIES REQUIRING LICENSURE OR REGISTRATION.

4725.0475, Subpart 1. The two proposed amendments to this part clarify that modification or removal of a screen, pitless unit, or pitless adapter, and termination of a casing at-grade, require a license or registration.

Minnesota Statues, section 103I.101, subdivision 5, requires the commissioner to adopt rules including issuance of licenses for persons who modify or repair well casings, well screens, or well diameters. In order to install a screen in an existing well, it is necessary to first remove the existing screen. In order to install a pitless adapter or pitless unit, it is necessary to modify the casing by either cutting or drilling a hole into the casing, or cutting the casing off. Termination of a well or boring at-grade requires that the casing be cut-off (modified) at a precise elevation, and a protective manhole or vault be installed.

4725.0475, Subpart 2. This subpart is proposed for amendment to allow persons responsible for public water-supply wells to disinfect those wells. Public water systems are regulated by the MDH under Minnesota Rules, Chapter 4720. All public water systems are inspected and tested on a regular basis by MDH staff. Operators of community public water systems, including municipalities, mobile home parks, and extended health care facilities, and nontransient noncommunity systems, such as schools and businesses, must be certified under Minnesota Rules, Chapter 9400, and attend continuing education. Many transient noncommunity water systems, such as restaurants, convenience stores, campgrounds, and other facilities, are licensed by the MDH, Minnesota Department of Agriculture, or local governments. A disinfection

procedure is most often performed in response to a positive coliform bacteria water test done by the MDH. The MDH contacts the facility, provides disinfection guidance, and collects a follow-up water sample. Because of the MDH oversight, and training required of the operator/owner, it is reasonable to allow persons responsible for public water systems to disinfect their water-supply wells, as long as the disinfections are performed in accordance with the disinfection requirements of part 4750.5550.

4725.0475, Subpart 4. A clarification is proposed for addition to item D, that does not change existing requirements, but simply clarifies that a person licensed to construct a particular type of well or boring may also seal that type of well or boring.

4725.0550 CERTIFIED REPRESENTATIVE OR INDIVIDUAL WELL CONTRACTOR: APPLICATION AND ONGOING QUALIFICATIONS.

Minnesota Statutes, section 103I.205, subdivison 4, states that a person may not drill, construct, repair, or seal a well or boring unless in possession of a well contractor's license. Minnesota Statues, section 103I.525, establishes that a person may apply for a well contractor license as an individual, or may apply to be certified to represent a firm, sole proprietorship, partnership, association, corporation, or other entity including the United States government, any interstate body, the state and agency, department or political subdivision of the state. The statute further establishes that the certified representative and individual well contractor must meet qualification and certification or license requirements.

4725.0550, Subpart 1. Amendments are proposed to this subpart to comport with changes made to Minnesota Statutes, chapter 103I, during the 2005 regular legislative session. The statute was amended to use the term "certified" and "certification" when referring to the process of qualifying a representative.

4725.0550, Subpart 3. Amendments are proposed to this subpart to include the term "certified," and to detail the responsibilities of the certified representative. The existing rule part requires that the representative be responsible for operations of the licensee. This proposed amendment specifies two basic activities: supervising work regulated by Chapter 4725, and signing reports or records submitted to the MDH.

4725.0550, Subpart 4. Amendments are proposed to existing rule to address the situation where a representative leaves a licensee, and the licensee no longer has a representative. A certified representative of a limited well/boring contractor, monitoring contractor, or elevator contractor must document experience, and take and pass a written exam. A certified representative well contractor must document experience, take and pass a written examination, and take and pass a verbal examination before the Advisory Council on Wells and Borings. The Advisory Council meets four times per year. A company with only one representative, who unexpectedly leaves the company, such as in the case of an unexpected death, must now acquire a new certified representative in 90 days or stop conducting business. Since the Advisory Council only meets every 90 days, it can be difficult or impossible to certify a new well contractor representative in time. The MDH is proposing to extend the time that a company can operate without a certified representative to 150 days. This is reasonable in that it will allow for at least one regularly scheduled Advisory Council meeting. While the requirements and time necessary to certify a

limited, monitoring, or elevator contractor representative are less than those for well contractor representatives, it can still take considerable time to complete the process. For consistency sake, the MDH proposes to extend the time limit for all certified representatives.

Many contracting firms are small family businesses. Commonly, the father is the certified representative and driller, the mother does the office work, and the children work in the business. There may be an employee or two. If the certified representative suddenly dies, the company may be without the person most knowledgeable about the well and boring construction requirements. The acting representative may be a person with very limited experience. Allowing the company to operate for 150 days with an acting representative is reasonable if compliance with the rule can be assured. Requiring the acting representative to contact the MDH before each regulated activity is reasonable, as it allows the company to remain in business while affording the MDH the opportunity to inspect in order to assure that work is completed in accordance with Chapter 4725.

4725.0650 EXPERIENCE REQUIREMENTS, CERTIFIED REPRESENTATIVE AND INDIVIDUAL WELL CONTRACTOR.

As discussed in part 4725.0550, subpart 1, the licensee or registrant is in most cases a corporation, business, state agency, or other business entity, not a human being. A human being (the certified representative) "represents" the licensee or registrant. The certified representative must meet specified experience criteria, pass one or more examinations, annually attend continuing education, and supervise those activities regulated by this chapter.

4725.0650, Subpart 1. This subpart pertains to well contractor certified representatives and individual well contractors. Amendments are proposed to increase the experience requirements, and to allow formal well construction education in lieu of some practical experience.

The well contractor license allows the licensee to construct, repair, and seal water-supply wells, monitoring wells, dewatering wells, environmental bore holes, elevator borings, and vertical heat exchangers. The current experience required to qualify for an individual well contractor license or certification as a licensee's representative is four years of experience with 1000 hours per year, and the construction of at least five wells per year. This is minimal compared to the requirements of each limited or specialty certification. The limited licenses, or specialty licenses, allow the licensee to only construct, repair, and seal that specific type of well or boring. The experience requirements for the limited or specialty license certified representatives range from two years experience with a total of 100 hours and 20 pumps for a limited pump certification, to three years of experience with 1000 hours per year and 20 monitoring wells or environmental bore holes per year for the monitoring well certification.

The MDH is proposing to increase the experience requirements in two areas. Item A lists basic drilling activities that the applicant must be familiar with in order to meet the 1000-hour (half a year) requirement. Applicants have appeared before the advisory council with 1000 hours of experience per year, but only in one activity, such as drilling, without doing pump work, performing disinfections, or completing records. This proposed amendment reasonably assures that the applicant is familiar with the range of activities regulated under the statute and rule.

4725.0650, Subpart 1, Item B increases the minimum number of wells that must be drilled each year to qualify, from five to ten. When the five well per year requirement was enacted in 1974, most wells were constructed by the cable tool method. It would take a few days to a few weeks, to drill just one well. Today, with rotary drilling, a well can often be drilled in one-half day. Item C amends existing language to still allow for person to qualify drilling large diameter, deep wells that typically take considerable time to drill, often by the cable tool method. This proposed amendment to increase the amount of experience reflects the change in drilling technology and experience.

The proposed language contains a "grandfather" clause so that persons with experience prior to the change from five wells per year to ten wells per year may use that experience to qualify.

At one time, the Staples Minnesota Technical Vocational School offered one-year and two-year programs in water well drilling technology. Currently, a limited number of community colleges in the United States and Canada offer well drilling programs that are a mixture of classroom and hands-on experience. The MDH has observed that the graduates obtain education and experience equal to, or greater than, working for a well contractor drilling five (now ten) wells per year. The MDH is proposing to allow this education to apply for certification or licensure on a one-to-one basis, up to two years.

4725.0650, Subpart 2. This subpart pertains to monitoring well contractor certified representatives and is proposed for amendment in response to statutory changes concerning licensing of geologists under Minnesota Statutes, Chapter 326. Geologists who practice in Minnesota must now be licensed by the Minnesota State Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience, and Interior Design.

4725.0650, Subparts 3 through 9. These subparts are proposed for amendment to reflect amendments to Minnesota Statutes, Chapter 103I, in the 2005 legislative session that changed the term "limited well contractor" to "limited well/boring contractor," and uses the term "certify" to apply to the qualification process for contractor representatives.

4725.1025 EXAMINATION.

Amendments are proposed to the examination requirements of this rule part to increase the accountability and quality of applicants, and eliminate frivolous use of MDH and Advisory Council time.

All applicants for license or certification must take and pass a written examination. Many other licensing or credentialing programs require that the examination be taken only at set locations and times. Sometimes, only one or two exams are given per year. MDH written exams are a closed-book examination of predominately rule and statute requirements. The present statute and rule do not require a fee for retaking an exam, and do not limit the number of times a person may take the exam. The MDH has allowed applicants to take the examination at any convenient time, and at any MDH district office staffed by Well Management personnel. The MDH grades the exam, mails the results, and includes a narrative as to the subjects the applicant answered incorrectly. Since the majority of the questions are related to the requirements of rule and law, it

is important that the applicant know the correct answer to avoid future violations. In some instances, applicants have asked for the exam to be graded immediately, and if they failed, have asked to immediately retake the exam. The existing rule does not prohibit this, nor does the rule expressly allow this, since the existing rule is silent on the issue. In order to provide the MDH time to grade the exam and send the results, along with narrative about areas needing study, it is reasonable to require a two-week wait before retaking an exam.

The well contractor examination process consists of a written exam followed by an oral examination before the Advisory Council on Wells and Borings, an 18-voting member group established under Minnesota Statues, Chapter 103I. The oral examination requires one-half to one hour of time for each applicant. Applicants have failed the exam, been given specific study materials, and returned to the next exam having studied nothing. To reduce the amount of wasted Advisory Council time, and emphasize that an applicant should be studying for the exam, the MDH is proposing to amend the rule to require that if an applicant fails the exam three times, he/she must wait a year, and then start the licensing or certification process over.

4725.1075 APPLICATION FOR LICENSURE OR REGISTRATION.

The existing rule requires that the name of all certified representatives be included on the license or registration application. A sentence is been proposed to remind the reader that a business must be represented by at least one certified representative. An amendment is proposed to delete the reference to the application fee in rule, since rule authority to set fees has been removed, and the fees are now in statute.

4725.1300 LICENSE OR REGISTRATION RENEWAL.

The MDH sends license or registration renewal application forms to each licensee or registrant in the fall of each year. An article concerning renewal is placed in the Well Management Newsletter mailed to all licensees and registrations. Licensees or registrants who do not renew by the end of the licensing or registration year are sent a letter reminding them that they did not renew, and that they may no longer do work requiring a license or registration unless they renew.

4725.1300, Subpart 1 is proposed for amendment to simplify the renewal process. The amendment removes the requirement for a licensee to submit the specific continuing education credits taken by a certified representative. The continuing education credits for the certified representative will now be addressed in part 4725.1310.

4725.1300, Subpart 2 addresses failure to renew. On occasion, a licensee or registrant has failed to renew, and at a point some years later, has requested to renew the license or registration by simply paying the current year's fee. This proposed amendment requires payment of back fees and current fees in order to renew a license or registration.

4725.1310 CERTIFICATION RENEWAL.

As previously indicated, changes to Minnesota Statues, Chapter 103I, in 2005 clearly separate the licensee or registrant (business), from the certified representative (human being). The certified representative must obtain continuing education, not the licensee or registrant. However, the existing rule requires the licensee or registrant to include the continuing education on the license or registration renewal. This proposed amendment appropriately separates the continuing education requirements of the certified representative, from the license or registration renewal of the licensee or registrant, and places it with certification of the representative.

4725.1310, Subpart 1 is proposed to establish certification renewal dates consistent with license and registration renewal dates for simplification. Completion of continuing education is required in under Minnesota Statutes, Chapter 103I, and Minnesota Rules, part 4725.1650.

4725.1310, Subpart 2 is proposed to require that a representative who does not maintain continuing education, and wishes to renew certification after two years, may not renew, but must be recertified. The existing rule does not prohibit a representative from renewing five, ten, or more years after the last renewal. During this time, the person would not receive MDH correspondence such as notices of meetings, or the Well Management Newsletter. The person may not be active in the business, and would not be inspected by the MDH. This lack of activity, inspection, and keeping current with changes could lead to compliance problems. For that reason, the MDH is proposing to add subpart 2 to require that a person who does not recertify within two years of expiration, must become recertified by passing an examination.

4725.1500 DISCIPLINARY ACTION AGAINST CERTIFIED REPRESENTATIVE, INDIVIDUAL WELL CONTRACTOR, LICENSEE OR REGISTRANT; RETURN OF DOCUMENTS.

As previously indicated, amendments to Minnesota Statutes, Chapter 103I, separate the licensed or registered business from the certified representative. The proposed amendments to this rule part include the certified representative in disciplinary actions, and add two additional violation classes that may subject the person to disciplinary action. The proposed amendments are necessary and reasonable to assure compliance with the rule and the protection of public health, and to assure that the persons to whom the rule applies are aware of actions that are grounds for disciplinary action.

The existing rule language concerning disciplinary action is focused on the licensee or registrant, and does not address the representative. As noted in part 4725.0550, subparts 1 and 3, the certified representative is responsible for supervision of activities of the licensee or registrant, and is responsible for signing and verifying permits and records submitted to the MDH. It is reasonable to hold the certified representative responsible for his/her actions, and to have appropriate sanctions available to respond to violations or misconduct. The proposed disciplinary actions are consistent with those of septic system installers, designers, and inspectors in Minnesota Rules, part 7080.0900. The criteria are also consistent with criteria for other occupations regulated by the MDH under the Health Enforcement Consolidation Act of 1993, Minnesota Statutes, section 144.99.

4725.1500, Subpart 1, Items G and H are proposed to address enforcement problems that the MDH has observed. The MDH has encountered falsified samples, records, or qualifications for examination. Administrative Penalty Orders have been issued, and the applicant has failed to pay the monetary penalty. The MDH has also entered into stipulated agreements, or other settlements, where the responsible party has failed to comply with the conditions of the agreement.

4725.1600 REAPPLICATION AFTER CERTIFICATION, LICENSE, OR REGISTRATION REVOCATION.

The proposed amendments to this rule part add the term "certification," consistent with amendments to Minnesota Statutes, Chapter 103I, in 2005, and add the revised references to rule parts pertaining to reapplication.

4725.1650 CONTINUING EDUCATION REQUIREMENTS.

Proposed amendments to this rule part reduce continuing education requirements for certified representatives of limited licensees to reduce the regulatory burden, and require that two hours of continuing education credit be obtained at a MDH sponsored program to improve communication, focus education on relevant topics, and improve compliance.

Minnesota Statutes, sections 103I.525, 103I.531, 103I.535, and 103I.541, require a certified representative of a licensee or registrant, and an individual well contractor, to meet continuing education requirements in accordance with rules established by the commissioner. The present rule requires all individual well contractors and certified representatives of all licensees (including limited licensees) to annually obtain six hours of continuing education. The subjects are of the representative's choosing as long as the education meets the general criteria of part 4725.1675.

Many persons with limited licenses, or specialty licenses, have argued that due to the unique or limited nature of their business, it is difficult, or in some cases impossible, to obtain six hours of relevant, worthwhile education. They have also argued that it is not fair to require a limited contractor to obtain the same amount of education as a well contractor, who is licensed to do many more activities.

The MDH has observed that some persons needing focused education, or those with compliance problems, do not choose to get particularly meaningful education, but instead attend annual trade shows, and hear the same presentation year after year. At the same time, programs presented and sponsored by the MDH attract a smaller contractor audience. The persons who do attend, are frequently those who need it the least--persons who largely do not have compliance problems. Persons with compliance problems often do not attend MDH programs.

To address the concerns of the limited license certified representatives, and to reach all persons with a minimum amount of essential information, the MDH is proposing to reduce the continuing education requirements for certified representatives of all limited and elevator contractors from six hours annually, to two hours annually. However, the two hours must be at a MDH presented or sponsored program. The MDH has been holding eight to nine evening

district meetings, where focused topics, such as the rule revisions, have been presented. The meetings are at no charge to the attendees, and have been held in the evenings, at times of the year when contracting work is slow (restricted by road weight limitations), and at various locations around the state. The proposal also requires that two of the six hours required of certified representatives of monitoring well contractors and well contractors be obtained at MDH presented or sponsored programs. The certified representative may choose the remaining four hours as long as the criteria of part 4725.1675 are followed. This requirement is not removed for representatives of well contractors or monitoring well contractors due to the broad, or sensitive nature of their work. This proposal reduces the burden for many contractors, and focuses the education on topics the MDH believes are relevant and necessary, such as law or rule changes, health advisories, water quality issues, new product approval, compliance problems, and enforcement.

4725.1800 DRILLING MACHINE AND HOIST REGISTRATION.

Minnesota Statutes, section 103I.545, requires that drilling machines and hoists be registered annually with the MDH, that the registration be on forms prescribed by the commissioner, and that a $75 fee be paid for the registration of each machine. According to existing rule part 4725.1300, licenses expire on January 31, and registrations expire on December 31. In order to simplify and make consistent the license and machine registration process, this proposed amendment specifies that the drilling machine annual registration is concurrent with the issuance of the license or registration.

The statute sets only one annual fee for drilling machine or hoist registration. This proposed amendment clarifies that these registrations are not prorated, because prorating or giving refunds for partial year use unduly would complicate the process, and would often cost the state more money to issue a refund than the value of the refund.

D. Permits and Notifications.

4725.1810 PERMITS AND NOTIFICATIONS, GENERAL.

This new rule part is proposed to simplify and consolidate requirements and conditions common to many permits and notifications.

4725.1810, Subpart 1 reminds the reader of Minnesota Statutes, section 103I.205, subdivision 8, concerning situations where the well owner and property owner are different persons. Where the well owner is not the property owner, this subpart establishes that the well owner (or other person identified in the agreement) is regulated by Chapter 4725, and has the responsibilities and authorities of the property owner.

4725.1810, Subpart 2. Minnesota Statutes, section 103I.111, allows the commissioner of health to delegate portions of the state well program to a local board of health. Upon delegation, the local board of health is responsible for permitting, inspection, and enforcement. Not all portions of the regulatory program under Chapter 103I may be delegated by law, and many delegated programs choose to only take a portion of the programs that may be delegated (many local

programs choose to take only the potable well program). This clarifies that delegation of a portion of the program includes both the construction and sealing aspects of the regulated activity.

4725.1810, Subpart 3 references the permit and notification fees set in statute, and the rule requirements for payment and processing of fees.

4725.1810, Subpart 4 requires that depths and casing heights be reported from a common datum--the established ground surface. Currently, depths are reported in various ways, relating to the ground level, sea level, inner casing, outer casing, well pit floor, or basement floor, often without specifically mentioning which datum is used. This amendment is needed and reasonable to make the data system consistent, and to avoid confusion that has occurred in compliance issues.

4725.1810, Subpart 5. Minnesota Statutes, section 103I.205, subdivision 1, states that a person may not construct a well until a notification and the fee prescribed in statute are filed with the commissioner. A notification does not require review or approval by the commissioner; as soon as the notification is "filed," the contractor may start work. The bulk of the notifications are mailed or faxed days or weeks before the work is done. However, some contractors routinely fax in notifications with credit card payment after normal business hours, on holidays, or on weekends. Because of the frequency of the after-hours notifications, and the nonemergency nature of much of the work, it is obvious that some contractors are trying to avoid inspection. In some cases, the MDH has determined that the work was actually completed earlier in the day, and the notification was sent later the same day. It should be noted that MDH inspectors occasionally work after normal business hours, on holidays, and on weekends when sufficient need warrants. The MDH is proposing a rule amendment to clarify that "to file" a notification with the commissioner, the MDH must receive the notification and fee when MDH staff are working – that is during normal business hours. This proposal is needed and reasonable to assure compliance with rule requirements. The rule still allows an emergency notification in the case of a true emergency.

4725.1810, Subpart 6. In certain circumstances, a contractor may file a notification, or obtain a permit, but may not construct or seal the well or boring. Subsequently, another contractor may want to construct or seal the well in question, using the same permit. This rule part proposes to prohibit this, because the new contractor may not be aware of conditions attached to the original permit, and a different party may have made payment. If some work has been done, or if there are compliance questions, transferring a permit may make responsibility unclear.

4725.1810, Subpart 7. The rule establishes different construction requirements for different types of wells and borings because of their unique use or nature. A hole for an elevator hydraulic cylinder is different from a monitoring well drilled though heavily contaminated soil. In certain cases, individuals have tried to change the status or use of a well to avoid enforcement, because they had made a construction violation, or because they constructed a well or boring that they were not licensed to construct. Subpart 7 clarifies existing interpretation that a well or boring constructed to one set of standards may only be converted to another type of well or boring if the well or boring also meets the construction criteria for that type of well or boring.

4725.1820 NOTIFICATION FOR CONSTRUCTION OF WATER-SUPPLY WELLS.

The amendments in this part are proposed to clarify for the reader that the part applies to water-supply wells, not to monitoring wells or dewatering wells. It clarifies that a drive-point or dug well limited contractor may construct a drive-point well and must submit a notification. It also clarifies that a notification must be made for wells constructed to test water yields.

4725.1820, Item B is amended to allow for electronic (web-based), or other methods of submission of forms, when and if the security and logistical issues can be satisfactorily addressed.

The existing rule requires notification of either the township, range, section (TRS), and one quartile, or the street address. The option to list either was adopted in rule because the street address was usually the easiest identifier for the contractor to use with urban properties, and the TRS system was easiest, or the only one available, for rural properties. Due to the establishment of the emergency telephone system (911), rural properties now have, or shortly will have, a numerical street address. If the proposed well is in a development of small lots, locating the correct property by TRS can be very difficult, since one quartile is a 160 acre parcel, and the well could be on any property within the 160 acres. The street address is valuable for locating the correct property and correct property owner, mailing correspondence, and for legal identification. The TRS identifier is valuable for mapping, and the computer database. So, in item D the MDH is proposing to require that both the street address and township, range, section, and one quartile be reported. The street address is not required if one has not yet been assigned.

4725.1825 DEWATERING WELL CONSTRUCTION NOTIFICATION.

Minnesota Statutes, Chapter 103I, originally required a permit for construction of a dewatering well. The well rule, Chapter 4725, implemented this requirement. Chapter 103I has been subsequently amended to change the permit to a notification. This rule part is proposed for amendment to reflect this change. Chapter 103I also contained language that "sunseted" in 1994 to exempt dewatering wells 45 feet or less in depth, and this proposed amendment removes the parallel obsolete language.

The proposed amendments parallel the water-supply well notification requirements, including the requirement to file a notification if an existing well is deepened through a confining layer or has casing installed or removed below the frost line.

The requirement to report the anticipated depth is proposed for removal, since it is not required when filing a notification for a water-supply well.

4725.1830 MONITORING WELL CONSTRUCTION PERMIT.

4725.1830, Item A is amended to clarify that a limited screen/pitless contractor, who has the authority to modify a casing termination and cap, may install an at-grade termination.

4725.1830, Item B is amended to allow for electronic submission of a permit application when the technology is operational. This will decrease the cost and time required for both the regulated parties and the MDH.

4725.1830, Item C is amended in accordance with a change to Chapter 103I allowing a monitoring well site permit for agricultural chemical facilities. Also, the existing rule exempts a temporary monitoring well sealed within 48 hours of construction from the permitting requirement. The MDH is proposing to extend the time limit an additional 24 hours, to a total of three days (72 hours). Monitoring well contractors have reported that with deeper wells being constructed, more tests required, and the greater reliance on temporary wells, 48 hours are not always enough to drill, complete testing, and seal. The MDH believes this is a reasonable request.

Minnesota Statutes, section 103I.205, subdivision 8, requires that an agreement be written if a person constructs, or has constructed, a well on property of another person. This occurs most frequently with monitoring wells--usually a person responsible for a pollution incident places wells on neighboring properties. Part 4725.1830, Item D requires that the MDH receive a copy of the agreement so that it may be verified that the agreement exists, and that it provides the details of the names and responsibilities for maintenance or sealing.

4725.1830, Item E is amended, similar to other permits and notifications, to require reporting of the township, range, and section, as well as the street address, if a street address has been assigned.

The language formerly in part 4725.1830, item H has been moved to the rule part specifying general requirements for all permits and notifications, part 4725.1810.

4725.1831 GROUNDWATER THERMAL EXCHANGE DEVICE PERMITS.

Minor changes are proposed for this rule part, largely to reduce paperwork and expedite the permit process. Consistent with amendments proposed for other permits and notifications, a provision has been added to allow for electronic submission of ground water thermal exchange device permit applications. In order to process the application, it is necessary to be able to read it. Some permit applications are illegible. It is reasonable to require that the information submitted is legible. Similar to water-supply well and dewatering well notifications, an accurate location of the well is necessary in order to conduct investigations and inspections.

4725.1832 NOTIFICATION FOR WELL SEALING.

A list of the types of wells requiring a well sealing notification has been added. This does not change the effect of the rule; it only provides clarification for the reader.

4725.1832, Item A. The same requirements of legibility, and reporting of the address, required of other wells and borings are required here. A proposed amendment allows the commissioner to accept notifications in alternative format such as electronically. Regardless of how the

notification is delivered, it must contain the information required by rule, and in a format that is decipherable, therefore the statement about submission by telephone or fax is misleading and is stricken.

Wells have been constructed in Minnesota for over 100 years. State wide well construction requirements did not exist before 1974. Records of well construction have been required state-wide only since 1975, so there is no original construction record for most wells that are sealed. Well sealing requires knowledge of how the well was constructed. The complexity of well sealing, and the potential impacts on the groundwater, increase greatly when the well diameter increases, and the well contains multiple casings, because multiple aquifers are more likely penetrated, obstructions may exist in the well, and the annular space between the casings may not be grouted. The MDH is proposing in 4725.1832, item A. subitem (4) to require that when the well to be sealed has more than one casing and the inner casing is 8-inches or larger in diameter, a box on the notification form must be checked. This represents a very small group of wells that have a high potential for problems. This should not affect a contractor's ability to seal the well, but will allow the MDH to identify the higher risk wells, and focus inspection efforts on them.

4725.1833 VERTICAL HEAT EXCHANGER CONSTRUCTION PERMITS.

This proposed amendment adds language to clarify that a permit is required when vertical heat exchanger piping is altered below the frost line, consistent with other wells and borings. A modification is proposed to simplify terminology by referring to the person with a limited license to construct vertical heat exchangers as a "vertical heat exchanger contractor" as defined in part 4725.0100, subpart 49f. The proposal requires reporting of the street address consistent with the proposals for other notifications and permits.

The system piping diagram in 4725.1833, item C, subitem (5) is proposed to be removed, since the heating and cooling system compressor, controls, and other above-ground components of the heating, ventilating, and air conditioning system are not regulated under this rule. However, the construction and grouting of the hole in the ground is regulated. The grout materials allowed are dependent on the geology penetrated. The contractor must have some knowledge of the expected geology in order to design the system.

4725.1835 ELEVATOR BORING CONSTRUCTION PERMITS.

The proposed amendments for elevator boring permits are predominately ones of simplification, organization, and a reflection of the change in statutory terminology. Minnesota Statues, Chapter 103I, was amended in 2005 to change the terms "elevator shaft," and "excavation to install an elevator hydraulic cylinder" to "elevator boring." Proposed amendments to this rule part reflect that change. Other proposed amendments are the same as for other notifications and permits--requiring the street address for location, inspection, and identification purposes, and establishing that permits are not transferable, to clearly establish responsibility.

4725.1836 NOTIFICATION AND PERMIT FEES.

Minnesota Statutes, Chapter 103I, requires submission of a permit or notification fee. Existing rule requires that the fee must accompany the notification or permit application. The proposed rule amendment clarifies that a valid fee must be submitted; otherwise the permit or notification is not valid.

Permit applications require MDH staff time for processing, review, and approval. Notifications require considerably less MDH time, since staff review and approval is not required. Refund of permit applications has not been done because of MDH costs of processing, and the cost of refunding the money. Water-supply well notification fees have been refunded to the party who paid the fee (well contractor or well owner) if drilling did not occur, and if the refund is requested within the 18-month period of time that the notification is valid.

4725.1838 EMERGENCY NOTIFICATIONS AND PERMITS.

The proposed amendments to this rule part are clarifications and the addition of two less restrictive requirements. The existing rule language is incorrect, in that it uses the term "well," when the intent is "water-supply well," since the same sentence (redundantly) includes the terms "dewatering wells" and "monitoring wells," which are clearly types of "wells." To clarify this, the modifier "water-supply" is proposed for addition. The term "elevator boring" is used to replace "elevator shaft" or "excavation for an elevator hydraulic cylinder" as discussed previously. While it is not likely that construction of an elevator will need to be started under emergency conditions, it is possible. Therefore, it is proposed to allow construction under the same conditions as other wells and borings.

Due to statutory change, dewatering wells are no longer regulated under a permit, but are regulated under a notification. Therefore, the language of item A has been proposed for modification.

Elsewhere in the rule, the property owner's agent may file a notification or obtain a permit for the owner. Therefore, it is reasonable to allow the agent to act for the owner in an emergency.

4725.1840 UNSUCCESSFUL COMPLETION OF A WELL OR BORING.

Geologic conditions can be variable, and in some circumstances, a hole drilled for a well or boring will encounter a boulder or other obstruction, or will produce aesthetically unacceptable water, an inadequate quantity of water, or no water at all. Amendments are proposed to this rule part to provide the same notification exemption to vertical heat exchangers as given to other wells and borings. Additional amendments clarify existing requirements.

Minnesota Statutes, section 103I.205, subdivision 1, states that if a well notification is filed and an attempt to construct a well is unsuccessful, a new notification is not required unless the information relating to the construction has substantially changed. The statute refers to wells, not borings. However, the existing rule includes elevators, a type of boring, and it is reasonable to include vertical heat exchanges, another type of boring (the other boring regulated under this

rule, environmental bore hole, does not require a permit or notification). Since a permit or notification is valid for 18 months under existing rule, it is appropriate to allow construction of a replacement well or boring within the same time limit.

The MDH is proposing to remove the requirement to submit an amended permit or notification showing the new location. Since the replacement well or boring must be on the same property, and since the location is only required to a 160 acre parcel, the information will provide nothing different. The well record, however, is completed to greater detail, and includes a map. It is important that the permanent record of the well contain the accurate location so as not to confuse the replacement well with the unsuccessful well or another well or boring.

Minnesota Statutes, section 103I.301, requires that a not-in-use well be sealed. An unsealed, unsuccessful, non-functional, unused well or boring presents a direct conduit for surface contaminants to quickly reach the subsurface. Large diameter holes are also a safety hazard.

4725.1845 DENIAL OF CONSTRUCTION PERMIT APPLICATION.

Amendments are proposed for this rule part to make consistent requirements for all permits. Dewatering wells no longer require a permit. Groundwater thermal exchange devices and vertical heat exchangers require a permit in accordance with Minnesota Statutes, sections 103I.208, 103I.621, and 103I.641. The existing rule establishes conditions for denial of monitoring well dewatering well, and elevator permits. The proposed amendment deletes dewatering wells, since they no longer require a permit, and adds thermal exchange devices and vertical heat exchangers.

4725.1848 WELL MAINTENANCE PERMITS.

The proposed amendments in subpart 1 do not change any requirements, but simply clarify when permits are required, and reference the date that maintenance permits were first required (January 1, 1990).

4725.1849 DRIVE-POINT WELL CONSTRUCTION NOTIFICATION.

The MDH is proposing clarifications to the drive-point well construction notification requirements that do not affect existing regulatory requirements, and is also proposing a less restrictive provision for sellers of drive-point screens.

Drive-point wells are defined in statute, and consist of a pipe with a pointed well screen on the end, forced or driven into the ground with a hammer, maul, or weight. Drive-point wells are most commonly constructed by property owners for lake cabins or recreational properties in areas of very shallow groundwater. Drive-point wells are occasionally constructed by licensed well contractors for water-supply wells, by monitoring well contractors for monitoring wells or environmental bore holes, and by dewatering contractors for dewatering wells.

4725.1849, Subpart 1. Minnesota Statutes, Chapter 103I, does not exempt drive-point wells from the construction requirements of rule, and therefore, unless specifically exempted, must comply with the requirements of Minnesota Rules, Chapter 4725. Minnesota Statutes, section 103I.205, subdivision 1, paragraph (d), allows a property owner or lessee to construct a (water-supply) well for his or her residence, or for farming purposes, without being licensed as a well contractor. The law does not give a property owner the right to seal the well. Minnesota Statutes, section 103I.205, subdivision 4, paragraph (d), clause (1), establishes a notification process without a fee for a drive-point well installed by a person on property owned or leased by the individual, that is used by the individual for farming or agricultural purposes, or as their abode. The statute does not require notification prior to construction of this water-supply well, but allows notification up to ten days after the drive point is installed. The statute does not extend this type of notification to a well contractor, to drive-point wells constructed for other purposes, or to other types of wells installed by the property owner.

4725.1849, Subpart 3. Minnesota Statutes, section 103I.205, subdivision 1, requires that a person who sells drive-point wells at retail must provide buyers with notification forms and informational materials that are provided by the commissioner. The unique aspect of the drive-point well is the drive-point screen, not the other materials that are used for many other applications. For example, casing used for drive points is the same steel pipe that is also sold for plumbing. In order to focus the rule on drive-point wells only, the MDH is proposing to use the term "drive- point screens" instead of "drive-point well materials."

The MDH has required by rule that sellers maintain a list of purchasers. The list is to be maintained for three years, or sent to the MDH yearly. Sellers of drive points (hardware stores, home and farm stores, etc) have not sent the lists to the MDH. The MDH has not pursued collection of the lists dues to limited resources and priorities. The MDH is proposing to remove the requirement for sellers of drive points to collect the names and addresses of purchasers.

4725.1851 WELL AND BORING RECORDS.

Each year in Minnesota, approximately 12,000 wells and borings are drilled, and approximately 12,000 wells and borings are sealed. Minnesota Statutes, section 103I.205, subdivision 9, requires that within 30 days of completion or sealing of a well or boring, the person doing the work must submit a verified report to the commissioner containing the information specified in rule. The information is needed to assure that wells and borings are properly constructed and sealed, and do not pose a threat to the groundwater. The geological and hydrological information is important to well owners, engineers, planners, and other state and local agencies such as the Minnesota Geological Survey, Department of Natural Resources, Pollution Control Agency, and many counties who use the information for mapping, land and water studies, and resource evaluation and protection.

Amendments to subpart 1 are proposed to specify, in accordance with Minnesota Statutes, section 103I.205, subdivision 8, that not only must licensed or registered contractors submit reports, but that property owners who construct their own wells must also. The statute requires that the report be verified, and establishes that the commissioner may make rules governing submission. A report that is not accurate, or is illegible, is of little value.

The law requires submission of the report within 30 days after "completion or sealing." Questions have been raised as to what the definition of "completion" is. Some contractors have argued that the well or boring is not complete until they are paid, and they withhold the record until they receive payment. The MDH believes the work is complete when all activities regulated by Chapter 103I and Chapter 4725 are done. Cleanup of the site, plumbing not regulated by Minnesota Rules, Chapter 4725, and payment are not relevant to the regulated work, and information required on the report. The MDH has proposed a definition of "completion of work" in part 4725.0100, subpart 23b, to establish when the report ("record") must be submitted, based on when regulated work done by the contractor in question is finished.

4725.1851, Subpart 1, Item A is proposed for amendment to allow an amended record to be filed. This may reduce paperwork for the submitter and the state, and reduce confusion resulting in two or more records with different unique numbers for the same well or boring.

4725.1851, Subpart 1, Item B establishes that for wells located in delegated jurisdictions all copies of the multi-part record must be submitted to the delegated well program. This will reduce the burden for the contractor since he/she will not have to split the copies and send some to the delegated program and some to the state. It will also establish a clear process for submission and record keeping.

4725.1851, Subpart 1, Item C currently allows a single record to be used to report multiple wells of the same depth and geology on a continuous parcel. Since wells and borings are rarely the same exact depth or penetrate exactly the same geology, questions have been raised as to how much variation in depth or geology is acceptable. The proposed amendment allows a depth variation of 25 feet, and bases the geology on the formation the well or boring is terminated in versus the exact geology penetrated. This may significantly reduce the paperwork required of the contractors. However, it is important not to lose track of the wells and borings, so it is proposed to require a map showing the well or boring locations.

4725.1851, Subpart 1, Item D is added to require that all depth measurements be reported from the established ground surface. Part 4725.1810, subpart 4, requires that depths be reported from a common datum. The "established ground surface" is used elsewhere in the rule. Currently, depths are reported in relation to the ground level, sea level, inner casing, outer casing, well pit floor, or basement floor, often without specifically mentioning which datum is used. This will make the data system consistent, and avoid confusion that has occurred in compliance issues.

The proposed amendments to 4725.1851, subpart 2 specifically list the information that must be submitted, expanding on the more general requirements of the statute. This is necessary and reasonable, because by specifying the information required, the MDH is able to standardize the form, and will have complete records for wells and borings. It also makes it clear what is expected of the regulated parties. Gravel packs around screens are becoming more common, and a description of the gravel pack interval is needed to determine compliance with parts 4725.2020 and 4725.2850. The existing rule currently allows, and is proposed to allow more, alternative, less expensive sealing materials. Along with a description of the pump, it is important to know

the types of pump materials, to address such issues as lead impurities in metals. The increasing use of hydrofracturing makes it more important to know which portions of the well have been fractured. A description of the drilling fluids used is necessary to determine compliance with part 4725.2950

4725.1851, Subpart 3. It is important to know when the property owner and well owner are different persons, should issues of responsibility arise, and to comply with Minnesota Statutes, section 103I.205, subdivision 8. Recording an accurate location of sealed wells has proven to be extremely important. The average life of a water-supply well is commonly in the 30 to 50 year range, so many properties have two or more wells. In some cases, it is less costly to construct another well for an outbuilding or remote barn than to extend a water line a considerable distance. Investigations of contamination often involve the construction of numerous wells, and borings, both on and off the subject property. Wells may be reconstructed, and monitoring wells may be renumbered. Demolition, construction, or regrading of properties may obscure wells. The disclosure provisions of Chapter 103I require a property owner to report the well location, and the status ("in use," "sealed," or "under a maintenance permit") of all known wells at the time of property transfer. A map showing the well or boring location, or a global positioning satellite (GPS) location will result in an accurate description of the well's location. The ASTM Standard D2487-85 is proposed to be moved to subpart 4. Information regarding the well head completion can be valuable when multiple wells exist on the property, and questions arise as to which well was sealed.

4725.1851, Subpart 4. Subpart 4 requires the person to use one of three common reporting systems for describing unconsolidated materials or rocks: definitions found in the American Geological Institute dictionary, the criteria of ASTM Standard D2487-85, or the definitions in the proposed rule. This is designed so that the reports are consistent and understandable, while allowing the person completing the report flexibility to use whatever system is most appropriate. The definitions of "rock" have been deleted and replaced with the same definitions of rock in the exploration rule, Minnesota Rules, part 4727.0920, subpart 4, item B, that followed recommendations made by the Minnesota Geological Survey, and definitions in the "Dictionary of Geological Terms."

4725.1855 CUTTING FORMATION SAMPLES.

This rule part has been broadened to include borings. Geological samples from borings provide the same natural resource and regulatory information as samples from wells.

E. Well and Boring General Construction and Use Requirements.

4725.2010 APPLICABILITY.

The proposed amendments to this part do not alter the requirements or applicability of the rule, but simply clarify for the reader, which rule parts apply to which types of wells and borings.

4725.2020 INTERCONNECTION OF AQUIFERS PROHIBITED.

This rule part contains requirements that do not allow interconnection of aquifers, in order to protect uncontaminated aquifers from surface contaminants or water entry from contaminated aquifers. Proposed amendments provide clarification of the existing rule, and provide a mechanism for less restrictive requirements where site-specific conditions allow.

"Aquifers" are layers of unconsolidated materials or rock containing pore spaces or fractures that store and transmit water. Aquifers are commonly found in sand, gravel, sandstone, limestone, or in some cases, fractured igneous and metamorphic bedrock. "Confining layers" are layers of sediment or rock that slow or stop the transmission of water. Common confining layers are clay, shale, or igneous and metamorphic rocks that are not weathered or fractured.

In many instances, the sediment and rock sequences in Minnesota consist of alternating aquifers and confining layers. In some places in Southeastern Minnesota, six or more distinct sedimentary rock aquifers exist, separated by confining layers, with each aquifer having different water chemistry and pressure. The preservation of confining layers is important to:

- Prevent surface contaminants from directly entering deeper aquifers.
- Slow the downward movement of percolating water to allow for the filtering and/or breakdown of contaminants before they reach aquifers used for drinking water.
- Prevent bore hole collapse due to cascading water.
- Prevent natural contaminants such as sulfate, arsenic, or radon, from spreading between aquifers.
- Prevent the waste of groundwater, dewatering of aquifers, erosion, and subsidence, due to uncontrolled artesian flows.

The existing rule prohibits interconnection of aquifers separated by a confining layer, allows open hole through no more than 10 feet of a confining layer, prohibits the interconnection of aquifers in unconsolidated materials separated by a confining layer, and specifically names four rock confining layers.

4725.2020, Subpart 1 is proposed for amendment to prohibit interconnection of an unconsolidated aquifer and a bedrock aquifer. The hydrogeology, water flow characteristics, and water chemistry of aquifers in unconsolidated materials are quite different from aquifers in bedrock, even if a distinct confining layer does not exist. Separation of the two different types of aquifers is important for the reasons listed above.

Wells or borings are typically allowed to be open to a confining layer in three types of cases: first, for monitoring wells used to determine the extent of vertical contamination; second, for water-supply wells where either the full thickness of the aquifer is needed to supply enough water and the confining layer below the aquifer is penetrated a short distance to determine the bottom of the aquifer; and third, where the confining layer produces some water, and largely for cost reasons, the contractor or owner does not wish to drill, case, and grout deeper. Subpart 1a. is amended to include gravel packs, along with open hole or screen, since a gravel pack functions like an open hole or screen to allow water movement and interconnect the well with the

formation(s) that are gravel packed. The part is made consistent with the amended definition of "confining layer," to include the more restrictive requirement that only 2 feet of the Decorah and Glenwood confining layers may be used. It is important that when a confining layer is drilled into, the full thickness of the confining layer is not opened, to prevent leakage across the breached confining layer. For that reason, at least one-half of the confining layer must remain intact.

The sedimentary rocks of southeastern Minnesota were deposited in a shallow inland sea from a billion to 300 million years ago. From that time to the present, the rocks have been subjected to weathering and most recently in geologic time, glaciation. In some locations where a confining layer is closest to the land surface, 300 million years of erosion, weathering, fracturing, and other geologic processes have destroyed some of the confining units ability to resist water movement. The proposed amendment establishes the ability to study, map, and modify the rule requirement in those discrete areas where the regional confining layer does not function normally.

4725.2020, Subparts 2 and 3 are combined with the definition of "confining layer" in part 4725.0100, subpart 24a, so they are proposed for deletion here.

4725.2050 USE OF WELLS OR BORINGS FOR DISPOSAL OR INJECTION PROHIBITED.

The existing rule prohibits the use of a well or boring for disposal. Proposed amendments exempt activities necessary to drill, maintain, or utilize a well or boring that do not result in groundwater contamination.

Two-thirds of Minnesota's residents use groundwater, obtained from wells, as their primary source of drinking water. Domestic water supply is granted the highest priority of water use under Minnesota Statutes, section 103G.261. Groundwater is protected as a source of drinking water. Minnesota Pollution Control Agency rules (part 7060.0600) prohibit discharge of wastes into the zone of saturation through an injection well or by other means. Injection of wastes, surface water, or other contaminants directly into a well or boring bypasses the natural filtration afforded by percolation through layers of soil, sediment, or bedrock, and can seriously degrade groundwater.

The existing rule prohibiting disposal into a well or boring is proposed for amendment to include injection. Some have argued that chemicals used for any purpose, regardless of volume or toxicity, or even effectiveness, may be placed in a well so long as the intent is not to "dispose" of the chemical. The amendment adds "injection" as a prohibited practice. The rule is also proposed for amendment to exempt selected specific products that are placed ("injected") into a well or boring. These products, such as drilling fluids or chlorine disinfectants, are necessary to construct or rehabilitate the well, or in some cases are allowed by statute, and are regulated by other rule parts in the chapter.

4725.2150 GAS PIPES, LIQUID PROPANE TANKS, AND ELECTRIC LINES.

The existing rule establishes minimum setback, separation, or "isolation" distances between a well or boring and a gas pipe, liquid propane tank, or electric line to prevent injury or death, and to allow for service to the well or boring. Amendments are proposed for clarification, and to exempt certain conditions or circumstances deemed to present a low hazard.

The well drilling industry has one of the highest worker compensation rates of any trade, due to the dangerous nature of the work. Utilities constitute one of the dangers. Electrocution is a major cause of death for workers in the drilling industry. Liquid propane and natural gas pipes create a potential for fire and explosion due to sparks or flames from metal masts, derricks, metal drilling tools, welding torches, and metal cutting equipment. The existing rule contains isolation distances to electric lines and gas pipes to protect workers and the public from injury and death. The setbacks also protect the utilities from damage, and allows for access to the well or boring for repair or sealing. The federal Occupational Health and Safety Administration (OSHA) requires a 10-foot radial setback between the closest part of a mast or derrick, and an electric line. However, the OSHA requirement only applies to the facilities governed by OSHA, and does not consider future use. OSHA would not prohibit the placement of an electric line less than 10 feet from a well, or even immediately over a well.

4725.2150, Subpart 1. The existing rule establishes isolation distances between a well or boring, and a pipe with flammable or volatile gas, an overhead or underground electric transmission line, or a petroleum tank. The separation distances are needed and reasonable to prevent injury and death to persons drilling wells or borings, and to protect persons repairing or sealing wells or borings in the future. The hearing record before the Minnesota State Board of Health, on January 9, 1974, for the initial well rule, reports that a well contractor representing 27 well drillers stated that.... "wells, particularly larger wells, have been located in very bad places regarding gas lines and power lines." The group recommended a 15-foot separation. The proposed rule was amended to include an isolation distance to an electric transmission line. The term was not defined. The initial reason for the rule, the reason identified in the Statement of Need and Reasonableness for amendments to Chapter 4725 in 1992, and the reason now is the protection of the worker from injury or death due to contact with a wire, line, or conductor that transmits electricity with sufficient amperage to cause harm. It has recently come to our attention, that the term "transmission line" is used generically by some, particularly electric utilities, to mean only high voltage electrical conductors. The intent of the rule, and the application of the rule since 1974, has been to apply the isolation distance to overhead or underground wires or conduits transmitting electricity. The OSHA standard describes the setback from electrical distribution and transmission lines. The proposed rule amendment clarifies the intent to apply the setback between a well, and a wire, cable, or other conductor of electricity. The terms are generally consistent with the National Electrical Code, and the National Electrical Safety Code.

The 10-foot electric line separation is consistent with the OSHA standard contained in 29 CFR Chapter XVII, sections 1910.180 and 1926.550, which applies to the safe operation of cranes, derricks, crawler locomotives, and truck cranes. The OSHA standard requires that for lines over 50 kilovolts, the clearance is increased 0.4 inch for each kilovolt over 50 kilovolts.

The present requirement to maintain a 25-foot distance to electric lines over 50 kilovolts is not consistent with OSHA requirements, and is proposed for deletion. The rule refers the reader to the OSHA requirements, which contain additional standards. The language of subpart 1 is amended to clarify the existing requirements.

4725.2150, Subpart 2 is proposed for deletion, with the safety precautions formerly in subpart 2 moved to subpart 1.

4725.2150, Subpart 3. The existing rule (subpart 1) exempts the electrical service line to the well or boring from the isolation distance setback. This has been moved to subpart 3. Additional exemptions have been added for low hazard (low voltage and amperage) electrical lines such as fiber optic or perimeter low voltage lighting. Temporary, usually small, liquid propane tanks are also exempted, which are needed for some drilling operations, and are removed when the job is completed. Numerous wells and borings, constructed prior to the effective date of the first well rule in 1974, are located within 10 feet of overhead or underground electric lines. In some cases, minor repairs or sealing can be done with hand tools, grout can be inserted with flexible plastic pipe, and derricks, drill rods, or other conducting implements are not needed, or can be kept the minimum (arc) distance from the electric line to comply with the OSHA standard. A buried gas pipe or electric line presents a hazard only when excavation is conducted. Item D is proposed to allow work where hazards are minimal and the OSHA standard can be met.

4725.2175 LOCATION OF WELL OR BORING WITHIN BUILDING.

The existing rule prohibits location of a well or boring in a building, unless the building is an approved well house. This allows for access to the well or boring for repair or sealing, allows for inspection of the well or boring, prevents accidents to persons working on the well, and protects the well from spills or sewer backups that would be contained within the walls and footings of the building. Amendments are proposed to separate, for the sake of clarity, the requirements for the building (subpart 2), from the requirements for the well (subpart 3). Proposed amendments also place additional requirements on the building design to protect the well or boring and groundwater. Less stringent amendments are proposed to extend the exemption for temporary monitoring wells and environmental bore holes from 48 to 72 hours, as proposed in part 4725.1830, item C, subitem (2), to provide greater contractor flexibility and reduce cost, and to exempt removable well houses to also reduce costs.

4725.2175, Subpart 1. The requirement to prohibit wells in most buildings has proven to be very important for well sealing. Every day, contractors and well owners are faced with extensive problems sealing old, used wells located inside buildings. Sealing costs can increase by factors of ten or more when access is restricted. In some cases, the MDH has had to issue variances to postpone sealing, after attempts to access and seal wells are unsuccessful. This creates huge costs for the owner, and places restrictions on the property deed.

Two types of exemptions are allowed in the existing rule, one for wells or borings located in a specially designed "well house," and one for environmental bore holes and monitoring wells that are drilled and sealed within 48 hours after beginning construction. These environmental bore

holes and monitoring wells are typically drilled for rapid assessment of a contaminant spill. As explained in part 4725.1830, item C, subitem (2), it is not always possible to drill, test, and seal the well within the 48-hour limit in existing rule, so it is proposed to extend the time to 72 hours.

4725.2175, Subpart 2. The existing rule allows a well or boring to be located inside a special building, commonly called a "well house," as long as the following conditions are met: the building must allow access to the well; the building must be exclusively to protect the well, boring, pump, and water conditioning equipment; and chemicals may not be stored in the building. Items D and E have been moved from existing subpart 3 to subpart 2, since subpart 2 pertains to the building, and subpart 3 pertains to the well. These two requirements pertain to the building. Item F is proposed so that in the case of a pump malfunction or water discharge pipe break resulting in the well house filling with water, water will drain out of the building, a person inside can escape, and a person attempting to enter the well house from the outside to remedy the problem will be able to open the door. Item G is moved from existing subpart 1, since it is a requirement of the building, and more logically fits in this subpart. Item H is proposed to clarify that a well house may be built against another building as a "lean-to," commonly used for small residential wells. There must be no access or openings between the well house and the other building to prevent backup of sewage, spills, or releases of contaminants in the other building from entering the well house.

4725.2175, Subpart 3. The requirement to extend the casing 12 inches above the floor is to prevent flood waters or spills from directly entering the well. Item B reminds the reader that the requirements of part 4725.2185 to maintain a 3-foot separation between a well or boring and a building apply, except where the well house is removable. Well houses for domestic wells, often seen at lake cabins, are buildings the size of a typical doghouse. These well houses are easily removed when service of the well is needed. The requirements for the well house floor formerly in subpart 3, items B and C have been moved to subpart 2.

4725.2185 DISTANCE FROM A BUILDING.

The existing rule part requires a 3-foot separation between a building or building projection and a well or boring. The proposed amendment prohibits enclosure of a well or boring (on more than three sides), thereby allowing access to the well. The reasons for the rule are the same as those identified in part 4725.2175, including allowing access to repair, treat, or seal the well or boring. The 3-foot separation requirement as currently written, would allow construction of a courtyard or similar structure completely around a well or boring, as long as a 3-foot separation was maintained from each wall. This would not allow for access by a drilling machine.

4725.2250 GENERAL CASING REQUIREMENTS.

It is necessary to establish minimum standards for casing to ensure that the material will not corrode or collapse, causing failure of the hole, and will not introduce contaminants or impurities into the groundwater through holes or other defects. This rule part applies to both temporary and permanent casings. The modifiers "permanent" or "temporary" have been added to the appropriate subparts for clarity.

4725.2250, Subpart 1 references material standards for each type of approved casing. Poured concrete and concrete curbing are proposed to be deleted as approved casing, as explained in part 4725.5750.

4725.2250, Subpart 2 requires watertight casing. Watertight casing is required to prevent leakage of surface contaminants into the groundwater, prevent contaminants from moving from a contaminated aquifer to an uncontaminated aquifer, maintain artesian pressures, and prevent loose sediment or rock from obstructing the bore hole.

Since the existing rule contains some provisions for the use of lighter weight casings as a cost saving measure, and the proposed rule contains additional circumstances where nonstandard casing may be used, this part is clarified to refer to standard permanent casing. Stainless steel casing is expensive, and is used almost exclusively for contaminant monitoring where steel would deteriorate or interfere with chemical analysis, and as such, is moved to the rule part pertaining to monitoring wells and environmental bore holes. As explained in part 4725.5750, concrete curbing or poured concrete is proposed for removal from the list of approved casing materials. A reference is added concerning flush threaded plastic casing. The reference does not change current rule requirements. The requirement to have threaded, solvent welded, or welded joints is moved to new subpart 2a.

4725.2250, Subpart 2a has been split from subpart 2 since the first portion of subpart 2 referred to water tightness, and the second to the casing joints. The existing rule contains adequate standards for threaded casing here and in the referenced specifications for each type of casing. The plastic casing referenced specification ASTM F480 contains standards for solvent welded joints. However, the standards, and the existing rule do not contain welding specifications. To provide reasonable minimum standards for welded joints, specifications are proposed to be added, similar to the welding requirements in the State of Wisconsin's well rule, NR 812.17. Specifically, the requirement for a beveled joint provides for the weld to penetrate the metal and cover a greater surface area of casing wall, instead of simply tacking the outer surfaces together. A full circumference weld provides strength, corrosion resistance, and water tightness. Welding couplings should be equivalent to the casing materials to prevent corrosion and leakage, allow for proper welding of similar materials, and provide strength equivalent to the casing. Welding the casing to the inside of the coupling requires a more difficult weld to make, reduces the chances for water tightness, and does not allow the casing pipe ends to meet, thus increasing the risk of cracking of the weld when the casing is subsequently driven.

4725.2250, Subpart 3. The existing rule requires that casing either be new, or salvaged from an (unsuccessful) well or boring within 120 days of installation, and still meet the standards for new pipe. This is needed to prevent the use of defective pipe, sewer pipe, culvert, used chemical process piping, or other casing, pipe, or tubular goods that may be substandard and fail, or be coated with chemicals or substances which could leach into the drinking water or groundwater. Casing removed from a monitoring or remedial well, that was in contact with petroleum, would not be appropriate for reuse in a drinking water well.

4725.2250, Subpart 4. Casing markings are required to assure that the casing meets the specifications indicated, and that both the installer and the inspector can determine that the casing meets the specifications. Each standard, such as ASTM A53, contains the details of the markings required.

Some standards do not require marking. Rolling, stamping, or stenciling of the markings by the manufacturer assures that the mark is relatively permanent and that a third party has not altered the markings. Stainless steel is predominately used for contaminant monitoring. Because of concerns that ink or paint markings could interfere with chemical analysis, stainless steel casing is not marked with the casing specifications.

4725.2250, Subpart 6. The term "pipe" has been replaced with the term "casing" since the rule pertains to casing. The stainless steel casing specifications have been moved from part 4725.2450, and the concrete curbing specifications of part 4725.5750 have been deleted.

4725.2250, Subpart 7. This rule part is proposed for amendment to clarify that the casing material standards only apply to permanent casing. Temporary casing, by its very nature, is only used to advance the hole, and is later removed. The requirements of subparts 2, 7, and 17 are not material standards, but construction details necessary to protect the well or boring from collapse, and prevent the entry of surface water or other contaminants into the ground during the construction process.

4725.2250, Subpart 8. The existing rule currently requires a minimum annular space to be maintained when one casing is placed inside another. The purpose is to allow sufficient room to insert a tremie pipe to the bottom between the casings, in order to fill the space with grout. An open space provides a direct conduit for surface contaminants to quickly reach the groundwater. The conduit can be through the annular space between the drilled hole and the casing, the space inside the casing, or the space between two casings, one placed inside the other. Placing grout in the annular space between the casings prevents flow, and supports the inner casing. The existing rule requires an inner casing to be 3.25 inches smaller than the outer casing (1.625 inches of space surrounding the inner casing), except for larger diameter casings where 3.5 inches is required. The MDH is proposing to reduce the requirement from 3.25 inches to 3.0 inches (1.5 inches of space surrounding the inner casing), and to amend the requirement for larger diameter casing to apply only to casings deeper than 100 feet. This will allow for some casing products now in common usage, like 4-inch (inside diameter) solvent-welded plastic casing, to be used inside of the commonly available 8-inch outer steel casing. The .125 (1/8th)-inch reduction of space (and grout) should not affect the ability to grout, or the final grout properties. Applying the larger diameter requirements only to wells or borings deeper than 100 feet allows more flexibility and lower costs for the shallow, large diameter wells and borings, while maintaining the greater clearance for deeper wells and borings, where tolerances are more critical.

4725.2250, Subpart 9. The existing rule allows less stringent outer casing materials in an unconsolidated formation, when an inner casing is cemented inside. If an outer casing is used to hold back loose or unconsolidated sediments with the intention of installing and cementing an inner casing, then the outer casing acts largely as a temporary form for the cement, and provides

no real structural support. In this case, the MDH proposes to allow the installer discretion to determine the kind of casing to use in this situation. The proposed rule amendment clarifies that this applies to permanent outer casings since temporary casings are already exempt under subpart 7. It clarifies that this lighter weight outer casing must be steel, since part 4725.2650, subpart 8, prohibits drilling inside of plastic casing. The existing rule exempts the casing from the general material specifications in this part. If it did not, requirements like subpart 4 would mandate standard casing. The requirements of parts 2, 9, and 17 are retained, since they affect the well design and sanitary protection, not the material specifications. Requiring that the casing be free of oil or other contaminants provides assurance that the casing will not affect the quality of the well water or groundwater. The proposed amendment allows cement-sand grout in addition to neat-cement grout, just as the proposed amendments do in other instances where only neat cement is now allowed. The amendment also reminds the reader that the outer casing is not exempted from the grouting requirements of part 4725.3050.

4725.2250, Subpart 11. The purpose of extending the casing 12 inches above the established ground surface or floor is to prevent spilled chemicals, flood waters, runoff, dirt and other potentially harmful materials from directly entering the well. The proposed amendment allows the casing to terminate 6 inches above the concrete slab for a hand pump, if the slab is 6 inches or more above the ground. The net result is a casing 12 inches above the ground. Placing some hand pumps on a casing 12 inches or more above a concrete slab make it too high to operate the hand pump easily, particularly for persons in wheel chairs or motorized scooters.

4725.2250, Subpart 13. The existing rule requires a well or boring to be constructed so as not to interconnect aquifers. As such, a single well or boring cannot have multiple screens in different aquifers, cannot be gravel packed across confining layers to interconnect aquifers, and must be grouted except in the aquifer used. In some parts of the United States, wells or borings are constructed in a "nest" by drilling a large diameter hole, and placing multiple separate casings at various depths (and various aquifers) in the same hole. Grout may be emplaced around intervals where none of the wells or borings has screens, but gravel pack is placed in the intervals where one well has a screen, but the other, deeper casings do not. The gravel then surrounds the casing of the deeper wells. When these casings fail or corrode, water from the higher pressure aquifers, usually the upper aquifers, will enter the well or boring and be injected into the lower pressure aquifers, usually the lower aquifers. This has been prohibited in the past because of the requirement to surround a casing with grout. This subpart is proposed to directly clarify that this type of construction practice is specifically prohibited.

4725.2250, Subpart 14. This subpart is proposed to require the same inside diameter throughout the length of a casing in order to allow for service and sealing, and maintain water-tightness. Most new domestic wells are cased with 4-inch inside diameter casing, and have submersible pumps. Submersible pumps are inserted in the well below the water level. The outside diameter of submersible pumps ranges from 3.5 to almost 4 inches. Well screens are made in variety of sizes, but commonly are just slightly smaller in diameter than the casing. Pumps and screens fail, and need to be removed for repair or replacement, and in the case of pumps, sealing of the well. Reducing the size of the casing can make removal of screens and pumps difficult or impossible, and can interfere with other repair or sealing operations. Historically, casings were "telescoped," that is, a smaller diameter casing was dropped inside another casing, with a portion

of the two casings (hopefully) overlapping. This technique does not provide a watertight connection, because an annular space is left between the casings, and any packers or plugs between the casings are not solid and secure. In some instances, the casings actually separate. For this reason, telescoped casing is not permitted.

4725.2250, Subpart 15. The existing rule requires use of a "drive shoe" on driven casing, but does not define what a drive shoe is or establish specifications. A drive shoe is typically a coupling-like fitting that has a hardened, chisel-shaped lower edge, and is attached to the bottom of a casing to be driven. The drive shoe is pounded or "driven" into the ground in order to seal the bottom of the casing into the formation, prevent leakage or sand pumping, allow the casing to "slice" through resistant formations, protect the casing from damage such as bending or kinking, and help the casing remain plumb and aligned. A "drive point" consists of a screen with a metal, conical, closed, and pointed bottom end (the "point") to allow for driving the screen and casing into the ground. Drive points are proposed to be exempted because the drive point serves the same purpose as a drive shoe.

A "temporary casing" is installed during the drilling process and then removed. One purpose of the drive shoe is to seat the casing firmly into the formation. If the casing is seated too firmly, it may not be easily removed, making the temporary casing permanent. Therefore, temporary casings are proposed to be exempted. A cement grouted double-cased well has an inner casing that is doubly protected and sealed with cement, making a drive shoe unnecessary. There is no national consensus standard (like ASTM or API) for drive shoes. This proposed rule establishes minimum standards that require the drive shoe to be functional (have a hardened beveled cutting edge), be comparable to the casing in strength and corrosion resistance, and be securely attached to the bottom.

4725.2250, Subpart 16. In order to prevent vandalism and to prevent debris, contaminants, , animals, and (in the case of large diameter wells) children, from falling into a well or boring under construction, it is important that the hole and casing be covered when work is not being done on the well or boring. This rule part clarifies existing rule parts 4725.3150 and 4725.4950 that an uncompleted well or boring must have a weatherproof and vermin proof cover of cap. The proposed amendment allows the caps or covers allowed in subpart 17 for permanent installations, and in addition, allows an overlapping steel plate held down with the drilling tools (a method now in common use). The proposed rule also requires that an open bore hole (without casing) and the annular space around a casing, be covered when work is not being done on the well or boring, to prevent accidents, and to prevent debris or contaminants from entering the well, boring, or groundwater.

4725.2250, Subpart 17 is proposed to replace the cap, cover, and connection requirements in existing rule part 4725.4950, which is proposed for deletion. The requirement to cover a casing is important not for only water-supply wells, but also for other wells and borings.

4725.2350 STEEL CASING REQUIREMENTS.

The ASTM and API standards have been made current. The requirements of the rule part have not changed.

4725.2450 STAINLESS STEEL CASING REQUIREMENTS.

This entire part is proposed to be repealed and moved to part 4725.6650, which pertains to monitoring wells. Stainless steel is very expensive, and has been used almost exclusively for monitoring wells and other environmental wells and borings, where an inert material is needed so as not to interfere with contaminant analysis. The standards for stainless steel are proposed to apply only to monitoring wells, environmental bore holes, and remedial wells.

4725.2550 PLASTIC CASING AND COUPLING REQUIREMENTS.

4725.2550, Subpart 1. The outdated ASTM standards have been brought up to date. The current ASTM F-480 standard now includes specifications for flush threaded pipe. This joint configuration is designed for the monitoring and environmental field. While the current rules limit flush threaded pipe to these non-potable wells, the ASTM standard does not specify use criteria. Therefore a caution is proposed to remind the reader of the approved use of flush threaded plastic casing.

4725.2550, Subpart 2. The market for plastic well casing is very small compared to the market for plastic pipe used for other purposes such as water or sewer pipe. The market for plastic casing couplings is small compared to the market for plastic casing. Because of the relatively low demand, manufacturers are reluctant to make couplings specifically for plastic casing. Plastic couplings for water pressure pipe are made in some sizes and configurations that are equivalent to the standards for plastic casing couplings. This rule part proposes to allow the use of other plastic couplings, if the couplings meet the performance standards of ASTM F-480. This is reasonable because it will allow contractors greater choice of materials without sacrificing the quality of the couplings.

4725.2550, Subpart 3. The ASTM and NSF/ANSI standards are updated.

4725.2650 PLASTIC CASING INSTALLATION.

4725.2650, Subpart 8. The proposed amendment clarifies existing language prohibiting drilling inside of plastic casing, but allows drilling through temporary plastic casing, consistent with part 4725.2250, subpart 7, which exempts temporary casing from the material standards. Plastic casing is a comparatively soft material, easily damaged by steel or carbide drilling tools. Plastic casing sections joined and installed in a drill hole are rarely perfectly aligned, which means that additional drilling would likely contact the sides of the casing at some point. This can easily damage the casing and allow seepage or failure.

4725.2650, Subpart 9. The existing rule prohibits the installation of plastic casing in limestone or dolomite, unless it is contained in an outer steel casing where the grout volume can be controlled. The proposed amendment simply clarifies existing requirements. Limestone and dolomite are hard rocks, which transmit water through fractures, solution cavities, and occasionally caves. In order to install a casing in limestone or dolomite, a hole larger than the casing must be drilled first, and the casing installed into the hole. In order to prevent surface water from running down the hole outside the casing, the space between the bedrock and the hole

must be filled with grout. Cement grout is needed to support the casing, and to remain in place. However, cement generates heat when it cures, enough heat so that cement in a large solution cavity or cave can melt plastic casing.

4725.2650, Subpart 9a. This proposed amendment moves the requirement in part 4725.3050, subpart 7, to this subpart for better organization. Part 4725.3050, subpart 7, requires cement grouting of plastic cased wells and borings, since plastic casing may not be driven, and requires that the grout extend a minimum distance of 5 feet into (bed)rock to assure that the casing is sealed into the bedrock. Steel casing has tensile strengths commonly in the range of 45,000 to 60,000 pounds per square inch (psi). Steel can be driven or pounded into the ground. Plastic casing has tensile strengths commonly in the range of 4,000 to 9,000 psi, and hydraulic collapse ratings of 100 to 300 psi. Plastic casing can deform, bend, or shatter if pounded into the ground. Therefore, driving plastic is prohibited by existing subpart 7.

4725.2750 SCREENS, SCREEN LEADERS, RISERS, AND SUMPS.

The existing rule requires a screen to be attached to a casing. This prevents the addition of more gravel pack or filter sand material, should the gravel pack around the screen settle. This amendment removes the requirement for mandatory connection to allow the contractor flexibility in well design. The requirement for a competent and nontoxic connection protects the well or boring and groundwater.

The existing rule allows a screen leader to be no more than 10 feet above or below a screen. A "screen leader" is a piece of blank pipe attached to the top or bottom of a screen. A screen leader on the top of a screen is also called a "screen riser," and a screen leader on the bottom of a screen is also called a "screen sump." A screen riser provides some cushion when pulling back a casing to expose a screen, so that the casing is not pulled too far, and the well fails. The riser also provides some opportunity to complete a well if the casing is set too shallow, or will not advance. The well industry has asked for more than 10 feet of screen riser to accommodate more gravel pack, particularly in cases where the gravel pack settles. Screen sumps are rarely used, and 10 feet has been sufficient. The leaders that are commercially produced, are not made to casing standards. Also because the screen risers and sumps are not grouted, it is important that the length be limited, and that it not breech a confining layer. A maximum of 21 feet of total leader (the common length of one piece of casing) is proposed. Consistent with part 4725.2020, limits are placed on screens, risers, and sumps placed in a confining layer to protect the integrity of the confining layer, and the underlying aquifers. Multiple screens separated by multiple risers or sumps are prohibited to prevent wells or borings from interconnecting multiple aquifers.

4725.2850 GRAVEL PACKS.

"Gravel packs" or "filter sands" are materials placed between a bore hole and a screen to stabilize the hole, allow water to pass through the screen, and prevent sediment from entering the well or boring. Being in contact with water, it is important that the materials do not negatively impact the water quality.

The gravel pack or filter sand is a very porous and permeable material. Placing a gravel pack to the ground surface, across a confining layer, or between aquifers creates an envelope, essentially

a gravel drain, allowing contaminants, undesirable water, or gasses to quickly travel along the outside of the casing and impact the well or boring and groundwater. Limits must be placed on the extent of the gravel pack. The limitations proposed are consistent with parts 4725.2020, 4725.2750, and 4725.3050.

4725.2950 DRILLING FLUIDS.

4725.2950, Subpart 1. This subpart requires that water used in the drilling process not contain harmful materials that may contaminate the groundwater. When a well or boring is drilled, a mixture of water and drilling additives is used to suspend and carry the pulverized soil and rock out of the hole, cool the drill bit, and stabilize the hole to prevent collapse. Water may also be used in certain maintenance, repair, or sealing operations, including hydrofracturing. A portion of the water, and associated additives, are never removed from the drill hole. They are lost into the ground, often largely into an aquifer (source of drinking water) since an aquifer by definition is capable of storing and transmitting water. Water taken from an unsafe source may contain pathogenic organisms or harmful chemicals. The proposed amendments add hydrofracturing, repair, and sealing to the activities requiring clean water. Existing rule part 4725.6650, subpart 3, already exempts monitoring wells from maintaining a chlorine residual, due to potential interference with water quality analysis.

4725.2950, Subpart 2. Proposed amendments to this subpart update adopted standards. "Drilling additives" are materials or chemicals added to the drilling water or air to aid in drilling a hole. Historically, a mixture of water and bentonite, a natural swelling clay mineral, have been used. Increasingly, chemical additives have been developed for specific drilling operations, such as the unique circumstances of drilling some oil wells. Some of these products contain diesel oil, other petroleum products, or harmful substances that should not be present in drinking water. NSF International, formerly known as the National Sanitation Foundation, has established "Standard 60," which evaluates the health effects of drinking water chemicals including drilling additives. This is the only nationally recognized health-based standard available. The American National Standards Institute (ANSI) has developed an accreditation program under Standard Z34.1, which assures that organizations such as NSF are credentialed to perform the evaluations required by the standard.

4725.3050 GROUTING.

"Grouting" is the process of inserting a low permeability material around a casing to support the casing, protect the casing from corrosion, prevent surface water from entering the ground, prevent collapse of the bore hole, and prevent flow of water, gases, or contaminants between aquifers. Casing is used in the construction of wells and borings to stop loose materials from caving into the hole, to stop water movement from one aquifer to another or from the surface into the well or boring, and to allow for testing and deeper drilling. Casing is typically installed either by forcing, pounding, or driving the pipe into the ground as the hole is drilled (driven casing), or by lowering an entire string of casing into an oversize hole that has been drilled completely. This larger hole creates an open area around the casing--an "annular space." If this annular space is not filled with an impervious material, water, other fluids, or contaminants can quickly enter the groundwater or spread between aquifers.

4725.3050, Subpart 1. Proposed amendments to this subpart rename "concrete grout" as "cement-sand grout," and combine "bentonite grout" with "high-solids bentonite grout." This existing subpart requires the use of neat-cement grout, concrete grout, bentonite grout, or high-solids bentonite grout. The amendments to this subpart propose to clarify where the approved materials are to be used, namely in the annular space surrounding the casing. The amendments propose to eliminate the definition of "high-solids bentonite grout," and combine the criteria with those for "bentonite grout" for the reasons identified in part 4725.0100, subpart 21d. "Concrete grout" is proposed to be renamed "cement-sand grout," as explained in part 4725.0100, subpart 22b. Concrete was previously allowed only in the dry portion of the hole due to concerns for separation of the mixture below the water level. Cement-sand grout, injected from the bottom up through a tremie pipe should not appreciably separate. The grout materials listed are in common usage in the industry, and have been proven to result in a satisfactory low-permeability seal. They are readily available, reasonably priced, and can be physically installed with existing equipment.

4725.3050, Subpart 2. This subpart establishes the requirements for placement of the grout in the annular space. Prompt grouting is necessary to prevent collapse of the bore hole and assure that the annulus is completely grouted. Collapse of the bore hole can introduce surface soils, surface contaminants, or loose materials (often gravel or sand) into the annular space that can create a gravel envelope from the surface to the well intake. In some circumstances, particularly when installing a casing inside an existing cased well or boring, a method is needed to prevent the grout from filling and plugging the open hole below the casings. Acceptable methods of preventing this include backfilling the open hole with gravel which is later removed, installing a metal ring on the outside of the inner casing, or using a "grout basket" or "shale trap" made of inert materials. Unacceptable methods include use of organic materials such as wood (so called "brush plugs"), burlap, or other organic materials that may decompose and harbor bacteria. Grouting from the bottom up is necessary to prevent separation and dilution of the grout mixture and to assure that voids are filled and that bridging of the grout does not occur. As the grout is pumped into the space, water begins flowing out of the well or boring. As the grout continues to displace the water and drilling fluid in the well, and the grout level rises near the surface, grout starts appearing in this expelled water. The percentage of grout increases until all the water is expelled, and the material exiting the space is all grout. If grouting is stopped when the first sign of (diluted) grout appears at the surface, the upper portion of the hole will be filled with a diluted, substandard grout. The MDH is proposing to allow dumping of grout where the depth is 10 feet or less. Bridging, dilution, and questions of improper grout placement should not occur at this minimal depth, and this procedure will reduce the costs substantially in some circumstances, such as with shallow monitoring wells, or when a well or boring has been grouted and the grout has settled.

4725.3050, Subpart 2a. Proposed amendments to this subpart reduce the "wait on" cement time. The existing rule requires a minimum wait of 48 hours (12 hours if rapid setting cement is used) between cement grouting and resuming drilling. This is to give the cement sufficient time to harden before further drilling occurs, since drilling could weaken, crack, or cause catastrophic failure of wet cement. Bentonite grout sets very quickly, within minutes of installation, and is designed to remain pliable, so it is not necessary to wait 48 or even 12 hours before drilling. The 48 hour requirement was included in the original well rule in 1974, when a substantial number of

wells were drilled with "cable tool," a pounding, or "percussion," method that creates considerable shock on the cement. Wells today are predominately drilled with the "rotary" method. Also, research done by the State of Michigan has shown that cements reach a compressive strength of 500 psi within 24 hours, a standard used in the oil well drilling industry to determine when to proceed with drilling.

4725.3050, Subpart 3. Amendments to subpart 3 propose to increase the minimum grouting depth in unconsolidated materials from 30 feet to 50 feet. The existing rule requires all annular space surrounding a casing to be filled. Cement grout is required in bedrock. Bentonite grout may be used in unconsolidated formations. Drill "cuttings," a mixture of the ground up sediment and drilling fluid, may be used in unconsolidated formations below a depth of 30 feet. Cuttings have historically been used as a cost saving measure, and as a means of using up what otherwise would be a waste material requiring removal from the site. If the cuttings contain a high percentage of clay and other fine-grained material plus bentonite drilling fluid, and if the mixture is slowly and carefully placed so as not to bridge, cuttings can provide a relatively effective seal.

However, in practice, cuttings often are too permeable and do not completely fill the annular space. Cuttings often contain a higher percentage of coarse-grained (more permeable) particles than was originally present in the undisturbed material. The fine-grained materials remain suspended in the drilling water or are washed out. Placement of cuttings by dumping or shoveling often leads to bridging, and therefore partial and incomplete sealing. The action of the falling cuttings dislodges the more permeable materials around the bore hole. During settling of cuttings through standing water, the heavier coarser materials settle faster. A medium sand settles at an average rate of 626 feet per hour, while clay settles at 0.45 to 0.018 feet per hour. This differential settling can result in permeable sand filling the space and the suspended fines washing out of the hole.

Ideally, the open annular space of all wells and borings should be grouted for the entire length of the casing, so called "full-length" grouting. Full length grouting is becoming a more common requirement in other state's well regulations, with Michigan, Ohio, and Indiana adopting full length grouting requirements in the past ten years. Surrounding states such as Iowa require grouting to a minimum depth of 40 feet or below all clay layers thicker than 5 feet. However, full length grouting can present increased costs, and can be practically difficult in some geologic conditions, such as unstable gravel and boulders, or so called "heaving" sands.

The MDH has observed numerous cases of well contamination due to the present 30-foot grouting minimum, which could have been prevented with deeper grouting. Surficial sands in some of the sand plain areas contain nitrate from land uses such as crop fertilizer, animal manure, or individual septic systems. In those areas, wells are often drilled through the sand in an attempt to get below the contamination, through a clay layer, into an underlying sand. Cases have been observed where the sand and contamination extended deeper than 30 feet, but the grout was terminated at the rule minimum of 30 feet, resulting in nitrate flowing through the cuttings or backfill down the bore hole, and contaminating the well.

Full length grouting provides the greatest protection, but in some cases may be expensive and technically difficult. Establishing a standard based on geology can tailor well construction to

existing conditions, but would be difficult to determine until the well is drilled, creating problems for bidding, inspection, and enforcement. As a compromise, the MDH is proposing to increase the minimum grouting depth from 30 feet to 50 feet. This will provide increased protection for the well and groundwater, and not substantially increase drilling costs or practical difficulties. The increased grouting depth also provides some justification for decreasing some of the isolation distances to contamination sources.

The existing rule allows the space below the grout in unconsolidated formations to be filed with cuttings. The intent is to use the same (unconsolidated) materials removed from the drill hole to fill the drill hole. Most bedrock in Minnesota is covered with unconsolidated materials. Cuttings from bedrock may be more porous and permeable than the overlying unconsolidated materials. The proposed amendment requires that the cuttings placed in the unconsolidated portion of a well or boring, were taken from the unconsolidated portion.

4725.3050, Subpart 4. It is necessary to seal the space between casings for the same reasons it is necessary to fill the space between a casing and a drill hole. Neat-cement grout or cement-sand grout provide a low permeability seal under a wide range of conditions, and provide support for the casing.

4725.3050, Subpart 5. Proposed amendments to this subpart exempt some wells and borings from the requirement to use a drive shoe, for practical or cost-saving reasons, and consolidate the requirements for driving casing into rock. Existing language requires that when driving casing, a bentonite material be placed around the casing at or near the ground surface. The bentonite is drawn downward around the casing as it is being driven, particularly if "threaded and coupled" casing is used. The bentonite seals or "grouts" the annular space created. It also lubricates the casing, allowing easier installation, decreasing the likelihood of casing damage while driving, and increasing the likelihood of successful casing removal if desired. A "drive shoe" is required by existing rule to obtain a tight seal at the bottom of the casing, and to protect the casing while driving as described under part 4725.2250, subpart 15. A "drive point" has a pointed end built into the screen, so a drive shoe is not needed. Temporary casing is removed, and a cement-grouted outer casing has the inner casing and cement grout for protection.

Historically, casing was driven with a "cable tool" (percussion) drilling machine. The casing was pounded into the ground a few inches to a few feet. A drill bit smaller in diameter than the casing was then inserted into the casing and a few feet drilled by raising and dropping the bit. The pulverized soil and rock, called "cuttings," were mixed with water and removed with a bailer. The process was repeated over and over. Because the hole drilled was smaller than the casing, the casing was forced tightly against the surrounding materials providing a tight seal.

The more recently developed "drill-and-drive" techniques that combine a rotary drilling action with a driving mechanism, under-reamers that have a bit that expands in diameter below the casing, or techniques such as "dual rotary" that use an outer "casing" to drill, all raise concerns that the seal around the casing may not be tight. As indicated in the justification for part 4725.0100, subpart 26d, to be considered a "driven casing," and not require tremie pipe grouting, the drill bit must be smaller than the outside diameter of the casing.

Geologic formations that are unconsolidated, or loosely consolidated, are most amenable to driving, both from a practical aspect, and from a well and groundwater protection aspect. As such, this proposed rule allows driving in unconsolidated formations, and in sandstone formations, which are comparatively soft. By contrast, limestone and dolomite are generally very hard and impossible to drive through, except that in some cases it may be possible to drive through some softer layers, and historically some contractors have used extreme measures such as explosives. Excessive driving can damage the casing, collapse some formations, and negatively affect a finished well. The irregular nature of the limestone leads to concerns that the formation will not seal against the casing. For these reasons, driving through more than 10 feet of competent limestone or dolomite is prohibited. The prohibition against driving more than 10 feet in the St. Lawrence or Eau Claire confining layers, and 2 feet in the Decorah or Glenwood confining layers is consistent with the definition of "confining layer" and the goal to not breach confining layers.

4725.3050, Subpart 7, Item A. The proposed amendment changes the term "rock" to "bedrock," and allows the use of cement-sand grout consistent with other amendments to the rule.

4725.3050, Subpart 7, Item B. The existing rule requires a 3.25-inch bore hole to be drilled whenever casing extends more than 10 feet into (bed) rock. Consistent with, and as explained in, part 4725.2250, subpart 8, the bore hole size requirement has been reduced from 3.25 inches to 3.0 inches.

Consistent with other proposed amendments, this proposed amendment would allow cement-sand grout wherever neat-cement grout is now allowed. This proposed amendment also allows casing to be driven in sandstone even if the sandstone is not the first bedrock encountered, as explained in subpart 5. This will allow driving an inner casing in the "Jordan" sandstone in the very common "8X4" wells, where the first bedrock is commonly the Prairie du Chien limestone, and the Jordan sandstone may be soft.

4725.3050, Subpart 7, Item C. Rule part 4725.3050 applies to all wells and borings regulated by this chapter unless specifically modified. The existing language in subpart 7, item C only applies to water-supply wells in or below limestone or dolomite. For clarity and better organization, the language in item C has been slightly modified and moved to a proposed new rule, part 4725.4250, in the section pertaining specifically to water-supply wells.

Minor modifications have been proposed to (former) item D allowing cement-sand grout, consistent with proposing to allow this material everywhere neat-cement grout is allowed, and allowing stone aggregate in subitem (2), since stone aggregate is allowed in subitem (1). Geologic materials like clay, sand, or fractured granite contain very small void spaces, typically a few millimeters or less. Grout inserted into these formations penetrates only a short distance. However, some geologic materials, like karsted or cavernous limestone, may contain large openings or even caverns. It is not necessary from a groundwater protection standpoint, or reasonable from an economic standpoint, to fill these caves with neat-cement grout. This proposed rule part would allow less costly alternative materials to be used in plugging these large voids.

4725.3050, Subpart 8. This new subpart is proposed to allow an intermediate bentonite seal for all wells and borings. Existing rule part 4725.6650, subpart 2, allows the use of bentonite pellets as an intermediate seal between a gravel pack and a grout in order to prevent the grout from penetrating the gravel pack and plugging the screen. The rule part limits this activity to monitoring wells and environmental bore holes, and places restrictions on depth. The existing rule allows the bentonite pellets only for those wells/borings where the activity was commonly used--environmental wells and borings. The depth was limited because early bentonite pellets were prone to rapid hydration, resulting in premature swelling and bridging. Bentonite chips do not hydrate as quickly. This rule part extends the allowance of this intermediate seal to all wells and borings and to all depths, with the important requirement that a tremie pipe be inserted to the top of the seal and the well be grouted to the surface. This assures that the solid bentonite does not bridge, and is emplaced where it is supposed to be, and that the space above it is sealed with grout.

4725.3150 CASING CONNECTIONS AND CAPS.

This rule part is designed to prevent the entry of potentially contaminated surface water and vermin into a well, and to provide a secure connection to lessen the likelihood of vandalism and prevent injury. Surface water, flood water, runoff, and even splashing from rainfall can contain dirt, bacteria, and chemicals that can contaminate a well, boring, or groundwater if the well or boring has openings. Mice, snakes, insects, and other vermin can be carriers of disease and will enter a well or boring if unprotected openings exist. A secure cover, and secure connections help prevent unauthorized entry into a well or boring, and in the case of the electrical wires, help prevent electrical shock.

4725.3150, Subpart 1. Amendments are proposed to include examples of some connections already covered under the existing rule, add a solvent welded connection and overlapping cap as approved connections, and revise the pump connection language. The list of connection examples does not add any new requirements; it only provides typical connection examples. The term "solvent welding" is added to clarify that solvent joining or "welding" of plastic casing is approved. The language requiring a pump to be mounted on a concrete pedestal is removed. The practice of using a concrete pedestal is rarely used today, except for some very large turbine pumps. Mounting a pump directly on a casing using the connections identified in this subpart will provide a secure and watertight seal. A concrete pedestal may still be used if desired.

4725.3150, Subpart 2 contains requirements to reasonably assure that fittings, pipes, or other connections to the casing installed less than 12 inches above the ground do not provide an entry point for flood water, runoff, vermin, or other contaminants to enter the well, boring, or groundwater. Because the connections in this part present a higher risk (most are below ground), than above-ground connections, the requirements are more restrictive than those in subpart 1. At the same time, they are somewhat less restrictive than the casing joining requirements of part 4725.2250, subpart 2, item A, that apply to the total depth of the casing. The use of the connections detailed in this subpart is limited to the depth of the frost line, where they can be dug up by conventional excavating equipment and replaced or repaired if needed. Providing internal clearance (required for pitless units and pitless adapters in existing rule) allows for complete access to the pump, screen, and casing. The standards for the threaded casing connections should be as strong and watertight as the casing itself.

Specific standards are established in 4725.3150, subpart 2, item B for welded connections that allow for a wider range of fittings such as the "Weld-O-Let" type fittings. Both the rubber expansion sealer and bolted flange with rubber gasket have been deleted from item C as acceptable connections, since there is a very wide range of design and quality, with some products on the market being of poor quality (such as homemade connections using bicycle inner tubes, radiator hoses, tin cans, tape, or wire). A standard has been added to item D for a bolted, sleeve-type coupling, sometimes referred to by the trade name "Dresser coupling," in common use for potable water distribution piping, and that has an accepted standard from the American Water Works Association. Solvent welded connections have been added since standards exist, and the products are readily available.

At times, an installer may have a steel casing without threads, or a plastic casing, and may wish to attach a threaded pitless unit. This would require either threading the steel casing, which may be difficult for some existing wells, or by installing a coupling that has threads on one end, and a welded (solvent welded for plastic) fitting on the other. Unfortunately, casing adapters and fittings are not made that comply with all the requirements of the ASTM well casing standards. The MDH is therefore proposing, in 4725.3150, subpart 2, item E, to allow the use of alternative fittings, manufactured for plumbing or water piping, that meet the material standards (thickness, strength, etc.) of the casing specifications. The MDH is proposing to restrict the use of these fittings to the connection for the pitless unit, so that they can be excavated and replaced if necessary.

4725.3150, Subpart 3 proposes requirements pertaining specifically to electrical connections, to consolidate rule requirements, and to assure watertight connections. In the existing rule, electrical connections are regulated under subparts 1 and 2 of this rule part, and part 4725.4850. The existing rule requires all connections, including electrical connections, to be weatherproof and inspect proof, but does not provide details. Electrical connections have been observed to be particularly troublesome, partly because the irregularly shaped wires can be more difficult to make watertight, and partly because the connections are sometimes made by a person not totally familiar with both wells and electrical wiring. Electrical connections through the side of a casing are difficult to make watertight, typically cannot be made watertight without a fitting that obstructs the casing, can be a safety issue, and can make later service difficult. This subpart references the Minnesota Board of Electricity, and the standards for conduit in the electrical code. If a caulk or sealant is used, it must meet the NSF/ANSI standards for contact with potable water.

4725.3250 PUMPS AND PUMPING EQUIPMENT.

4725.3250, Item B is proposed for amendment to allow alternatives to a stuffing box, to provide a weatherproof and vermin proof connection for a reciprocating pump rod. A reciprocating pump rod typically is not compatible with a stuffing box because of the design. Item D is proposed to acknowledge that water lubricated turbine pumps need water to operate. During start up, an external source of water is typically used for "prelubrication." If the source is not stored water from the well in question, it is important that the "priming" water that is injected into the well is of potable quality.

4725.3350 INTERCONNECTIONS AND CROSS CONNECTIONS.

Amended language is proposed to clarify that the well rule requirements for cross connection control end at the building plumbing, and that this chapter does not nullify requirements of the Minnesota Plumbing code. An interconnection, or "cross connection," between a source of contamination and a well or boring, can allow contaminants to enter the drinking water system, or the groundwater. Pesticides and fertilizers are added to many irrigation systems, and some irrigation systems are connected to systems that also supply potable water. The same water system that provides drinking water to the faucets and kitchens in a hospital, mortuary, or veterinary clinic, provides water to boilers, toilets, lab equipment, operating rooms, or embalming rooms. The existing rule prohibits direct connections or interconnections unless protected with an air gap or suitable backflow prevention device. The proposed additional language clarifies the distinction between this rule regulating wells and borings, and the rule regulating plumbing under Minnesota Rules, Chapter 4715.

4725.3450 FLOWING WELL OR BORING.

Flowing, or "flowing artesian" wells and borings occur most often when a confining layer, like clay or shale, overlies an aquifer in which the pressure in the aquifer exceeds the atmospheric pressure. This pressure differential will cause water to flow to the land surface without pumping when a well, boring, or other drill hole penetrates the confining layer. Flowing wells and borings occur most commonly at lower elevations near rivers or lakes. Pressures and flows can vary from slightly more than atmospheric pressure with flows of less than a gallon a minute, to tens of pounds of pressure with flows of hundreds or even thousands of gallons a minute.

Flowing wells and borings can present major problems for casing completion and well/boring sealing, and can also cause serious erosion and land subsidence problems, safety threats, and the waste of groundwater. Unsealed casings can allow water to move up the outside of the casing causing hole erosion and uncontrolled flows. Special precautions are needed during construction to prevent adverse effects. Tightly driving the casing or cement grouting assures that the casing will not wash out and the flow will not get out of control. Failure to provide a solid conduit for water to flow to the surface through the casing often results in erosion of the bore hole outside the casing to many times its original size. Erosion with subsequent subsidence can threaten drilling equipment and structures. In some cases uncontrolled flow can enter another formation or aquifer, or begin flowing from the ground some distance from the drill hole.

4725.3450, Subpart 1. This proposed amendment does not change the existing requirements; it simply clarifies that the requirements of the rule part are in addition to other requirements of the rule. The subpart has been divided, so that the requirements for low flow and low pressure are in a new subpart 1a, while the high flow, high pressure, or special construction area requirements in existing subparts 2 and 3 are combined into subpart 2.

4725.3450, Subpart 1a. The existing rule requires low flow wells and borings to have casing cemented into the flowing aquifer. The amended language proposes an alternative to cement grouting the casing--driving the casing. Experience has shown that properly driven casing can successfully contain low flows and pressures. Numerous problems encountered in the past with

flowing wells and borings have resulted from inadequately sealed casings, allowing water to flow to the surface around the casing. To prevent this flow, it is necessary to either firmly drive the casing, or grout the casing with neat cement.

Bentonite grout is not allowed, because it remains too fluid in the hole, and generally has insufficient weight to hold the artesian pressure. Water has a weight of approximately 8.4 pounds per gallon, bentonite grout weighs approximately 9.2 pounds per gallon, whereas cement grout weighs approximately 15 pounds per gallon. Cement has the added advantage of providing corrosion control for the casing.

4725.3450, Subpart 2. This subpart combines the existing subparts 2 and 3 since both pertain to high flow, high pressure, or special construction areas. The existing rule establishes that special construction techniques are required when pressures exceed 10 pounds per square inch (psi), flows exceed 70 gallons per minute (g.p.m.), or where unique geological conditions have resulted in uncontrolled flows and the commissioner has designated a special construction area. In these cases, a single casing is inadequate to control flows. The proposed amendments allow the outer casing to end in a competent bedrock above the confining layer to reduce costs, and allow a lighter than standard weight outer casing, consistent with part 4725.2250, subpart 9, since the well or boring will have a cement grouted inner casing. Another proposed amendment reduces the annular space requirements consistent with part 4725.2250, subpart 8. Cement-sand grout is permitted consistent with part 4725.3050, subparts 1, 4, and 7.

4725.3450, Subpart 3. As previously indicated, the high pressure, high flow or special construction area requirements of subpart 3 are combined with subpart 2. Subpart 3 is repealed.

4725.3450, Subpart 5 is proposed to combine existing general requirements for cross connection control, valving, and vermin protection, into this subpart specific to flowing wells and borings. When a well or boring flows, either the flow must be contained, and stopped at times when water is not needed, or the excess water discharged to a surface water, sewer, gravel pocket, or some other point of disposal. If an overflow discharge is used, it is important that this direct conduit into the well or boring and groundwater not allow backflow or back siphonage of surface water, if the well or boring stops flowing, or if the pressure in the receiving water is greater than the well or boring. The simplest and most effective means to prevent back flow is an "air gap." An "air gap" simply positions the discharge pipe above the water level of the lake, or level of the sewer. A screen is needed on the discharge pipe to prevent insects, rodents, and other vermin from entering the well or boring when it is not flowing.

4725.3450, Subpart 6 is proposed to exempt temporary flowing wells and borings from the construction requirements. The flowing well and boring requirements of this rule part prescribe a process of installing permanent casing to prevent leakage and uncontrolled flows for the life of the well or boring, that may be tens or even hundreds of years. Numerous temporary wells and borings are constructed to obtain hydrologic or geologic information and are then sealed. The requirements in parts 2 and 3 that are designed to tightly seal the casing to prevent leakage, result in casing that will be difficult or impossible to remove. Requiring that these standards be followed would substantially increase the cost of these temporary wells and borings--in some

cases by a factor of two or more. If the hole is kept under control while drilling, and sealed when finished, there is no practical need for permanent casing. Exempting temporary wells and borings from this rule part can substantially reduce costs to the industry and regulated parties.

4725.3550 WELL LABEL.

4725.3550, Subpart 2 is proposed for amendment to allow the label of an at-grade well to be attached to the vault. It may be easier, and more visible, to attach the label to the vault than the casing, which is terminated inside the vault.

4725.3650 REQUIREMENTS FOR DESIGNATED SPECIAL WELL AND BORING CONSTRUCTION AREAS.

To date, eleven localities, ranging in size from approximately 1/2 square mile to over 25 square miles, have been identified as "special well construction areas" because of groundwater contamination. These sites include areas where groundwater has been contaminated by sources such as a refinery, landfill, or solvent disposal area. The sites have been identified where widespread contamination exceeding drinking water standards has impacted groundwater and drinking water wells. The existing rule authorizes the MDH to require special construction techniques to provide safe water for drinking water wells, and to assure that the construction of the well (whether used for drinking or not) does not spread or exacerbate the contamination. The present rule part does not regulate borings in these vulnerable and contaminated areas. Proposed amendments to parts 1 through 3 add borings to the wells now regulated in special construction areas. A boring penetrates the same geologic formations and contaminants as a well, and has the some of the same potential to exacerbate contamination as a well.

Trichloroethylene contamination in Lake Elmo, Bayport, Baytown Township, and West Lakeland Township in Washington County has impacted an area over 6 square miles and has contaminated three major aquifer systems. The only aquifer remaining below the contaminated aquifers has not been used for domestic supply because of the depth, cost, unknown water quality, and physical problems constructing a well. Some concerns have also been expressed about drilling numerous holes through the contaminated aquifers, and the potential for leakage into the last aquifer left. Baytown Township and West Lakeland Township have passed ordinances requiring water testing, and regulating carbon filtration systems. Since public water systems do not exist throughout the area, remediation of the groundwater has not occurred, and obtaining a naturally safe well is problematic, treatment of both existing and new wells may be the only alternative. Subpart 4 acknowledges that in some cases, drilling a contaminated well may be the only option, and that in those cases, treatment and monitoring are necessary to reasonably assure a safe drinking supply.

4725.3725 CHEMICAL TREATMENT AND REHABILITATION.

This new rule part is proposed to establish standards for materials, typically liquid chemicals, inserted in a well or boring to facilitate construction, rehabilitation, or sealing. The rule requirement is needed to protect the safety of workers using the chemicals, prevent damage to the well, prevent contamination of the groundwater, and assure that the chemicals are removed or neutralized before someone consumes water from the well.

Chemicals such as acids, bases, biocides, oxidizers, dispersants, and surfactants are commonly used in wells and borings to help remove drilling fluids and clays, eliminate encrustation, and kill bacteria including pathogenic bacteria and nuisance bacteria. The present rule does not regulate the products, or the use of the products. Many of these chemicals are dangerous. Hydrochloric acid is extremely corrosive, and produces hydrogen chloride gas. Sodium hydroxide can cause a severe exothermic reaction. Other products are irritants, poisons, or are capable of causing burns or explosions. The lack of a material standard provides no safety control. For example, the MDH was involved with a well that produced a disagreeable taste and odor, although extensive tests indicated the water was acceptable sanitary quality. A well contractor used hydrochloric acid in an attempt to eliminate the tastes and odor. A water quality analysis taken after the well was acid treated indicated the presence of methylene chloride that exceeded the drinking water standard, a chemical not present before acid treatment. Investigation determined that the industrial grade hydrochloric acid contained methylene chloride as an impurity.

4725.3650, Subpart 1. The proposed amendments require that treatment chemicals meet NSF/ANSI Standard 60 "Drinking Water Treatment Chemicals-Health Effects." This assures that the product is appropriate for contact with water, and maintains quality control. Most household chlorine bleach, commonly used for well disinfection, has not been tested to Standard 60. The FIFRA standard establishes a parallel approval for chlorine. Since some of the well treatment chemicals must be concentrated to work effectively, it is important that the products be removed or neutralized. Drilling additives are regulated under part 4725.2950.

4725.3650, Subpart 2. Acids used in the well industry, such as hydrochloric or muriatic acid, are extremely dangerous if ingested, or if in contact with skin or mucus membranes. Acids can produce irritating, corrosive, and potentially life threatening gas. Asphyxia can occur due to the displacement of oxygen in confined spaces such as well pits, basement "offsets," or well houses. Subpart 4 of part 4725.3750 has been deleted from that rule part, and repeated here as item A. A pH value is a measure of the hydrogen ion concentration (acidity or alkalinity). A pH value of 7 is neutral. Most water in Minnesota is neutral to slightly basic (pH of 7 to 8). The pH value can be easily measured by use of a simple meter, or by dipping a test strip in the water. The test strip changes color, indicating the pH value. Measuring the pH value, and returning the water to a pretreatment pH value, assures that acidity is removed from the groundwater, and that water with high acidity is not inadvertently distributed as potable water.

4725.3750 REPAIR, CORRECTION, OR SEALING OF WELLS AND BORINGS.

4725.3750, Subpart 1. The existing rule requires that a defective part of a well or boring be repaired, and if not repaired, the well or boring must be sealed. The proposed amendments to this subpart add two more examples of defective parts--"connection" and "cover," to the list of defective parts that must be repaired.

Proposed amendments require that two serious defects be corrected: wastes directly entering the well or boring, and an unprotected connection between a public water-supply and a well or boring. The first defect is obvious, such as a sewer connected to well. The second is less obvious, but can, and has, caused contamination of a large portion of a public water system. It is relatively common for a well to remain in use after a building is connected to municipal water. The well is often disconnected from the household potable supply, and connected to a sprinkler or irrigation system. However, if the well and municipal water are both connected to the household plumbing, the well is contaminated, and the pressure from the well pump is higher than the pressure from the municipal system, contaminated water can be pumped into the municipal system and to other homes.

4725.3750, Subpart 3. Existing rule language requires that when all casing is removed and reinstalled, or new casing installed, the well or boring must meet the requirements for new construction. The proposed amendment clarifies this, and gives some examples without adding additional requirements.

4725.3750, Subpart 4 is proposed to be deleted here, and moved to part 4725.3725, subpart 2, item A.

4725.3750, Subpart 5 is proposed to clarify that the rule does not require wells or borings constructed prior to the effective date of the first well rule, July 15, 1974, to meet current rule requirements, but does require any new work to be in conformance with the proposed rule. Existing wells and borings must meet the requirements in effect at the time they were constructed. Except where specifically noted, the rule applies to new activities or construction, and is not retroactive; however, all new work must comply with the rule in effect at the time the work is done.

4725.3750, Subpart 6. Existing rule part 4725.5675 requires that the casing of a buried water-supply well be extended above the ground when repaired. That rule part is proposed for deletion, with the requirement placed in this subpart to fit better with other repair requirements, and is broadened to apply to all wells and environmental bore holes, rather than just water-supply wells. Buried wells and borings present a serious potential for leakage into the groundwater through a defective or corroded cap; a contamination source being installed nearby, since the well or boring is not visible; a building or other obstruction being built over the well or boring; or the well or boring being forgotten when no longer used and not properly sealed. For these reasons, it is proposed to require all wells and environmental bore holes to be extended above grade when repaired.

4725.3850 SEALING WELL OR BORING.

This rule part has been reorganized to more logically follow the chronological sequence of sealing, starting with the requirement to seal in subpart 1, followed by the preparation work in subparts 2 and 3, the general requirements for sealing with grout in 3a, specific additional requirements or exemptions for special geologic conditions in subparts 4 through 7, and ending with subpart 8 that addresses modification or disturbance to a sealed well or boring.

"Sealing" is the process of removing debris, obstructions, pumps or other materials from a well or boring; perforating, removing, or grouting multiple casings; and filling the well or boring with an approved grout. Filling the well with a low hydraulic conductivity grout prevents surface water or contaminants from entering the well or boring and groundwater; prevents the flow of water, gases, or contaminants between aquifers, or from a contaminated aquifer to a safe aquifer; and, in the case of large diameter wells and borings, prevents a safety hazard, especially to children.

Minnesota Statutes, section 103I.301, establishes conditions where a property owner must have a well or boring sealed, including if the well or boring is contaminated, improperly sealed, or located, constructed, or maintained in a manner that endangers groundwater quality, or is a safety or health hazard. The statute goes on to state that a well that is not in use must be sealed unless the property owner has a "maintenance permit" for the well.

4725.3850, Subpart 1. This subpart is proposed to clarify that sealing is required if the well or boring meets specific conditions specified in statute, and that licensing requirements for sealing are found elsewhere in this rule. The requirements concerning when a well or boring must be sealed are moved from existing subpart 6 to this subpart, to more logically follow the sealing process.

4725.3850, Subpart 2 currently requires that materials in a well be removed if the materials interfere with sealing. This is designed to require removal of materials that may contaminate the groundwater, such as debris, or pumps that contain PCB capacitors, and to require removal of an obstruction that would leave an unfilled void below if the obstruction were not removed. An unsealed pipe or casing could act as a conduit to allow fluids to move along the bore hole. However, it is common, and in fact normal, for some sediment to fill a small portion of the bottom of the well or boring. Removal of all sediment could add substantial cost with minimal benefit. This proposed rule amendment will allow small quantities of natural mineral matter to remain in the well or boring, and will allow natural sand resulting from blasting a sandstone formation to remain in the sandstone formation.

4725.3850, Subpart 3. The purpose of the existing requirements in subpart 3 is to fill all open spaces with grout. If the well or boring has multiple casings, and only the inside of the inner casing is filled, the open space between the casings can transmit water or contaminants. The existing rule establishes three methods to accomplish this: grout behind the casing, remove the casing, or puncture the casing to force grout behind the casing. These have not changed in the amendments, but have only been reorganized and clarified. The requirement to start grouting within 24 hours of perforation is new, and is proposed to avoid plugging of the perforations or

collapse due to perforations that may have been done with explosives. The perforation requirements have also been amended to require more open area per perforation for larger diameter casings (16 inches), since it requires more grout to fill the larger annular space between larger casings, and perforations may begin to plug and restrict as more cement is forced through the holes. A minimum perforation size of 1/8 square inch is proposed, since a hole too small will rapidly plug and not allow cement to flow through the perforation. Success in grouting with perforations is a function of the size of the individual perforation, the total open area of perforations, and the frequency of perforations. Larger perforations provide better grout flow, so as the size increases, the number of perforations can be reduced and the spacing increased. An additional perforation option is proposed in item C, subitem (2) to allow for less frequent perforations when larger holes are made.

Perforation is necessary and generally effective, but can be expensive and at times problematic. A typical $500 to $800 routine sealing, can cost two, three, or more times as much if perforation is required. Explosive perforators carry some risk of damage or injury, and have become stuck due to perforator malfunction or unstable bore hole conditions. In a situation where a well or boring is cased a small distance into an aquifer (not a confining layer), the costs and risks of perforation may be higher than the benefits. Subpart 3 is proposed to be amended to exempt wells or borings cased less than 20 feet into a limestone or sandstone formation from the perforation and casing removal requirement. Driven casing is also exempted in specific cases, since an open annular space should not exist around driven casing.

4725.3850, Subpart 3a. This subpart contains the requirements formerly in subpart 1 that the well or boring must be filled with grout, that the grout must be pumped from the bottom to the top, and that the grout pipe must remain submerged in grout while grouting. The low permeability of grout prevents the transfer of contaminants through the bore hole. Pumping grout assures that all voids are filled, and that the grout is placed where it is meant to be placed, and does not separate as it would if allowed to drop through water. Submergence of the grout pipe assures that the grout is not diluted by the water in the borehole or formation.

4725.3850, Subpart 4. Existing subpart 4 has been proposed to be separated into two subparts, subpart 4 pertaining to the approved grout for sealing wells and borings in unconsolidated materials, and subpart 4a detailing the alternative sealing materials for large diameter wells and borings in unconsolidated materials. Consistent with other portions of the rule, cement-sand grout (formerly called concrete grout) is proposed to be allowed below the water level, and the two existing standards for bentonite used for grout, have been combined as discussed previously.

4725.3850, Subpart 4a. The portion of former subpart 4 that provided alternative sealing materials for large diameter dug wells has been proposed as subpart 4a. The existing rule allows less costly sealing materials to be dumped into large diameter (16 inches and larger) dug wells less than 200 feet deep that have less than 20 feet of water. The proposed rule allows the same materials to be dumped in any well or boring regardless of whether dug, drilled, or driven, if the well or boring meets the same criteria. The method of construction is not relevant. The large diameter, relatively shallow depth, and substantially dry hole provides the conditions where dumping can fill the space without bridging or separation. The materials provide a substantially less costly alternative. It takes 0.66 gallons to fill one vertical foot of a 4-inch diameter well or

boring (the typical sized domestic drilled well), while it takes 9.5 gallons to fill 1 vertical foot of a 16-inch diameter well or boring (more than ten times as much grout as a 4-inch well). A 36-inch diameter well or boring, typical of dug wells, requires 53 gallons to fill 1 vertical foot (almost 100 times as much grout). Bentonite pellets and chips have been added as another material option, since they can be successfully poured into these large diameter holes. Water must be added to the bentonite pellets or chips to swell the bentonite.

4725.3850, Subpart 5 addresses materials allowed for permanently sealing a well or boring in bedrock. This proposed amendment will allow cement-sand grout (formerly called "concrete") to be used below the water level as mentioned previously. Bentonite grout, a semi-solid grout, may wash out of a fractured or cavernous rock, and is therefore not allowed in bedrock. This amendment also proposes to move the existing exceptions for use of alternative materials in areas of large grout loss to subpart 5a.

4725.3850, Subpart 5a. The primary goal of sealing a well or boring is to restore the integrity of the earth to at least as good a condition (low hydraulic conductivity) as existed before drilling. In situations where voids, caverns, or large fractures exist, and large grout loss occurs, the geologic materials are often eroded, fractured, or otherwise compromised, and the geologic materials have generally higher conductivity. The existing language of subpart 5 provided practical, and far less costly, alternative sealing methods and materials in situations where large voids exist or grout loss occurs. The alternative materials, while providing somewhat lower protection than standard grout, should provide protection equivalent to, or better than, the natural geologic materials, at a substantially reduced cost. Cement-sand grout is proposed for use below the water level consistent with other portions of the rule. The rule is clarified that sand may be used in a "blasted and bailed" sandstone formation, since the sandstone is an aquifer (not a confining layer), and the sand can restore the bore hole to near preexisting conditions.

4725.3850, Subpart 5b. Subpart 4a establishes the methods and materials allowed for sealing large diameter wells and borings in unconsolidated materials. Subpart 5b allows cement grouts (neat cement, sand-cement, and concrete) to be dumped into the rock portion of large diameter wells and borings. As explained in subpart 4a, the large diameter, relatively shallow depth, and small amount of water are conditions where, with care, the grouts can be placed by dumping, without the occurrence of bridging or separation. Bentonite, clay, or the other materials allowed in subpart 4a for use in unconsolidated formations are not allowed here because these materials can be washed out of the bore hole in highly fractured or cavernous bedrock.

4725.3850, Subpart 6 is proposed to be deleted, and the requirements moved to subpart 1.

4725.3850, Subpart 7. As indicated in the justification for part 4725.3450, bentonite grout weighs little more than water, and must remain soft and flexible in order to provide an effective seal. In conditions of even moderate water flow or pressure, bentonite grout can be diluted, eroded, and washed away, leaving an unsealed, flowing bore hole. Neat-cement grout has nearly twice the density of water when first mixed (15 pounds per gallon), and can withstand compressive strengths in excess of 3,000 pounds per square inch when cured. It is necessary and reasonable to use neat- cement grout for sealing flowing borings because its properties make it much more effective than bentonite grout in achieving a proper, permanent seal. In cases of higher pressures or higher flows, techniques such as thickening the cement to increase the weight to 16 or 17 pounds per gallon, using rapid setting cement, or pumping large volumes of cement

quickly can be successful. The addition of the very dense (heavy) natural minerals, hematite (Fe_2O_3), or barite ($BaSO_4$), can increase cement weight to 19 pounds per gallon and help hold down large flows.

4725.3850, Subpart 8. Minnesota Statutes, section 103I.325, establishes a waiver of contamination liability if a well is properly sealed and the sealing is not disturbed. It is important to maintain the integrity of the seal. However, at some time in the future, the property owner or others may develop the property, install buried utilities, dig a basement or otherwise excavate, and may encounter the sealed well. It is not reasonable to require that the casing, and cement or bentonite grout, remain above the land surface if the ground elevation is lowered, a basement is built, or other construction occurs, as long as the remaining well seal is not disturbed.

4725.3875 RESPONSIBILITY FOR SEALING.

4725.3875, Subpart 1. Existing subpart 1, and Minnesota Statutes, Chapter 103I, establish that a property owner is responsible for sealing, and that sealing must be done by a licensed contractor. An amendment is proposed to this subpart to reference subparts 2 and 5 in cases where a violation occurs. The MDH has enforcement authority under Minnesota Statues, Chapter 144 to require that the person responsible for creating a violation, correct the violation.

4725.3875, Subpart 2. Existing language in subpart 2 applies only to licensees or registrants. Many other persons, including a property owner, unlicensed contractor, or other individual, may improperly seal a well, in violation of statute or rule. The MDH has authority under Minnesota Statutes, Chapters 103I and 144, to take numerous enforcement actions, in addition to, or in concert with, issuing a corrective order. The actions are taken against the person who creates the violation. Language is proposed to clarify that this authority pertains to any person who does improper work.

4725.3875, Subpart 4 is proposed to address sealing of unsuccessful or test wells and borings. Not all attempts to construct a well or boring are successful. A large boulder may be encountered, the hole may be crooked, a drill bit or other tool may be broken off in the hole, or other physical or contractual issues may occur. While these unsuccessful wells or borings, or wells or borings constructed for testing purposes, are regulated by the sealing requirements, some persons have viewed them (erroneously) as not regulated or not important. This subpart clarifies that these holes must either be completed in accordance with the rule, or sealed in accordance with the rule.

4725.3875, Subpart 5. Part 4725.2185 requires a separation distance of at least 3 feet between a well or boring and a building, and prohibits a well or boring from being inside a building except in very limited and specific cases. One reason for this requirement is to allow access to the well for sealing. Part 4725.2250 requires the casing of a well or boring to terminate at least 1-foot above the ground surface. This protects the well or boring from surface contaminants and runoff. Termination above the ground surface also is a visual marker of the existence and location of the well or boring. If a well or boring is buried or built over, it can be forgotten, particularly when the well or boring is no longer used, or the property is sold. Building over a

well or boring can make it difficult or very expensive to seal the well. Demolition near the well or boring, or burial of the well or boring can damage the well or boring, allow contaminants into the well or boring and groundwater, and significantly increase the sealing cost.

F. Water-Supply Wells.

The following rule parts, 4725.4150 to 4725.6050, pertain to water-supply wells. Water-supply wells include drinking water wells, irrigation wells, wells used for commercial or industrial purposes, wells for groundwater heat pumps (groundwater thermal exchange devices), public water-supply wells, remedial wells for contaminant clean up, and dug wells.

4725.4150 BENTONITE DRILLING FLUIDS.

This new rule part is proposed to require the addition of chlorine to bentonite drilling fluids. The goal is to eliminate bacteria and other organisms introduced into the well and groundwater during the drilling process.

Bentonite is the most commonly used drilling fluid additive. Background information about bentonite is contained in the explanation for part 4725.0100, subpart 21c. Bentonite is mixed with water and used to stabilize the bore hole until the casing can be installed, by coating the bore hole wall with a semipermeable "mud cake." The mixture of water, bentonite, soil materials, drill cuttings, and any organisms encountered in the soil, is circulated down the drill hole as the well is drilled. A portion of the mixture is forced into the geologic formations, including the aquifer, and is not completely removed. This cuttings mixture (that may contain bacteria and other organisms) may be used to fill the space around the casing below the top 50 feet of grout, and may be mixed in with the grout. Organisms in this bentonite fluid may be forced into the formation, cake the bore hole, and be backfilled in the annular space. This can create a column of bacteriologically contaminated materials around the casing that seep out through time. Wells have been observed to take up to one year for the introduced organisms to die off naturally. Disinfection after the casing is installed will not reach behind the casing. In fact, even after initial disinfection, approximately 25 percent of new wells still test positive for indicator (coliform) bacteria, which triggers a warning not to drink the water without boiling.

Two approaches are needed to eliminate these organisms. The first being techniques to prevent entry of organisms into the well and groundwater during drilling, and the second is to do a better job of disinfection for those organisms that do survive the drilling process and are in the well and groundwater. The second approach is found in part 4725.5550. The first is detailed here.

Bentonite drilling fluids exacerbate the problem of contamination with organisms because the bentonite creates a physical barrier for removal of the organisms, prevents disinfectants from reaching the organisms, and provides a substrate for the growth of organisms. The minimal concentration of chlorine required in the drilling water by part 4725.2950, is quickly used up by the chlorine demand of organic compounds, iron, and other oxidizable materials in the drilling fluid. This subpart proposes a preventive approach to destroy many of the organisms as they are encountered, by requiring the bentonite drilling fluid to have a chlorine residual at all times during drilling. Disinfection after completion of drilling is important, but elimination before the

organisms are established, and while they can be reached, should eliminate many of the problems with wells that take multiple disinfections and many months of effort to clean up. Chlorine is an effective and common well disinfectant, and in fact, is required by rule. Chlorine is readily available, very inexpensive, and relatively safe if handled correctly. Most contractors use either a granular calcium hypochlorite, commonly used for swimming pool disinfection, or liquid sodium hypochlorite, sold as common laundry bleach. This new rule part will require contractors to maintain a chlorine residual in the drilling fluid at all times. Inexpensive, rapid reading test kits or paper strips can be used to determine that chlorine is present.

4725.4250 LIMESTONE OR DOLOMITE WATER-SUPPLY WELLS.

Existing rule part 4725.3050, subpart 7, item C, contains the requirements for drilling a water-supply well into or below limestone or dolomite. That subpart applies to all wells and borings; however, item C applies only to water-supply wells. For clarification and better organization, the requirements of part 4725.3050, subpart 7, item C, that apply to water-supply wells have been deleted in part 4725.3050, and added here. Amendments are proposed to address the construction of water- supply wells in and through limestone and dolomite because of the susceptibility of those formations to contamination.

Limestone and dolomite are hard rock materials comprised of calcium and calcium/magnesium carbonate respectively. Both rock materials are relatively brittle and can fracture. Both materials are soluble in acids, such as plant acids. Water moves through sand, or sandstone formations by slow movement through small pore spaces between sand grains. Water moves through limestone or dolomite through fractures, solution cavities, and in some cases, caves. A typical groundwater flow rate in sand is 100 to 200 feet in a year. Water can move 100-200 feet through heavily fractured limestone or dolomite in minutes. This very rapid water flow, without the natural filtration provided by flow through a fine-grained porous media, makes wells completed in a limestone or dolomite highly susceptible to contamination. Since this filtration to remove microorganisms and attenuate chemical contaminants is often minimal in the limestone or dolomite, it must occur in the overlying materials before reaching the limestone or dolomite. For this reason, the existing rule has required a minimum of 50-feet of overlying filtering materials above a limestone or dolomite for a 1-mile radius, if the limestone or dolomite is to be used for a potable supply. Since the limestone or dolomite is susceptible to contamination, nonpotable water-supply wells are also of concern, so that the construction does not spread contamination.

4725.4250, Subpart 1 specifies, as does existing rule part 4725.3050, subpart 7, item C, that this rule part applies to water-supply wells.

4725.4250, Subpart 2. Existing rule part 4725.2650, subpart 9, restricts plastic casing in limestone or dolomite. This rule part echoes those requirements specific to water-supply wells. Plastic casing cannot be driven through limestone, since the bedrock is hard and consolidated. Therefore, an oversized hole must be drilled to install the casing. This oversized hole creates an annular space that must be filled to prevent migration of water. Soft, fluid grouts like bentonite may be physically washed away in the voids, fractures, and caves of limestone and dolomite. Portland cement-based grouts provide a solid, competent seal and will remain in place.

However, cement generates heat (heat of hydration) as it sets. A large thickness of cement can melt plastic casing, causing it to deform, and fail. For these reasons, restrictions are placed on the use of plastic casing in limestone or dolomite.

4725.4250, Subpart 3. This subpart is consistent with the grouting requirements of part 4725.3050, subpart 7, item B, and replaces the limestone grouting requirements formerly in part 4725.3050 subpart 7, item C. A minimum bore hole size is necessary to allow for insertion of a grout pipe between the bore hole and casing. Limestone and dolomite present particularly unique challenges for grouting, since the large caverns and caves can take very large quantities of grout. Frequently, multiple batches of cement must be used, aggregate must be used to fill caverns, or the cement must be allowed to set up, prior to resuming grouting. If grouting is done through the inside of the casing, and the pumping of cement is stopped due to interruptions in cement mixing, cement delivery, pump malfunction, or grout loss, the cement can partly set, preventing the remaining annular space from being grouted through the casing. If sufficient annular space exists, it may be possible to insert a grout pipe on the outside of the casing, and resume grouting. If the drill hole is too small, it will not be possible to properly grout the well.

4725.4250, Subpart 4, item A. As explained above, limestone and dolomite are very sensitive to contamination due to the often rapid fracture flow, with little filtration, so filtration must occur in the overlying materials. Any overlying material occurring in Minnesota (unconsolidated materials, sandstone, or shale) over limestone or dolomite is acceptable, except other limestone or dolomite. The requirement for a minimum 50 feet thickness for a 1-mile radius is in existing part 4725.3050, subpart 7, item C, has been a requirement of the rule since its inception in 1974, and is the basis for grouting maps published by the MDH and Minnesota Geological Survey (University of Minnesota) as part of the County Atlas projects. A proposed amendment is a list of the common limestone or dolomite formations. This does not change existing rule applicability, but is proposed for the convenience of the reader.

4725.4250, Subpart 4, item B. The existing rule prohibiting potable use of a limestone or dolomite formation unless covered with 50 feet of overlying material for a 1-mile radius around the well has proven to be generally protective of public health. However, the rule is not ideal, largely because of the extremely wide variability of the limestone or dolomite, and variations in geologic conditions and land use. In a small number of unique geologic circumstances, the rule is not restrictive enough, particularly in areas of very permeable overlying materials, low groundwater levels, and extensive application of fertilizers and pesticides. In other unique geologic circumstances, the rule may be overly restrictive, such as where an overlying limestone or dolomite has small but significant confining layers, where groundwater is confined, where the overlying materials are thick and contain low permeability materials, where the groundwater flow direction is from an area of less contaminating land use, or where the location with less than 50 feet of overlying materials is near the 1-mile radius and is in a discharge area. The MDH is proposing to identify these areas, and modify the limestone grouting maps referenced in A above, similar to the flowing well and boring areas identified under part 4725.3450, and the contamination areas identified under part 4725.3650. The maps benefit contractors and others who construct, design, or use wells, and this provision matches the well construction to the specific conditions.

4725.4250, Subparts 5 and 6 take the existing requirements of part 4725.3050 subpart 7, reorganize the language, and reword for clarity without changing the requirements. The requirements in subpart 5 are needed to assure that the casing is firmly seated into the formation to prevent sediment from entering the well, and leakage around the casing. The requirement in subpart 6 to install a minimum amount of casing extending into an underlying formation is needed to prevent leakage of the potentially contaminated water in the overlying limestone from leaking into the underlying formation, and to allow the underlying formation sufficient flow to filter bacteriological contaminants if present in the overlying limestone or dolomite. The minimum bore hole size is needed to allow grouting with a grout pipe. Because large fractures and caverns in a limestone or dolomite may result in large grout losses, it may be difficult or impossible to grout through the casing, since grouting must be done continuously. Use of a tremie pipe allows the addition of materials such as gravel to plug large voids, and allows cessation of grouting to allow for setting of the cement, with later continuation of grouting. The larger annular space requirement for large diameter casings over 100 feet deep is consistent with the grouting requirements of part 4725.3050.

4725.4250, Subpart 7 is proposed to provide an exception for remedial wells that is necessary to remove groundwater contamination. A remedial well is used to remove groundwater contaminants. One of the most common groundwater contaminants is petroleum from such sources as leaking gasoline or fuel oil tanks. Petroleum will separate into multiple phases as it soaks into the ground. A portion of the petroleum will coat soil particles as it moves downward through the soil, some will be vaporized into the air spaces between soil particles, some will float on the water surface, and some will be dissolved into the water. Since an appreciable quantity will float on the water surface, in order to effectively clean up the petroleum, it is often necessary to have screen or open hole across the water table.

4725.4350 WATER-SUPPLY WELL DISTANCE FROM WATER BODIES: PROTECTIONS IN FLOOD AREAS.

This existing part establishes a minimum setback or "isolation" distance between a surface water body and a water-supply well, and establishes standards to prevent floodwaters from entering the well. The purpose of the setback, as with all setbacks from contamination sources, is to provide a separation to prevent flooding directly into, or near the well, that could lead to contamination of the well or groundwater. The separation distance increases the likelihood that contaminants will travel in the groundwater in a direction away from the well, provides sufficient distance to filter contaminants that do move in the groundwater toward the well, and prevents the flow of contaminants along the ground surface to the well.

4725.4350, Subpart 1. Amendments to this subpart are proposed to decrease the separation distance between a water-supply well and a surface water body, clarify that a storm water retention pond is a surface water body, and exempt specified surface water bodies that present a negligible risk.

Thirty years ago, when the rule was first developed, storm water retention ponds were rare. Today, with large construction projects, many times near wetlands, storm water ponds are common. Since the ponds collect runoff from storm sewers, paved areas, yards, roads, roofs, and

construction projects, the water may contain contaminants such as oil and petroleum products from automobiles, or road deicing chemicals, and presents a risk similar to other surface water bodies.

The surface water isolation distance has been 50 feet since the initial well rule was promulgated in 1974. The concerns at that time included the discharge of industrial wastes, run-off from animal operations, and direct sewage discharge into lakes and rivers. In the 30 years since the 50-foot setback was adopted, major pollution laws and programs have significantly reduced the discharge of these wastes into surface water bodies. As such, the MDH is proposing to reduce the isolation distance from 50 feet to 35 feet. The MDH is also proposing to exempt protected, small, or seasonal water bodies that present a minimal risk to a well. Included in this exemption are areas protected from flooding by federal flood control structures. These areas protected by berms, dikes, or other structures, are protected from the regional flood. The MDH is also proposing to exempt small, intermittent, or seasonal water bodies from the isolation distance requirement. It is not reasonable, or possible, to eliminate all water within the setback unless the property is large enough to place the well 50 (or 35) feet from all property lines and structures, and enough dirt is brought in to place the well on top of a hill. The proposed language exempts water sources that are small or short lived, and are unlikely to seriously affect the well.

4725.4350, Subpart 2. Protection from surface water encompasses two principles. First, maintaining a setback from water bodies results in a minimum soil separation. Lakes or rivers may recharge groundwater, or may be recharged from groundwater. Pumping a well can draw water from a lake or river. A separation of soil affords time and distance for contaminant attenuation and bacterial die-off. Second, the direct entry of floodwater, spills, or runoff into a well can be prevented by extending the casing above the flood level, or making the well waterproof. Items A and B are reworded, but the requirements have not changed. Items C and D are proposed as additional alternative flood protection measures. Contractors have expressed concern that casing extending a considerable distance above the ground may be damaged by floating debris in large floods, such as those that occur in the Red River Valley. Damage to the casing could result in massive quantities of floodwater and debris entering the well. Items C and D are proposed as alternatives to extending the casing, by making the well waterproof, so that if flooded, the flood waters should not enter the well. Similar to the exemption in subpart 1, it is being proposed to exempt the casing protection requirements for wells that are protected by a flood control structure certified by the Federal Emergency Management Agency (FEMA). These are substantial dikes or berms, typically installed by the Corps of Engineers

4725.4450 WATER-SUPPLY WELL DISTANCES FROM CONTAMINATION SOURCE.

This rule part contains the minimum setback or "isolation" distances required between a water-supply well and a source of contamination. Amendments are proposed to clarify some requirements, increase some isolation distances, and decrease other distances.

Minnesota Statutes, section 103I.205, subdivision 6, prohibits a person from placing, constructing, or installing a source of contamination any closer to a well than the isolation distances prescribed by the commissioner of health in rule. Therefore, the rule applies both to the placement of wells near existing sources of contamination, and the placement of

contamination sources near existing wells. The setbacks apply, regardless of the age and quality of the existing well or contamination source. The rule must therefore consider that many existing wells were constructed prior to the effective date of the first state wide well rule in 1974, and do not have the same protections of quality casing, depth, and grout that new wells are now required to have. These wells are more susceptible to contamination. Similarly, existing contamination sources such as sewage treatment systems, may have been constructed prior to enactment of regulations, and may be substandard, or even failing, as compared to newly installed ones. The isolation distances must take into account vulnerable geology and soils, poor quality older wells or contamination sources, and highly varied use and oversight.

Maintaining minimum setbacks helps to prevent direct entry of contaminants into a well, or into any open annular space around a well, should a spill or leak occur at the surface. For example, when a sewage drainfield fails, it commonly plugs and does not accept sewage. When that happens, the sewage can back up and flow onto the ground surface through the riser or inspection ports on the septic tank. While ideally the well should be on higher ground, and upgradient of contamination sources such as septic systems, the limitations of existing properties and soils leads many new septic systems to be placed at a higher elevation than the well.

The setback also provides a mechanism to allow for contaminant dilution in groundwater, and attenuation by filtration, adsorption, absorption, and chemical or biological alteration before reaching the well. Treatment capacity varies widely in soils, with dry, moderately permeable soils containing organic matter typically doing the best treatment. The distance between the contaminant source and the well, and the time that it takes for the contaminant to move to the well, allows for die-off of bacteria, viruses, and parasites. However, not all organisms die at the same rate, with some viruses and parasites remaining viable in soils or groundwater for years.

Contaminants are released into the environment from waste disposal, spills and leaks, and from commonly accepted activities such as fertilizer and pesticide application, and the use of individual sewage treatment systems (ISTS). Soil treatment systems such as a septic tank and drainfield, do not remove all contaminants, and some, particularly old, poorly designed, or malfunctioning systems, may remove very few. Even new ISTSs are designed primarily to remove bacteria and solids, but not most chemical contaminants. ISTS systems are not designed to remove chemicals such as petroleum products and solvents. Commonly, the nitrate-nitrogen concentration of effluent leaving a drainfield after treatment and entering the soil is 50 milligrams per liter (mg/L). That is five times greater than the drinking water standard of 10 mg/L.

A separation also increases the likelihood that the plume of contaminant will miss the well. Again, wells should ideally be placed upgradient of contaminant sources, but placing new wells or contamination sources on existing properties, particularly small lots, or on new marginally developable properties often presents challenges.

Some contaminant sources such as petroleum tanks or septic tanks present more of a potential hazard, and primarily present a problem in case of a spill or leak, caused by a malfunction, damage, or age-related deterioration. While the likelihood of a contaminant release may be small, the potential for harm if one occurs, can be very large. Some sources, such as a septic drainfield or an animal yard, discharge contaminants to the ground on an ongoing basis.

The minimum isolation distances vary, based on the volume of contaminants; the likelihood of a contaminant release; the standards or quality of the contaminant vessel; the use, management, application, and oversight of the contaminant; the potential for attenuation through the soil; and the toxicity of the contaminant(s). Conditions can vary by orders of magnitude. A deep well, cement grouted through two significant confining layers is at comparatively little risk from a complying drainfield serving a seasonal cabin used by individuals who do not dispose of improper materials. On the other hand, an old nonconforming well, or a well just meeting the minimum standards, is at considerably greater risk from a drainfield serving a facility disposing large volumes of infectious wastes, or hazardous materials. The minimum distances in the rule are chosen to provide protection in the majority of situations. In a limited number of cases, the rule provides more protection than is needed, and conversely, in a limited number of cases the rule provides less protection than is needed. Greater distances are recommended whenever possible, particularly in sensitive situations, but in the majority of cases, the minimum standard becomes the design.

The Minnesota Pollution Control Agency (MPCA) was asked by the MDH to assess the isolation distances in Minnesota Rules, Chapter 4725, in light of the MPCA's experience with monitoring the environment, including groundwater; regulating many contaminant sources such as feedlots, septic systems, petroleum storage, and landfills, including establishing setback rules; and investigating and directing clean up of soil and groundwater contamination. The MPCA provided the MDH a document, "Minnesota Pollution Control Agency Comments on Proposed Changes to the Minnesota Department of Health Well Code," March 18, 2004, that provides recommended setback numbers and justifications. This document is included with the supporting materials, and will be referenced later.

4725.4450, Subpart 1. The existing rule requires a well to be upgrade (upstream, upgradient) of a sanitary landfill, dump, or waste stabilization pond. This is a very good idea, not only for the listed sources, but also for all contaminant sources. However, the groundwater gradient (flow direction) is not always known to the well contractor. A rigid enforcement of the rule would prohibit wells on any property downgradient of these contamination sources. The MDH is proposing to make this very important concept apply to all sources, but to be discretionary because of the practical limitation of existing properties.

Rule part 4725.4350 requires the surface water setback be measured horizontally. This horizontal measurement has been the policy used by the MDH for also measuring the setbacks of this rule part. A horizontal measurement from the closest part of the contaminant source to the closest part of the upper termination of the well, provides a consistent measuring system, and assures that the minimum setback is maintained. Otherwise, a worst case scenario could lead to

a well on the top of a cliff, with a large contamination source at the base of the cliff. The setback measured down the slope (vertically) may be sufficient, but the contamination source could be right next to the well intake.

The proposed language clarifies that tanks are regulated separately (the volume of multiple tanks is not aggregated) except where the piping is interconnected and a leak in one tank will also drain other tanks. In this case, a leak in one of the multiple, smaller tanks has the same net effect as a leak in a single larger tank.

The existing rule and statute require that the minimum setbacks be maintained between a well and an actual or potential source of contamination. The contamination remains until it is removed. Some individuals have erroneously thought that once a system that stores and/or discharges contaminants is no longer used, the contamination is gone. While some contaminants, such as bacteria in soil, become less of a hazard through time, other sources such as a partly full fuel oil tank remain hazardous unless removed. Many properties have failed septic systems that were replaced with new ones, but the sewage in the old tanks may not have been pumped and removed, and the contaminants in the drainfield have not been removed. In these cases, the contaminants remain, and the isolation distance must be maintained.

4725.4450, Subpart 1, Item A contains the 300-foot isolation distances. Item A proposes a 300-foot isolation distance from the largest contamination sources, and/or sources that are discharging the largest volume of contaminants into the soil. Soil treatment systems discharging in excess of 10,000 gallons per day are given special requirements under MPCA rules, including being regulated directly by the MPCA and not typically by the local government units that regulate discharges under 10,000 gallons per day. Many landfills are included on the federal and state superfund listings, and some contain millions of cubic feet of refuse. Wastewater rapid infiltration basins, and stabilization ponds with 500 or more gallons /acre/day of leakage represent large sources of municipal human waste or industrial sewage, and leak a substantial volume into the soil. Liquid manure storage basins or lagoons that do not have a concrete or composite liner in accordance with MPCA rules present the most concentrated source of animal wastes directly in contact with the soil. The sources in item A have been identified by the MPCA as warranting the greatest isolation distances.

The existing rule requires a minimum 50-foot separation between a well and a septic drainfield, regardless of sewage flow or waste characteristics. The requirement dates from the original well rule in 1974, and was largely directed at the typical installations of the time—single-family residential septic systems that were commonly installed in rural areas. Soil absorption systems serving larger, and more varied users have become increasingly popular. Large systems dispose of much larger quantities of wastewater. The typical residential septic system produces 100 to 400 gallons of wastewater per day. This proposed rule establishes a larger setback for systems discharging 10,000 gallons or more per day. Large systems dispose of larger quantities of wastes, may contain unique, concentrated, or more toxic wastes, may fail more often, and have caused groundwater contamination, well contamination, and human illness.

Large systems may contain contaminants not typical of residential single-family septic systems. The Environmental Protection Agency, Office of Groundwater and Drinking Water, EPA/816-R-99-014e, "The Class V Underground Injection Control Study," Volume 5, "Large Capacity Septic Systems," report states:

> "Even with a fully functioning system, data indicate LCSS (Large Capacity Septic System) effluent may contain arsenic, fecal coliform, nitrate (as N), total nitrogen species (as N), and formaldehyde (in septic systems serving recreational vehicles) at concentrations above primary drinking water maximum contaminant levels (MCLs) or health advisory levels (HALs). The concentrations of aluminum, iron, manganese, and sodium may exceed secondary MCLs."

Recreational vehicle owners use chemical additives to stop offensive odors, break down toilet paper, and prevent freezing of wastewater holding tanks. Often these products contain formaldehyde, as well as other additives. The holding tanks are "dumped" at rest stops, campgrounds, gas stations, travel centers and other facilities that may have a large septic system. Studies cited in the EPA study report concentrations of formaldehyde in RV wastewater ranging from 30 milligrams per liter (mg/L) to 960 mg/L. The drinking water Health Risk Limit (HRL) in Minnesota is 1 mg/L.

Evidence also suggests that large systems fail sooner than residential systems. A study in Marion County Florida indicated that during a 7-year period from 1992 to 1998, 11 percent of all septic system repairs were for large systems, and yet large systems comprised only 3 percent of the systems in the county. County officials reported that mobile home park septic systems failed more quickly because of system overloading, invasive roots, or lack of system maintenance.

Studies of Large Sewage Treatment Systems (LSTS) located in Minnesota and elsewhere have documented the existence of groundwater contaminant plumes exceeding drinking water standards at distances far exceeding the present minimum setback of 50 feet. Nitrate-nitrogen plumes exceeding the 10 milligrams per liter (mg/L) Maximum Contaminant Level, and Health Risk Limit, have been found hundreds of feet down gradient of LSTSs. Appendix A, "Large Subsurface Treatment System Setback Distances," contained in the March 18, 2004, "Minnesota Pollution Control Agency Comments on Proposed Changes to the Minnesota Department of Health Well Code," reported on 12 studies. In 9 of the 12 studies, the 10 mg/L nitrate-nitrogen plume extended farther than 50 feet from the LSTSs, up to a maximum of 348 feet. Other studies reported in the literature have shown contamination reaching far in excess of that distance, and have reported instances of waterborne disease outbreaks caused by LSTSs.

Illness due to consumption of well water contaminated by LSTSs has occurred. In Racine, Missouri in 1992, two wells at a church and school were contaminated by a LSTS, resulting in 28 cases of Hepatitis A. In Coconino County, Arizona in 1989, failure of a LSTS leaching field at a resort resulted in 900 cases of gastroenteritis. In Richmond Height, Florida in 1974, contamination of a well from a day-care resulted in 1,200 cases of gastroenteritis. Other outbreaks of waterborne diseases, including salmonellosis, shigellosis, and acute viral gastroenteritis, have also been attribute to LSTSs.

The appropriate distance necessary to protect a drinking water supply from a waste source is dependant on many factors, including the condition, design, operation, and maintenance of the waste system and water supply, as well as the characteristics of the soil, geology, and hydrology. In order to protect public health, the rule must account for vulnerable conditions that occur in Minnesota, as well as existing (pre-rule) nonconforming wells and waste sources. The Minnesota Pollution Control Agency publication: "Human Health Risks from Nonconforming Individual Sewage Treatment Systems," March 1995, reported that as of 1994, approximately 70 percent of existing onsite septic systems did not meet minimum standards. This means that a new well drilled on an existing property with a large septic system, would frequently encounter a noncomplying system.

Researchers have documented that large septic systems can create plumes of contaminants exceeding drinking water standards, at distances exceeding 50 feet. Robertson reports in "Ground Water" January-February 2002, of a plume migrating from a campground LSTS 200 meters to a surface water discharge point. He reports of another LSTS serving a service center restroom, and formerly a 14-unit motel, that has created a plume of nitrate-nitrogen with a concentration of 76 mg/L (seven times the drinking water standard) at least 20 meters long. A classic study of the Otis Air force base, Falmouth Mass., reported in "Ground Water," November-December 1999, identified a contaminant plume from the base LSTS 1000 meters wide, 23 meters thick, and 4500 meters long. An elementary school in Langton, Ontario, Canada, reported in "Ground Water," November-December 1996, found a nitrate-nitrogen plume of 10mg/L approximately 20 meters wide and 110 meters long, with chloride concentrations ranging from 42 to 209 mg/L, and sodium ranging from 34 to 101 mg/L.

The minimum setbacks between a well and a septic system established by other states vary from 50 to 1000 feet, with some, like Minnesota, not currently differentiating based on system size. More recently, groundwater time of travel has been used by some to establish setbacks. Vermont uses a two-year travel time. Groundwater travel times can vary from a few feet per year in some confined aquifers, to thousands of feet per day in karst limestone. Typical groundwater travel time in sand is 50 to 300 feet per year. Pathogen survival times, particularly for viruses, have also been used to establish setbacks. Massachusetts utilizes a 250-foot setback, based on virus survival, while other researchers have suggested that a 300 to 400-foot setback is more appropriate. Wisconsin requires a 250-foot setback for waste flows of 8,000 gallons per day and larger. The MDH is proposing a 300-foot setback for systems with sewage flows exceeding 10,000 gallons per day. At this flow, an SDS permit is required from the MPCA. The larger setback to LSTSs is needed.

The MPCA investigated groundwater impacts of liquid manure storage systems, and published the findings in the April 2001 report, "Effects of Liquid Manure Storage Systems on Ground Water Quality." The report states, "We estimate manure storage systems should not cause exceedances of surface water criteria for ammonia-nitrogen and drinking water criteria for nitrate when distances to a surface water body or well are more than 100 feet for concrete-lined basins, 200 feet for earthen-lined basins or open lots, and 300 feet for unlined basins." Based on this, a 300-foot distance is proposed for a liquid manure storage basin or lagoon that does not have a liner meeting the standards in MPCA rules.

Beginning with the original well rule in 1974, an isolation distance has been required to be doubled between a contamination source directly entering the soil, and a well susceptible, or "sensitive," to contamination because of its shallow casing or lack of a confining layer. This type of well, defined as one without at least 50 feet of water-tight casing that does not penetrate 10 feet of confining materials, is now defined as a "sensitive well" in part 47245.0100, subpart 43a, and is further explained in subpart 2. Consistently in this entire part, all contaminant sources that discharge into the soil are required to be twice as far from "sensitive wells."

4725.4450, Subpart 1, Item B, contains the 150-foot isolation distances.

Item B formerly required a 150 foot setback to a sanitary landfill, dump, or waste stabilization pond. These sources have been redefined, and in some cases divided. The setback to a sanitary landfill, dump containing mixed municipal wastes, or municipal wastewater stabilization pond with leakage over 500 gallons/acre/day is proposed for increase to 300 feet. These represent a high level of risk due to:

1. The very large volume of wastes. Some landfills hold millions of tons of refuse.
2. The wastes contain hazardous materials are mostly not treated.
3. In the case of dumps and stabilization ponds with measured leakage, the contamination sources are releasing contaminants into the soil and groundwater.

The setback to a municipal wastewater stabilization pond with less than 500 gallons/acre/day, or an industrial wastewater stabilization pond remains at 150 feet.

This proposed amendment reduces the setback to a construction debris disposal area, or solid waste (dump) from a single residence to 50 feet. Construction debris disposal sites (excluding demolition landfills), and single household waste disposal sites, represent small volumes of waste, and/or low hazard materials, consistent with other sources in the 50-foot distance.

4725.4450, Subpart 1, Item B, Subitem (1). The existing 150-foot setback to an agricultural chemical, hazardous substance, or petroleum references a minimum regulated volume of 25 gallons in current rule. A minimum was established to eliminate the small quantities of cleaning products, dandelion killer, or gasoline commonly found in residential garages or other small establishments. The number was based on the lowest volume regulatory standard found at the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency. The regulatory minimum now, in Minnesota Rules, part 1505.3010, is 56 gallons for bulk pesticides. The MDH is therefore proposing to increase the minimum from 25 to 56 gallons for all agricultural chemicals, hazardous substances, and petroleum.

4725.4450, Subpart 1, Item B, Subitem (2). This proposed amendment increases the isolation distance to 150 feet between a well and a septic system receiving infectious or pathological wastes. Typical onsite septic systems consist of a septic tank and drainfield. Wastes enter a septic tank when a toilet is flushed, or materials are poured into a drain. The addition of liquids to the septic tank, forces existing wastes into the drainfield. The wastes then enter the drainfield, which is a perforated pipe, surrounded by gravel, in a trench excavated in the soil. This trench, or bed of sand, is the absorption area. Treatment occurs by heavy or large solids settling out in the septic tank, biological activity in the drainfield, and die-off and attenuation in the soil as the

effluent moves through the soil to the groundwater. The effluent leaving the drainfield or absorption area contains contaminants. Onsite systems do not kill all pathogens, particularly viruses and parasites, and remove some chemicals fairly effectively, while doing a poor job removing others. A typical nitrate-nitrogen concentration of domestic wastes discharging into the soil from a drainfield is 50 milligrams per liter (mg/L). This is five times the drinking water standard of 10 mg/L. Facilities discharging large quantities of sewage, or particularly hazardous sewage, present an increased risk. Infectious or pathological wastes, along with pharmaceuticals, discharged from facilities like mortuaries, hospitals, and veterinary clinics constitute a further risk. A setback of 150 feet from these facilities is warranted.

4725.4450, Subpart 1, Item B, Subitem (3). This proposed amendment retains the existing 150-foot setback to a waste stabilization pond, but modifies it to include those municipal facilities that the MPCA has deemed to be less of a threat, based on reduced leakage to the groundwater.

4725.4450, Subpart 1, Item B, Subitem (4). The industrial wastewater stabilization ponds formerly contained in the broader category of "waste stabilization pond," remain at a 150-foot setback.

4725.4450, Subpart 1, Item B, Subitem (5). This amendment proposes a 150-foot setback to a municipal or industrial wastewater spray irrigation area because of the relatively high risk due to the large volume of wastes, the presence of pathogens, pharmaceuticals, and chemicals in municipal sewage, the variable environmental conditions including rainfall events, and the runoff and infiltration risk. Together, these present a risk similar to the other sources regulated with a 150-foot setback.

4725.4450, Subpart 1, Item C contains the 100-foot isolation distances. The distances in subitems 1 through 4 are not changed, but are modified to better clarify the setback to sensitive wells, and to include the revised minimum quantity of chemicals described in item B.

4725,4450, Subpart 1, Item C, Subitem (5). Liquid manure storage is currently regulated by existing rule that requires a 100-foot isolation distance to a manure storage area. This proposed amendment, and subpart 1, item A, subitem (6), separate liquid manure basins and lagoons. The MPCA has recommended a 100-foot isolation distance to a liquid manure storage basin with a concrete or composite liner. Facilities with liners have been observed through MPCA study to present less contamination risk than an unlined manure basin.

4725.4450, Subpart 1, Item C, Subitem (6). This proposed amendment increases the setback between a water-supply well and a large animal feedlot to 100 feet, due to the larger volume of wastes. The existing rule requires a 50-foot setback to an animal feedlot. This is appropriate for the typical animal confinement area, but is overly restrictive for domestic pets and for small numbers of animals. On the other hand, a 50-foot setback is inadequate to a large feedlot holding hundreds or thousands of animals, with the corresponding large production of animal manure. This proposed amendment separates the setback to an animal feedlot into three categories, with the setback increasing for increasing number of animals and volume of animal manure, and increasing for more vulnerable conditions. The proposed rule requirements are a 20-foot separation for 0.1 to 1.0 animal units, a 50-foot separation for more than 1.0 animal unit

except for large open feedlots, and a 100-foot separation for an unroofed feedlot with 300 or more animal units.

An unroofed feedlot presents a greater threat to groundwater than a covered feedlot (barn), because rainfall mobilizes and carries the contaminants directly into the soil, no floor exists to impede infiltration as in a barn, and manure management is often less rigorous outside. This proposed rule will use the term "animal feedlot" to include an area holding more than one animal unit. This could be a hobby farm with two horses. The hobby farm presents far less risk than an open 1000 hog feedlot. The MDH is proposing to establish a 100-foot setback to unroofed feedlots holding 300 or more animal units. The 300 animal unit criteria is consistent with Minnesota Rules, part 7020.0450, for feedlot construction or expansion permits administered by the MPCA or a delegated county feedlot program.

4725.4450, Subpart 1, Item C, Subitem (7). The MPCA recommended a 300-foot isolation distance to a wastewater treatment facility. The definition of "wastewater treatment facility" in Minnesota Statutes, section 115.71, is very broad and includes plants, disposal fields, and lagoons for sewage collection, pumping, treatment, stabilization and disposal works. Many of these components have been addressed separately in this rule. The components that remain best fit the definition of "wastewater treatment unit," in Minnesota Rules, part 6045.0020, subpart 103. The hazards of a typical wastewater treatment plant vary widely depending on the type of treatment, facility size, and engineering controls. For that reason, some components have been separated. Wastewater enters a treatment facility through a sewer (that has a 50-foot isolation distance). Various treatment reactors, filters, tanks and other devices treat the sewage, until the treated water is discharged into a receiving water, typically a stream or river. The discharge point also has a 50-foot setback. Because the treatment unit itself does not directly discharge wastes to the ground except in case of an accident, spill, or unintended leak, the likelihood of a contaminant release is very small, but the potential damage can be very large. Due to the operation of the treatment unit by trained and licensed operators, regulatory oversight, and the low potential of an occurrence, the MDH is proposing a 100-foot setback to a wastewater treatment unit.

4725.4450, Subpart 1, Item C, Subitem (8). The groundwater contamination risk from a petroleum pipeline is similar to a wastewater treatment plant. Under normal conditions, no contaminants are released. The likelihood of a release is very small, but the impact of a release can be very large. The 100-foot setback proposed to a petroleum pipeline proposed is appropriate and reasonable.

4725.4450, Subpart 1, Item D, contains the 75-foot isolation distances. The types of contaminants regulated, and the distance is not changed. The proposed amendment simply uses the new term, "sensitive well," instead of referring to the subpart describing a sensitive well.

4725.4450, Subpart 1, Item E, contains the 50-foot isolation distances.

4725.4450, Subpart 1, Item E, Subitem (1), is proposed for amendment consistent with subpart 1, items B and C, concerning the increase in the minimum regulated volume of agricultural chemicals from 25 to 56 gallons. The types of contaminants regulated and the setback distance have not changed.

4725.4450, Subpart 1, Item E, Subitem (2). An "animal unit" is defined to standardize and compare the amount of animal fecal material (manure) produced by different animals. One animal unit is defined as 1 horse, 10 sheep, 100 ducks and so on. As mentioned earlier, the existing rule requires the same 50-foot setback between a small number of animals, theoretically 2 dogs or 2 chickens, and a 1000 hog concentrated feedlot. The proposed amendment to this subitem does not change the 50-foot setback for the typical farm, but is part of the proposed separation of animal facilities into three categories, with increasing setbacks for increasing risks due to increasing numbers of animals. The distance to a few domestic pets or a hobby farm is proposed to be reduced to 20 feet in subpart 1, item G, subitem (7), and the distance to a large concentrated animal operation is proposed to be increased to 100 feet in subpart 1, item C, subitem (6).

4725.4450, Subpart 1, Item E, Subitems (3) and (4) are proposed for amendment to include the previously mentioned consistent language concerning "animal units," and "sensitive water-supply wells."

4725.4450, Subpart 1, Item E, Subitem (5). Proposed amendments to this subitem do not change the setback or regulated contaminant source, but only provide examples of two common types of interceptors for the understanding of the reader.

4725.4450, Subpart 1, Item E, Subitem (6). Amendments to this subitem are proposed to clarify that the existing rule regulates graves of animals, and above-ground graves. An amendment is proposed to exclude a burial site with one or less animal unit; otherwise, a site presenting a negligible risk such as a pet bird burial site, would require a 50-foot separation.

4725.4450, Subpart 1, Item E, Subitem (7) is proposed for amendment to be consistent with the MPCA replacing the term "subsurface disposal area" with "soil treatment system." "Absorption area" is defined in part 4725.0100, subpart 1a by referencing the MPCA definition, and is the area from where the MPCA measures setbacks.

4725.4450, Subpart 1, Item E, Subitem (8). This subitem pertains to tanks or receptacles containing sewage. Some tanks or receptacles are used in conjunction with a soil treatment system (septic tank), some are used to lift sewage (sump), some are used to hold sewage until pumped (holding tank), and some are used to treat sewage. Amendments are proposed to reference the exception for an approved tank (sump) subject to a reduced distance, and to address new types of tanks. New technologies are being developed and used for Individual Sewage Treatment Systems (ISTS), particularly for areas where conventional septic tank and drainfields, or mound systems, have failed, or where additional sewage treatment is desired or required. One system becoming more common is an aeration tank, which is essentially a septic tank with an aerator or mixer. These devices are similar in size, content, and risk to the other sources in this subitem and are therefore proposed for a 50-foot setback.

4725.4450, Subpart 1, Item E, Subitem (9) is proposed for amendment to clarify that the 50-foot distance pertains to a buried petroleum tank, as opposed to one that may be underground, such as in a basement. The buried tank presents a much grater risk due to corrosion of the tank, fittings, or piping, and the inability to visually observe a leak. A tank that is underground, such as a fuel oil tank in a residential basement, presents a similar risk to an aboveground tank.

4725.4450, Subpart 1, Item E, Subitem (11). The term "hazardous substance" is proposed to be removed from this subitem since hazardous substances are covered in subpart 1, items B and C.

4725.4450, Subpart 1, Item E, Subitem (12) is proposed for amendment to note that additional approved pressurized sewers are included in the 20-foot setback of subpart 1, item G, subitem (7).

4725.4450, Subpart 1, Item E, Subitem (13) is proposed to clarify that a drain, grate, or trough connected to a buried sewer is part of the buried sewer. These are already subject to the 50-foot setback and included and defined in part 4725.0100, subpart 45. However, recent inspections have shown that the regulated industry is not totally aware of the requirement. This amendment is proposed to reduce confusion and future violations.

4725.4450, Subpart 1, Item E, Subitem (14) is proposed to address new developments in soil treatment systems. Sand filters, peat filters, and constructed wetlands have been included in the 50-foot setback, since they are a type of soil treatment (disposal) system presently included in subpart 1, item E, subitem (7). They are used as an alternative to a drainfield, bed, or mound, that currently have a 50-foot isolation distance. The MPCA has recommended a 50-foot isolation distance for these types of sewage treatment systems.

4725.4450, Subpart 1, Item E, Subitems (15) through (30). Existing part 4725.4450, subpart 1, item E, subitem (11), requires a 50-foot isolation distance to a source of a pollutant, contaminant, or hazardous substance ("hazardous substance" is proposed to be removed), without listing specific sources. In response to inquiries from the public and regulated industries, the MDH has, over time, published specific sources that are identified as a pollutant or contaminant, and subject to the 50-foot setback, in the Well Management Newsletter, and in the "Rules Handbook--A guide to the Rules Relating to Wells and Borings." These sources, once identified, are more appropriate in rule. Subitems (15) through (30) list the specific sources of fecal or chemical pollution or contamination identified to date, that may affect a well.

4725.4450, Subpart 1, Item F, is a new item proposed to contain contamination sources required to be a minimum of 35 feet from a water-supply well. The explanation for the proposed 35-foot distance to a vertical heat exchanger is located in part 4725.7050, and the explanation for the surface water setback is explained in part 4725.4350. The distances are repeated here, so that the installer of a water-supply well is clearly aware of the requirements.

4725.4450, Subpart 1, Item G, contains the 20-foot isolation distances.

4725.4450, Subpart 1, Item G, Subitem (1). Amendments to subitem 1 are proposed to differentiate a approved sewage sump subject to the 20-foot isolation distance, from an unapproved sump, lift station, or lift tank subject to the 50-foot isolation distance requirement.

The rationale for reducing the isolation distance for approved sumps from 50 feet to 20 feet, is similar to the rationale for reducing the sewer setback from 50 feet to 20 feet when the sewer is constructed of approved materials, and has been successfully air-tested and shown not to leak. A 20-foot distance is allowed by existing rule for a sump that meets the requirements of part 4715.2440 of the Minnesota Plumbing Code. Part 4715.2440, however, contains requirements in addition to material standards and air testing. These additional requirements for the discharge line, sizing, venting, and for clear water sumps are plumbing requirements, not necessarily requirements relevant to the well setback, and have disqualified some otherwise watertight sumps. The proposed amendment retains those portions of the Plumbing Code that are most relevant, and replaces the term "watertight" with a reference to the specific requirements, since numerous individuals have questioned the difference between a watertight sewage sump, and a lift station, pump station, or nonwatertight sewage sump. A maximum sump volume of 100 gallons has been added to also differentiate a sump used to move sewage to a septic tank or municipal sewer, typically located in or near a building, from a sewage lift station or pump station, that is often a compartment in a septic tank, and that contains considerably more sewage, typically 500 gallons or more. Because of the smaller size, better construction, testing, and inspection by the owner, the sump presents less risk than a sewage pump or lift tank.

4725.4450, Subpart 1, Item G, Subitem (2). Existing rule requires a 20-foot setback to a pit or unfilled space. An amendment is proposed to exclude shallow excavations that have negligible effect on the well, by establishing a minimum depth for the pit or unfilled space. Numerous small, unfilled spaces exist, from a posthole, to a lawn sprinkler shut-off box, to a campfire pit, none of which presents a contamination hazard to the well. Four feet was chosen as the minimum significant depth, since 4 feet is a common regulatory standard used by OSHA for trench and other excavation safety requirements, and confined space regulation, and represents a significant hole where runoff can collect and concentrate.

4725.4450, Subpart 1, Item G, Subitem (4). The existing rule requires a minimum 20-foot setback to an above ground petroleum tank holding 1,100 gallons or less. An amendment is proposed to include petroleum tanks, typically home heating oil tanks, that are visible and underground (in a basement) but not buried. The visibility, inspection, and containment afforded by the basement presents a risk comparable to above ground tanks. An amendment is also proposed to reference the minimum regulated volume of petroleum consistent with other provisions in this subpart.

4725.4450, Subpart 1, Item G, Subitem (5). Amendments are proposed to this subitem to allow additional sewers to qualify for the reduced sewer setback. The existing rule allows the isolation distance to be reduced from 50 feet to 20 feet for some sewers constructed of better quality materials (cast iron or plastic meeting Minnesota Plumbing Code specifications), and that have been shown not leak as evidenced by passing an air test in accordance with the Plumbing Code. This reduced distance has applied only to (gravity) sewers that were not included in part 4725.4450, subpart 1, item E, subitem (12) (not collector or municipal sewers), and pressurized sewers serving a single family residence. This amendment is proposed to clarify the existing rule which, in its present wording is open to various interpretations; allow the reduced distance based on better materials, passing the leak test, and use, regardless of whether pressurized or not; and

not allow the reduced distance for sewers that carry high loads of infectious or pathological wastes. These amendments better equate to the contamination risk from the sewer, allow a reduced distance in more cases, and should be easier to understand and follow.

4725.4450, Subpart 1, Item G, Subitem (6) is proposed to be amended to reduce the minimum regulated storm water drain pipe from 12 inches to 8 inches. The proposed new definition of "storm water drain pipe" in part 4725.0100, subpart 47a, removes many of the culverts and other seasonal storm water drainage structures from regulation, and focuses this rule on pipes carrying storm water more likely to carry contaminants, such as petroleum products or road deicing chemicals from parking lots. This narrowing of focus on storm sewers more likely to carry contaminants, necessitates a narrowing of the threshold for regulation. The typical 4 and 6-inch drainage pipes for residential properties, and basement foundation drain tile, do not present appreciable hazards in most instances. However 8 and 10-inch storm sewers that are now not regulated, have been observed draining the types of facilities deemed to be greater risks. While the MDH would encourage a separation from pipes smaller than 8 inches, a mandatory setback does not appear practical.

4725.4450, Subpart 1, Item G, Subitem (7) is part of the new proposed requirement that divides the existing 50-foot isolation distance from any number of animals, into 3 categories: a 20-foot distance for 1.0 to 0.1 animal units (this subitem), a 50-foot distance for more than one animal unit (item E, subitems (2), (3), and (4)), and a 100-foot distance to an unroofed facility with more than 300 animal units (item C, subitem (6)). The 20-foot distance proposed in this subitem would most often apply to a small hobby farm with a horse, 10 sheep, or up to 300 chickens, or a residence with up to1000 pounds of dogs in a kennel. Less than 0.1 animal unit (100 pounds of animals) would not require a minimum setback. Without a minimum, an area for a single household pet, including a dog, cat, or bird, could be considered a feedlot.

4725.4450, Subpart 1, Item G, Subitem (8). A 20-foot setback is proposed between a buried nonpressurized cistern or a reservoir and a water-supply well. Nonpressurized cisterns or reservoirs present a risk if the water storage vessels rupture and flood the area, are no longer in use and collect runoff, or contain water from a nonpotable source, such as rainwater or nonpotable fire fighting water.

An excavation in the ground, particularly one that receives some water, disturbs the soil, typically creates a more permeable horizon, and channels water into the ground that could be carrying contaminants.

4725.4450, Subpart 1, Item G, Subitem (9) is proposed to establish a 20-foot setback to a disposal area for clear water drainage. These water disposal structures, such as those installed in conjunction with a hand pump to dispose of wasted water, contain primarily potable water, but can contain surface contaminants or animal droppings, and present a risk similar to a pit, unfilled space, or storm water drain pipe.

4725.4450, Subpart 1, Item G, Subitem (10) is proposed to establish a 20-foot isolation distance to a portable privy. The existing rule requires a 50-foot isolation distance to a privy, regardless of design. The 50-foot distance was established to a privy, pit latrine, or "outhouse" where fecal

wastes are in contact with, and drain into the soil. A portable privy, sometimes generically referred to by the trade name "Satellite," is a sealed, above-ground container where the wastes are removed, and represents a problem only in case of vandalism, leakage, or spillage. The present 50-foot setback would apply to both types of privies. While the risk of contamination from a portable privy is small, they are periodically the target of vandals, so some setback is necessary. A reduced distance, 20 feet, is more appropriate for the risk from a portable privy.

4725.4450, Subpart 1, Item G, Subitem (11). This amendment is proposed to establish a setback distance to a water treatment basin or tank, typically a component of a public water supply system. A water supply backwash basin is a tank used to treat water, typically to remove aesthetic (non-health related) substances such as iron. However, treatment may be designed to remove, or inadvertently remove, health related contaminants such as arsenic. The incoming untreated water is usually potable water from a well, but may be surface water. The treatment facility is typically operated by MDH certified treatment plant operators. Systems that discharge to a sewer without a backflow prevention device present the greatest hazard, and a 50-foot isolation distance is proposed in part 4725.4450, subpart 1, item E, subitem (28). Systems that are backflow-protected present less risk.

4725.4450, Subpart 1, item H, includes the 10-foot isolation distances. An amendment is proposed to the existing 10-foot setback to a frost-proof yard hydrant, to include cases where a pipe is attached to the hydrant drain to dispose of the drain-back water at some distance from the hydrant. Water disposed of near the well from a hydrant, repeated discharges of water, or in the case of a flushing or fire hydrant, large discharges of water near the well, can wash soil contaminants toward the well.

This proposed rule will require a setback of 10 feet to the horizontal piping of a heat exchanger containing propylene glycol. This would include the piping of a horizontal (trenched) ground source heat exchanger, and the horizontal piping of a vertical heat exchanger connecting the vertical loop with the compressor, pump, and heat exchanger. Horizontal loops are not regulated by the MDH, and in general, are not regulated by any other government entity. The heat transfer fluids used in horizontal loops are most commonly ethylene glycol or proprietary products. Propylene glycol has a low toxicity, while ethylene glycol (the "antifreeze" used in automobile radiators) has a considerably higher toxicity. Horizontal loops containing ethylene glycol are proposed in 4725.4450, subpart 1, item D, subitem (16) to have a 50-foot setback.

4725.4450, Subpart 2. An amendment is proposed to subpart 2 to simplify the language, and separate the two exemptions.. The existing language of subpart 2 contains two "exceptions," a more restrictive requirement to double the isolation distance for wells (sensitive well) with less than50 feet of casing that do not penetrate 10 feet of confining materials, and a less restrictive provision to allow chemigation tanks 20 feet from an irrigation well. The MDH is proposing to separate these two very different provisions into separate subparts. Subpart 2 is proposed to contain the existing requirement to double the isolation distance between a sensitive well and a contamination source where the contaminant is directly entering the soil. A greater isolation distance helps to retard, treat, attenuate, or dilute the contaminant, since the well has less natural

protection. Contamination sources that do not directly discharge to the soil are not doubled. New contamination sources added to subpart 1 in this revision that discharge to the soil are added to the existing list. The criteria and conditions for doubling the distance are not changed.

4725.4450, Subpart 3 is proposed to contain the existing, less stringent standard from existing subpart 2 pertaining to chemigation tanks and irrigation wells, and to modify the requirements. The present exemption allows any chemigation tank, whether fertilizer or pesticide, to be 20 feet from an irrigation well if the tank is safeguarded in accordance with Minnesota Department of Agriculture rules. The Minnesota Department of Agriculture, and the Irrigator's Association of Minnesota, requested a modification to this subpart to allow temporary unsafeguarded (without secondary containment) fertilizer chemigation tanks 20 feet from an irrigation well. This would not apply to pesticide tanks.

4725.4650 SEDIMENT IN POTABLE WATER-SUPPLY WELLS.

The existing rule part applies the requirements of the sediment standard to new, and reconstructed wells. The proposed amendment will apply the requirement only to new wells. The first statewide well rule was promulgated in 1974. Therefore, the majority of wells in the state were constructed before the rule was in effect. A preexisting condition, a defect caused by a previous repair or person, or simply the age of the well, could cause the well to produce sediment. Requiring that old wells meet these standards, or requiring a person who may not have caused a problem to remedy it, is not reasonable.

Existing item B is proposed for removal. It is not possible to measure water levels in some well pumping systems such as those with packer jets, or some well types such as flowing wells, without removing the entire pumping system or piping connections. The requirement was originally placed in the rule before the widespread use of pitless adapters and pitless units. Sanitary well seals could be purchased with or without access holes for water level measurement. The typical pitless adapter or unit cap allows access for water level measurement by simply removing the cap.

The MDH is proposing an amendment to establish a maximum standard for sediment smaller than sand. The existing rule requires that a water-supply well produce no more than 5 milligrams per liter (mg/L) of sand. "Sand" includes particles from 0.080 inches to 0.0025 inches in diameter. Particles larger than 0.080 inches (about 5/64 inch) are defined as "gravel," followed by cobbles, and so on. Particles smaller than 0.0025 inches are "silt-sized," and smaller than silt, are "clay-sized."

Sediment, of any size, produced by a well is not desirable. These abrasive mineral particles can damage well pumps, pipes, components, and plumbing fixtures, and in the worst cases, can cause holes and well failure. Loss of these particles from the aquifer can cause increased sediment pumping, loss of well yield, and failure of the screen or well. Loss of these particles from the area around the casing or grout, can compromise the annular space seal, and the sanitary quality of the well. The presence of sediment may signal a sanitary defect such as a break in the casing,

improperly sealed pitless connection, or other well failure. Excessive sediment pumping has led to collapse of the ground around the well. Sediment in the water can provide a substrate for the growth of bacteria, and can interfere with attempts to eliminate the bacteria.

The existing rule does not regulate particles smaller than sand. The negative effects listed above can be caused by particles smaller than sand, i.e., silt and clay. The MDH is proposing to add a standard for silt and clay of 200 mg/L. Sand can be visually observed at concentrations of much less than the 5 mg/L standard. Abrasion and other sand problems occur at low concentrations. Silt and clay cannot be visually observed at this low a concentration without filtration settlement of the particles, or laboratory analysis. Low concentrations also do not have the same deleterious effects as sand. At concentrations of 200 mg/L and above, water containing silt and clay is visibly turbid.

The standard for sand, as well as silt and clay, includes mineral particles produced by the well at the designed, sustained pumping rate. The standard does not include a higher concentration of sediment that may be produced initially upon pump start up. The standard also does not include rust, manganese, scale or encrustants such as calcium carbonate (lime).

In a very small number of geological situations, it is practically difficult to eliminate sediment and still obtain water. In these cases it is reasonable to allow sediment above the standard if there are no real alternatives, and if the parties are aware of, and agree to the circumstances. The well owner can pursue continuous treatment of water to remove the sediment, and disinfect if necessary.

4725.4750 LEAD PROHIBITION IN POTABLE WATER-SUPPLY WELLS.

The existing rule establishes a maximum concentration of lead in materials used in the construction of any water-supply well. The purpose of the rule is to prevent persons who consume the water from ingesting lead. An amendment is proposed to require only wells used for potable purposes to meet the lead standard, and not to apply to wells used for nonpotable purposes such as remediation or cooling.

4725.4825 NONPOTABLE WATER-SUPPLY WELLS.

This proposed new rule part contains exemptions and additional requirements for nonpotable water-supply wells. Water-supply wells include wells used for private or public drinking water, irrigation, industrial process water, and other purposes where the water is withdrawn and used.

4725.4825, Subpart 1. In those cases where the water is used for nonpotable purposes, it is reasonable to allow the use of shallow groundwater, and exempt the well from the sediment and lead standards since the water is not consumed. This will result in cost savings.

4725.4825, Subpart 2. This subpart is proposed to reference the prohibition of connecting potable and nonpotable water systems in part 4725.3350.

4725.4825, Subpart 3. This subpart is proposed to require marking of nonpotable water pipes. Since a nonpotable water system may not be as safe as a potable water system, and since nonpotable supply system pipes are indistinguishable from potable system pipes, it is important that where both a nonpotable system and a potable system exist side by side, the nonpotable system be marked in accordance with the Minnesota Plumbing Code. This is already required where the Plumbing Code applies.

4725.4850 WATER-SUPPLY WELL PITLESS ADAPTER OR PITLESS UNIT, AND WELDED OR THREADED FITTING.

Amendments are proposed to this part to allow additional fittings to be used to connect a pitless unit to a casing, and to allow approved welded or threaded fittings to be used for casing connections other than a water discharge line.

A pitless adapter or pitless unit is a fitting that attaches to the casing (usually below the frost depth) that allows the pump to be installed and removed without digging up the well, allows the water line to exit the casing below the ground surface and not freeze, and allows the casing to extend above the ground to prevent flood water, vermin, and surface contaminants from entering the well. The adapter or unit is connected to the well casing with a threaded, welded, or compression connection.

4725.4850, Subpart 1 is proposed for amendment to allow alternative fittings, meeting recognized standards, to connect a pitless unit to a well casing. This is another situation where manufacturers of well casing or fittings do not make fittings that meet well standards because of the wide variety of sizes and configurations needed, and the small market demand. The amendment proposes to allow the use of specified fittings typically made for plumbing or piping purposes.

4725.4850, Subpart 2. In cases where the connection is not used for a pump and water discharge line, and therefore does not have the same issues of pump removal service and access, alternative connections exist that can provide a less expensive connection, and in some circumstances, may work better than a pitless adapter or unit. Pitless adapters and units are also not made for small diameter casings. Subpart 2 is proposed to allow these alternative connections detailed in part 4725.3150, subpart 2, where the connection is not for a water discharge line. Further explanation is found in the justification for part 4725.3150, subpart 2.

4725.4950 CAPPING WATER-SUPPLY WELLS.

This part is proposed for repeal. This rule part applies only to water-supply wells. The requirements of this part are proposed for addition to part 4725.2250 since it is important to properly cover or cap all wells and borings to prevent vandalism, accidents, or the entry of contaminants or foreign materials into the well or boring.

4725.5250 WATER-SUPPLY WELL PUMP DISCHARGE LINES.

This existing rule part establishes standards for the water pipe connecting the well to the distribution system. The intent of the proposed amendment is to prevent the siphonage of water back into a well, if a hole develops in a buried discharge line. If a vacuum (pressure less than atmospheric) is created, a hole in a buried discharge line will aspirate water into the pipe, and well, depending on the plumbing design. A vacuum release helps prevent this. An amendment is proposed to the rule to allow a combination vacuum release and air release. This device offers the same protection from vacuum, and also allows the equalization of pressure and discharge of air in the water system that can cause "spitting" of faucets, oxidation of iron, and other mechanical problems. For the vacuum release, or combination vacuum/air release to work, it must be located between the check valve and the well; otherwise, it will not function properly.

4725.5350 PRESSURE TANKS FOR WATER-SUPPLY WELLS.

It is important that any interior coating (one that is in contact with potable water) not leach chemicals into the water. The original intent of the rule was to require that if a tank had an interior coating, the coating be safe as evidenced by meeting NSF Standard 61. Not all tanks have a coating. Many tanks contain the water in a bladder inside the tank, or are made of fiberglass that meets the NSF standard. An amendment is proposed to clarify that if a coating is used, it must meet the NSF standard. It is also proposed to update the standard.

4725.5450 VENTING WATER-SUPPLY WELLS.

A well vent allows air pressure to equalize when the pump starts and the water level in the well drops, thereby preventing a vacuum. A vent also allows the escape of odorous, corrosive, explosive, or asphyxiating gases such as methane or hydrogen sulfide. Since the vent is an opening into the well, it is important to assure that the connection is watertight, and that it not allow mice, insects or other vermin to enter the well.

4725.5450, Subpart 2, Item A is proposed for amendment to allow a vent to be constructed with materials approved for water piping under the Minnesota Plumbing Code and this rule. These materials are already approved for water connections, and provide a competent alternative to the casing materials now approved.

4725.5450, Subpart 2, Item C is proposed for amendment to clarify that the standard vent height is 12 inches. However, as required by part 4725.5850, the minimum height for a community well vent is 18 inches.

4725.5450, Subpart 2, Item D, is proposed for amendment to require that the vent screen, presently required to keep insects and vermin from entering the well, be noncorrosive and have a maximum size. A noncorrosive material will maintain the integrity of the screen in the wet environment of a well. A maximum screen size will effectively exclude insects. The 1/16-inch standard is consistent with the Food Code, Minnesota Rules, Chapter 4626.

4725.5450, Subpart 2, Item E, is proposed to assure that the connections for the vent are watertight to exclude floodwater or other contaminants.

4725.5475 HYDROFRACTURING WATER-SUPPLY WELLS.

"Hydrofracturing" is the process of injecting water into a well, under pressures high enough to fracture bedrock, and (hopefully) increase well yield. Hydrofracturing is done on hard bedrock such as granite, where the water exists in natural cracks and fractures in the bedrock, but the well will yield insufficient quantities of water, typically less than 2 or 3 gallons per minute. A pipe with either one (single) or two (straddle) packers is inserted in a well. Water is injected under pressure, with pressures increasing until a sudden pressure drop is experienced, typically between 500 and 2000 psi. Successful hydrofracturing will widen and connect existing fractures, hopefully resulting in increased water yield. A two or three-fold increase in yield is considered very successful. The process, however, presents health and safety issues. The high pressures can be a safety concern for the operators. Improper hydrofracturing can cause damage to the well casing, or grout seal. The effects of hydrofracturing can extend well beyond the well bore, and can include interconnection of the well with surface water or contamination sources if precautions are not taken.

These proposed rule requirements are all new language. The existing rule does not establish detailed standards for hydrofracturing, but it does require that a person hydrofracturing a well be licensed (part 4725.0475), and that water used for hydrofracturing be potable and have a chlorine residual (part 4725.2950).

The states of Wisconsin and Michigan are located in geologic terrains similar to Minnesota's. They have had considerable experience with hydrofracturing, and have developed requirements for hydrofracturing. The Wisconsin requirements are in the Wisconsin Administrative Code, Chapter NR812.22, and the Michigan requirements are in R325.1637 of the Groundwater Quality Control Rules, and the Policy/Procedure 1996-5 "Hydraulic Fracturing of Water Wells." These proposed amendments adapt the Wisconsin and Michigan standards for Minnesota.

4725.5475, Subpart 1 is proposed to reference the definition of hydrofracturing, and the statutory requirements for licensing. The scope is proposed to restrict hydrofracturing to all water-supply wells except remedial wells. The greatest application is for water-supply wells. Hydrofracturing of some wells or borings, such as elevator borings, serves no purpose, and the MDH is not aware of hydrofracturing being done on other wells or borings. Concerns do exist for hydrofracturing wells that may be constructed to lower standards, such as temporary dewatering wells, or wells and borings encountering contamination such as monitoring wells, remedial wells, and environmental bore holes. For those reasons, only water-supply wells may be hydrofractured. Should a unique situation arise where hydrofracturing of these other wells and borings is warranted, an application for a variance may be made.

4725.5475, Subpart 2 is proposed to address materials injected into the well during the hydrofracturing process. The existing requirements of part 4725.2950 concerning the use of potable water with a chlorine residual are added here to prevent the introduction of harmful chemicals or bacteria into the well or groundwater, as is the requirement that additives are not harmful, as evidenced by conformance with ANSI/NSF standard 60. "Proppants" are small solid materials that are sometimes injected with the water to hold the fractures open. The most

common proppant used in water-supply wells is sand, but plastic or ceramic materials have also been used. Since these materials will remain in the bedrock surrounding the well, it is important that they not contaminate the groundwater or well.

4725.5475, Subpart 3 is proposed to establish restrictions on the use of hydrofracturing to prevent fractures from propagating to the surface and allowing the entry of surface water, prevent fracturing of the casing, limit the use of hydrofracturing to the appropriate geologic formations, and prevent interconnection with contamination sources such as septic systems.

4725.5475, Subpart 3, Item A is proposed to require the packer to be a minimum of 50 feet below the land surface. Wisconsin does not allow hydrofracturing within 40 feet of the ground surface. Michigan's minimum hydrofracturing depth is based on the depth of unconsolidated materials, bedrock type, and grouting of the casing. In some cases, hydrofracturing may not occur within 200 feet of the surface. The Michigan minimum is 50 feet, except by special permission. The MDH is proposing to not allow hydrofracturing within 50 feet of the surface, to prevent propagating fractures to the surface.

4725.5475, Subpart 3, Item B is proposed to require the packer to be 10 feet or more below the casing to prevent damage to the casing. Wisconsin requires the packer to be a minimum of 5 feet below the bottom of the casing. Michigan requires 15 feet minimum, and considerably more in some geologic conditions. The MDH is proposing a minimum of 10 feet below the casing to prevent damage to the casing.

4725.5475, Subpart 3, Item C is proposed to restrict hydrofracturing to igneous and metamorphic bedrock. Wisconsin allows hydrofracturing in igneous and metamorphic rocks, and sedimentary rocks only by prior contact with the Wisconsin Department of Natural Resources. Michigan requires submission of a written request, and approval of all hydrofracturing by the local health department. The proposed amendments require no special permit or permission. A variance could be applied for in the extremely remote case that hydrofracturing of a sedimentary rock would be needed.

4725.5475, Subpart 3, Item D is proposed to require that hydrofractured wells meet the minimum setback distances to contamination sources so that the fractures are not likely to interconnect the well and contamination. Michigan requires that hydrofractured wells meet the contamination source isolation or "setback" distances. Wisconsin has regulated well setbacks since 1936, so most wells meet the setbacks (as opposed to Minnesota where the first state-wide well rule went into effect in 1974). The MDH is proposing to require that hydrofractured wells meet the minimum contamination source setbacks to prevent interconnection of the well and contamination sources.

4725.5475, Subpart 4 is proposed to establish requirements of the person hydrofracturing, so that a hydrofractured well produces safe drinking water.

4725.5475, Subpart 4, Item A is proposed to parallel the requirement in part 4725.4650, item A to remove any additives inserted into the well. While additives are not commonly used, and must meet NSF standard 60 in accordance with part 4725.2950, subpart 2, they may not be completely non-toxic, and they serve no purpose remaining in the well.

4725.5475, Subpart 4, Item B is proposed to require disinfection of a hydrofractured well, similar to the requirements of a new or repaired well. Hydrofracturing involves inserting pipes and packers into the well that have been used in other wells and have been carried from job to job. They can be contaminated with bacteria. Disinfection of the well after the work is done is needed to assure that organisms introduced during the hydrofracturing are eliminated.

4725.5475, Subpart 4, Item C is proposed to require that a water sample be collected and tested after a well is hydrofractured. Hydrofracturing introduces water into a well, inserts pipes and packers, and changes the water transmission capacity of the bedrock. Any or all of these activities may introduce contaminants into the well. A test of the water prior to using it for drinking or other potable purposes confirms that the disinfection required under item B is successful, or if the water is not safe to drink and additional work is needed.

4725.5475, Subpart 4, Item D is proposed to require submission of a record that documents for the owner and the state, that the well was hydrofractured. When hydrofracturing is performed as a part of new well construction, which is the most common situation, the report already required by part 4725.1851 is sufficient. If the well was previously drilled, and a well record exists for the well, the record may simply be amended. The record can be valuable in the future, should a problem occur.

4725.5550 WATER-SUPPLY WELL DISINFECTION.

4725.5550, Subpart 2. Ideally, a residential water-supply well should yield 10 gallons per minute or more, and most wells do. However, in some geologic situations, the unconsolidated materials or bedrock will yield only small quantities of water, and in fact, in a few instances, the ground will not yield any water at all. Some wells that only yield small volumes of water are drilled with larger diameter casings or to deeper depths to act as a storage reservoir. It may take many hours for the well to fill. In these cases, the existing requirement to pump three casing volumes could take days. The requirement to pump three casing volumes or until clear, whichever is greater, is proposed for amendment to remove "whichever is greater," since the goal is clear water, not just removing a set number of casing volumes. The existing requirement to have 50 parts per million of chlorine is being amended to clarify that the chlorine available for disinfection must be the active form ("free chlorine," already required in existing subpart 2), not chlorine bound to other chemicals.

4725.5550, Subpart 3 is proposed for amendment to provide further clarification as to the types of repair or modification (as listed in part 4725.0475, subpart 1) where disinfection is required.

During disinfection, chlorinated water is often pumped into the distribution system (plumbing), to disinfect the pipes, and equipment such as water heaters. An existing provision of subpart 1 requires flushing of the chlorine from the distribution system after disinfection of a new well or pump. Flushing the distribution system after disinfection is equally important to prevent ingestion of heavily chlorinated water, or contact with sensitive portions of the body such as the eyes.

4725.5550, Subpart 4 is proposed to establish standards for disinfection chemicals. ANSI/NSF standard 60 is the most recognized nationally standard for evaluating the health effects of drinking water chemicals. The United States Environmental Protection Agency registers antimicrobial pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which include chlorine products labeled for disinfection of potable water. This standard assures a baseline of quality for the product. Some chlorine products are used for industrial cleaning, disinfection of swimming pools, or are marketed to domestic users. These products may contain chemicals other than sodium or calcium hypochlorite such as algaecides, perfumes, or other chemicals that are not appropriate for drinking water. Chlorine is the mainstay of drinking water disinfection. It is used to sanitize new and repaired drinking water wells, and to maintain a disinfectant residual in community water systems. However, new disinfectants are being developed, since chlorine has some limitations. Products including iodine and hydrogen peroxide have been used elsewhere. The proposed rule amendment allows the use of alternative disinfectants so long as the products meet the FIFRA standard, and provide biocidal effectiveness comparable to chlorine.

4725.5550, Subpart 5 is proposed to address chlorine used in solid form, typically as granules or pellets. Chlorine disinfectants used in wells come in either liquid form as sodium hypochlorite, or in solid form as calcium hypochlorite. The solid may be in the form of a powder, granules, or pressed into a pellet or larger solid.

The pitless adapter of a well is usually above the water level, along with a portion of the casing, drop pipe, and wires. These materials have been manufactured, stored in warehouses or yards, shipped, usually uncovered, on a truck, and sometimes dropped on the ground. The surfaces are not clean, and need to be disinfected. Simply dropping tablets into a well will not disinfect surfaces above the water level, and if the tablets do not immediately dissolve, and they sink into the sediment at the bottom of the well, they may not dissolve. The standard well drilled today has a 4-inch inside diameter casing, and a 3.5-inch to 3.875-inch outside diameter submersible pump. Solid chlorine will not fall below the pump, leaving a substantial portion of the well without disinfection. The rule is proposed to be amended to require dissolving the solid chlorine in water before placement in the well, or circulating the chlorine solution after placement of the solid in the well. The rule allows additional solid chlorine to be added after the minimum is satisfied, and to use the solid product for flowing wells, since the liquid may not reach the bottom because of the upward water movement. In this case, the natural flow will circulate and disinfect the entire well if a solid is placed at the bottom.

4725.5550, Subpart 6 is proposed to exempt remedial wells (a water-supply well used to remove or otherwise clean-up groundwater contamination) from the disinfection requirement, if the chlorine will interfere with the remediation by adversely altering the chemical compounds or reacting with the chemicals in the ground. Chlorine can create "trihalomethane" compounds such as chloroform, or can alter the chemistry of chlorinated solvents.

4725.5650 WATER QUALITY SAMPLES FROM NEWLY CONSTRUCTED POTABLE WATER-SUPPLY WELL.

The existing rule requires that a new well used for drinking be sampled and tested for total coliform bacteria and nitrate. These parameters have been historically used because of the capability of both constituents to cause acute illness in a consumer, the relative ease and low expense of analysis, the fact that both are common in the environment, and because both parameters are indicators of contamination and can signify the presence of other, potentially more serious, contaminants.

The existing rule requires testing before use. An amendment is proposed to require testing within 30 days of completion. In the case of wells drilled for a development or seasonal property where the well will not be used for months or longer, this will help identify contaminated wells and remedy them, plus help complete the reporting requirements, since section 103I.205, subdivision 9, requires submission of all records within 30 days of completion. The MDH has observed numerous wells that are drilled and completed, but not sampled until after the well is used, if the well is sampled at all. It is reasonable to require that the water quality report be submitted within 30 days of completion, regardless of when the well will be used.

This proposed rule requires submission of a sample from a well used for potable purposes, not just used for drinking. Water used for purposes other than drinking, such as for food preparation, manufacturing of food or pharmaceuticals, or for human contact such as bathing, has the potential for harm if contaminated.

A clarification has been proposed that a water sample is not required for a new pump or repair, unless the repair is a significant modification to the well that requires a notification under part 4725.1820, and could potentially introduce contaminants.

4725.5650, Item A is proposed for amendment to require that the well owner be notified that the water should not be consumed until all of the analyses are complete, not just the analysis for total coliform bacteria. This is especially important should the nitrate level be elevated, and an infant is consuming the water.

4725.5650, Item B is proposed for amendment to require that the water sample be analyzed for arsenic, in addition to nitrate and coliform bacteria. Arsenic is a naturally occurring mineral in soil and bedrock that can dissolve in groundwater. Arsenic may also occur in groundwater from use or disposal of arsenic containing pesticides, and from some mining and manufacturing operations. Recent studies suggest that the water in approximately 15 percent of the wells in Minnesota (a number higher than previously thought) contains naturally occurring arsenic concentrations above the recommended standard of 10 micrograms per liter (µg/L). Some groundwater has been found to contain arsenic levels exceeding 150 µg/L. Arsenic can occur in groundwater just about anywhere in Minnesota, but is more likely to occur in Western Minnesota. Arsenic levels can vary considerably from one well to the next, even in close proximity, and the presence or absence of arsenic in one well cannot be used to predict the presence or absence of arsenic in a neighboring well.

The effects of arsenic on health depend on the chemical form of the arsenic, as well as the concentration and exposure. The concentration of arsenic capable of causing death, approximately 60,000 micrograms (µg), is not typically found in Minnesota's groundwater. However, much lower doses, consumed over long periods of time, have the potential to cause problems with the skin, circulation, lungs, nervous system, immune and endocrine systems, and have been associated with skin cancer, and cancers of the bladder, lungs, kidney, nasal passages, liver and prostate.

Arsenic has no taste, odor, or color in water. As previously mentioned, arsenic levels can vary considerably from property to property, and cannot be predicted with certainty. The only way to verify the arsenic concentration is to collect a water sample and test for arsenic, a test that will cost approximately $30. The MDH is proposing in item B to require all new potable water-supply wells to be tested for arsenic. The laboratory certification rule, M.R., Chapter 4740, is being amended, and the reference to the certification process has been updated.

Item B proposes minimum laboratory reporting limits for nitrate (as nitrogen) and arsenic. This establishes a baseline so that concentrations of these chemicals are accurately tested, and reported. Without this, a laboratory could use insensitive equipment, or a testing method with a high detection level, ostensibly even above the health limit, and report that a chemical was not found, even though it was in the water. Reporting levels are proposed that are in common usage, are reasonably achievable by a competent laboratory, and provide a safety factor in relation to the drinking water standard.

A reporting level of 1.0 milligrams per liter (mg/L) nitrate-nitrogen is 10 percent of the current health advisory level (10.0 mg/L). It can be achieved using all approved drinking water testing methods, and also provides reasonable assurance to the well owner that a result reported as less than the reporting limit likely indicates no significant impacts on the well water from human sources of nitrate (e.g., septic systems, fertilizers, animal concentrations). While levels up to 1.0 milligram per liter can often be attributed to natural nitrogen sources, levels higher than that usually suggest a possible contribution from one or more human sources of nitrate.

A reporting level of 2.0 micrograms per liter (ug/L) arsenic is 20 percent of the current health advisory level for private well water (10.0 ug/L). This reporting level can be achieved by most competent laboratories using standard analytical equipment, while providing as much information as possible to the well owner about the presence of arsenic in the well water.

4725.5650, Item C is proposed for amendment to require that the sample results already required to be submitted to the owner and MDH are readable, and as required by Chapter 103I, are submitted within 30 days.

4725.5650, Item D currently requires that the person who constructs a new well containing coliform bacteria, remedy the coliform problem if the person collected the water sample. However, water samples may be collected by the MDH, or by a local Community Health Service program delegated authority by the commissioner. These samples may be collected to assist the contractor or owner in remedying a coliform positive, as compliance samples for a restaurant or

other public supply, or for an enforcement investigation or action. A proposed amendment to item D requires that the installer of the well, remedy coliform bacteria contamination caused by the installer, if the sample was collected by the commissioner.

4725.5675 CASING EXTENSION ON REPAIRED WELLS.

This part is proposed for repeal. The requirement for casing extension when repair occurs is proposed for addition to part 4725.3750 so that all wells and environmental bore holes are included.

4725.5675 DUG WATER-SUPPLY WELL.

Historically, dug wells were the first type of well, dating back centuries, where a hole was dug by hand to reach a shallow water table. Later on, animal assisted digging devices, and mechanical excavating or boring machines were used to dig a large diameter hole, that was then typically lined with rocks, brick, wood, metal, or other types of cribbing or curbing. The cribbing or curbing was installed to prevent collapse of the well, and allow water to enter the well. Dug wells have typically been shallow, and often constructed in areas of low water yield, since the large diameter of most dug wells (2 to 4 feet, versus 2 to 4 inches for a drilled well) will store a large volume of water in a small vertical section. The curbing or cribbing was designed to maximize the amount of water infiltrating the well, with little regard for the sanitary quality of the water. Dug wells often allowed, and in some cases were purposely designed to allow, surface water and shallow water in surface soils to enter the well.

Since their initial promulgation, Minnesota well construction rules have allowed dug or bored wells to be constructed, with concrete curbing or poured concrete, but have always recognized their vulnerability to contamination. The initial state well construction rule in 1974, Chapter 15, MHD 210-230, authorized dug wells "where geological conditions precluded the possibility of developing a satisfactory drilled well." The rule allowed only precast concrete curbing or a poured in place concrete wall or curbing. Isolation distances to sources of contamination were required to be doubled because of the sensitivity to contamination. Amendments in 1979 required that prior to constructing a dug well, the owner agree to maintain the isolation distances, and test the well for nitrate and bacteria once a year or as prescribed by the commissioner. No other type of well has been subject to all of these precautionary steps.

The material used for the majority of dug wells constructed in Minnesota during the last 30 years has been concrete curbing sections ranging from 2 to 3 feet in diameter, and typically 3 feet long. These 3-foot long curbing pieces, are just stacked on top of each other. Most have an irregular squared end, with no joint, connection, or sealant between sections. The joints between sections are not waterproof, and in fact, are purposely designed to leak in order to maximize the amount of water entering the well. These wells have been constructed in areas where water yields are typically very low and aquifers may have a limited thickness. However, the open joints for the entire length of the casing invites surface water, surface contaminants, and even tree roots to enter the well.

It has been recognized here and elsewhere that dug or bored wells present serious problems of contamination. Between 1991 and 1995, the Illinois State Water Survey conducted a study of 75 dug wells in Illinois. Their study concluded:

- "Shallow large-diameter wells are especially susceptible to contamination by agricultural chemicals, in part because they store water that has seeped from the surface rather than draw water from aquifers like drilled wells do."
- "Nitrate contamination is of greatest concern. Virtually every well sampled had detectable levels of nitrate. Levels frequently were several times higher than the acceptable limit of 10 milligrams of nitrogen per liter of water."
- "Fourteen pesticides were detected in the well-water samples.....Few wells exceeded government safety thresholds for pesticides, but about 15 percent of the wells contained unacceptable levels of at least one pesticide on at least one occasion."

The Ontario Ministry of Health, Northwestern Health Unit, under the Safe Drinking Water Act, Ontario Regulation 170/03, considers dug wells to be equivalent to a surface water supply, and states, "It should be noted that the depth of soil above a dug well aquifer, does not permit adequate soil filtration to remove all harmful organisms from surface water before it reaches the groundwater table as it does for a drilled well."

The Wisconsin Department of Natural Resources states, "Dug wells are typically constructed in areas with very high groundwater levels and utilize a constructed box or circular structure, which allows water to seep into the well. As these wells often pose a safety hazard and are more prone to contamination, they are generally discouraged for use."

In 1994, the United States Centers for Disease control (CDC) conducted a study of wells in nine Midwestern States, including Minnesota. The report, titled, "A Survey of the Quality of Water Drawn from Domestic Wells in Nine Midwestern States," was published in September 1998. The survey analyzed the water quality from 5520 wells, sampled on a 10-mile grid across the states. Findings included:

- A bored well was 12 times more likely than a drilled well to have coliform bacteria, 13 times more likely to have E. coli (a fecal coliform), and 6 times more likely to have nitrate-nitrogen over 10 mg/L.
- A buried slab well (dug well with a pitless) was 5 times more likely than a drilled well to have coliform bacteria, 4 times more likely to have E. coli, and only slightly more likely to have nitrate-nitrogen over 10 mg/L.
- A dug well was 10 times more likely than a drilled well to have coliform bacteria, 15 times more likely to have E. coli, and 4 times more likely to have nitrate-nitrogen over 10 mg/L.

In 1995, the MDH collected water samples from 22 concrete-curbed dug wells in Murray, Nobles, Redwood, Rock, and Yellow Medicine counties that had been constructed in 1990. The results were:

- 12/22 (55 percent) had nitrate-nitrogen levels exceeding the 10 mg/L standard.
- 12/22 (55 percent) had total coliform bacteria (five of the wells without bacteria were

regularly chlorinated).

- 2/22 (9 percent) had E coli (fecal coliform).
- 17/22 (77 percent) had coliform bacteria, nitrate-nitrogen over 10 mg/L, or both. Of the five that did not have coliform or nitrate-nitrogen over 10 mg/L, three were continuously chlorinated, and the remaining two had nitrate-nitrogen levels of 7.3 and 9.9 mg/L.

These results are unsafe and unacceptable.

Dug wells curbed with concrete were allowed by the first statewide well rule in 1974 because an industry was in existence constructing these types of wells, and because common alternatives did not (yet) exist. In the early 1970's, a handful of companies specialized in constructing concrete-curbed dug wells, and constructed hundreds of them. Presently, less than a dozen concrete-curbed dug wells are constructed each year. Dug wells were also allowed because of limitations of geology and well drilling equipment. Today, the greater availability of larger drilling machines, and larger conventional casing, particularly the less expensive and lighter weight plastic casing, has allowed completion of wells with larger casing that can be grouted to exclude surface water. Hydrofracturing has been used to complete successful rock wells in deeper protected formations, instead of constructing shallow dug wells to take near-surface water.

The existing rule refers to dug or bored wells, yet the statute refers only to dug wells. Neither the rule nor the statute defines a "bored" well. The distinction between the two is not clear, and the use of the two terms can be confusing, particularly since the statue refers to "borings" as an entirely different group of drill holes distinguished by use, not construction method. As such, use of the term "bored well" is proposed for deletion.

Dug wells have been shown to be highly susceptible to contamination, and variable as to water quality, with some wells testing satisfactory at some times, and unsatisfactory at other times (often after a rain or snow melt). Dug wells have shown the highest levels of nitrate contamination in individual wells, and the highest percentages of contaminated wells for a type of well. Alternatives to concrete curbing and poured concrete dug wells exist in most cases--alternatives that provide adequate and safe water, and comply with the same rule that all other wells must comply with. For these reasons the MDH is proposing to repeal the rule part allowing concrete curbing and poured concrete. This will not preclude someone using an auger, bucket drill, boring machine, or other "unconventional" excavation technique to construct a dug well, as long as the casing materials, grouting, casing connections, well head completion, and other components meet the rule standards. In situations where a well cannot be successfully constructed with conventional casing and grout, due to unique and limiting geology, a variance may be granted. The variance allows a specific assessment of the geology, allows for the use of special techniques and materials as well as specific precautions, and involves the well owner in the process.

4725.5825 PUBLIC WATER-SUPPLY WELLS.

"Public water-supply" wells provide water to cities, mobile home parks, health care facilities, businesses, schools, restaurants, parks, and any facility providing piped water for human consumption with 15 or more service connections or 15 or more living units, or serving at least

25 person daily for at least 60 days of the year. Public water supplies are divided into "community" supplies that serve cities, subdivisions, mobile home parks, and extended health care facilities, and "noncommunity" supplies that serve 25 people daily for at least 60 days a year in a location that is not their residence. Typical noncommunity supplies include schools, churches, businesses, and restaurants. Minnesota Rules, Chapter 4725, regulates public water systems for the location and construction of the well, and Minnesota Rules, Chapter 4720, the public water supply rule, regulates them for such things as drinking water standards, water testing, and public notification.

This all new rule part is proposed to provide a higher level of safety for public water-supply wells, since public water supplies provide water to large populations, serve vulnerable populations such as schools, serve transient populations such as fairs and rest stops where waterborne disease has the potential to spread quickly and far, and because the public well radius of influence (area of the ground that supplies water to a well) can be large.

4725.5825, Subpart 1 is proposed to clarify that the requirements in this rule part are in addition to those found in the general well and boring rules and the rules pertaining to water-supply wells.

4725.5825, Subpart 2 is proposed to require the well contractor to notify the MDH of the start time of drilling so that an inspector can inspect. This does not limit the contractor to any particular start time or prevent work during holidays, evenings, or weekends, but does allow the MDH to more efficiently schedule inspections. Public wells should have a higher level of scrutiny, since they serve the public, and since the requirements for construction are somewhat different. The notification may be included with the notification form and mailed, personally delivered, or faxed by the contractor to the St. Paul office of the MDH, or the notification may be provided by phone, fax, or in person.

The MDH has made a commitment to inspect all public wells. It should also be noted that some of the requirements for public wells are proposed for significant change. Should there be a problem, inspection during drilling could benefit the contractor, since correction is much easier before the well is completed. Public wells are typically much more expensive than domestic wells. The verbal notification allows the MDH to inspect the approximately 200 public wells drilled each year. The present well notification system is inefficient and costly for the state, and hence the public. Considerable time is spent telephoning contractors on a regular basis to determine when the public well will be drilled.

4725.5825, Subpart 3 is proposed to require additional efforts to eliminate coliform bacteria from new public wells constructed in unconsolidated formations with bentonite drilling fluids. Testing conducted by the MDH has shown a much higher incidence than normal of positive total coliform tests in public wells constructed in unconsolidated materials using a rotary drilling method with a bentonite based drilling fluid. Analysis of public water-supply wells constructed in 1998 and 1999 in the northwestern district, found 91 percent (21/23) initially positive for coliform bacteria. Four genera of coliform were detected, Enterobacter, Citrobacter, Klebsiella, and Serriatia. The mixture of species, the prevalence of environmental coliforms (common soil organisms), the general absence of fecal coliforms, and the general lack of a significant problem with wells drilled by cable tool or rotary without bentonite drilling fluid, led the MDH to

conclude that the coliforms are typically soil organisms made difficult to remove by the use of bentonite. As explained in part 4725.4150, soil and coliform bacteria living in the soil are inadvertently mixed into the drilling fluid as a well is drilled. The surface soils, once limited to the surface, are now in the cuttings/drilling fluid mix, and are circulated throughout the bore hole as the well is drilled to its total depth. The bentonite/cuttings/coliform mixture coats the bore hole wall to form the leathery "mud cake" that stabilizes the hole, is forced out into the formations, and (currently) is often used to backfill around the casing. The bentonite appears to provide a substrate to shield the organisms from destruction by disinfection.

As a result of the large number of coliform positives in new public wells, the MDH contracted with a well driller to test various techniques to eliminate, or at least reduce, the coliform positives. Various techniques were tried, including dumping the drilling fluid (bentonite, cuttings, and water) used in the top portion of the well, and mixing new fluid; drilling with chlorinated drilling fluid; disinfecting drilling equipment; flushing the bore hole with chlorinated water; adjusting pH; and enhancing well development procedures. The techniques that were most successful were maintaining a chlorine residual in the drilling fluid, flushing the drilling fluid from the well with chlorinated water before grouting, and well development (pumping and agitating the well to remove more of the drilling mud, drill cuttings and fine particles from the well). The MDH is proposing to require the first action for all water-supply wells constructed with bentonite (part 4725.4150), and to require either the second or third for public wells. Also, subpart 4 will prohibit cuttings as a fill material around the casing, designed to eliminate a bacterial source.

4725.5825, Subpart 3 as proposed requires that in addition to maintaining a chlorine residual, a public water-supply well must either be disinfected before grouting, or developed for a minimum amount of time. Disinfection before grouting allows the chlorine solution to circulate through the entire well, not just the small section exposed by the screen, and contact the entire length of the bore hole. While this is the preferred method, it may be difficult in some geologic circumstances to circulate the chlorine solution and keep the hole from caving. So, a second alternative is given that has also been shown to effective, that of development.

4725.5825, Subpart 4 is proposed to require that all open annular space around the casing of a public water-supply well be grouted, not just the top 50 feet as required in the general requirements of part 4725.3050. Part 4725.3050 requires the top 50 feet of all wells and borings that have an open annular space to be grouted. The portion below 50 feet must be filled with either grout or cuttings. A mixture of cuttings and bentonite can be an effective seal if proper materials are used and if the mixture is placed to completely fill the annular space. Unfortunately, it is difficult to assure the space is properly filled due to differential settling, bridging, settling, and collapse of permeable materials.

- Cuttings shoveled through standing water will separate reducing the effectiveness of the seal. The lighter fine-grained materials (clay and silt) fall much slower than the heavier materials (sand and gravel), resulting in coarse, permeable materials at the bottom, and the fine-grained, less permeable materials near the top. The settling velocity of medium sand through water is approximately 626 feet per hour, while the settling velocity of clay is less than 1 foot per hour.

- Since the rule does not require a minimum annular space size, and the typical bore hole is not much bigger than the outside of the casing, cuttings shoveled from the surface frequently bridge, and leave voids below casing couplings, crooked spots in the well, or locations where the bore hole has swelled.
- Materials dumped from the surface are not pressure grouted in place or compacted. The column of cuttings later settles, leaving voids. Some wells and borings have been observed to settle more than 50 percent.
- Lastly, the falling cuttings can cause native materials to collapse. The loose, more permeable materials, such as sand or gravel, preferentially fall into the space, resulting in the opposite of what is desired--the permeable materials, not the impermeable materials, filling the space.

Full length grouting of all wells and borings is ideal, but full length grouting can be difficult in some geologic situations, adds additional expense, and is strongly opposed by some contractors. Public wells are some of the most critical wells, because they serve a large number of people, and in some cases a large number of sensitive or vulnerable people (schools, nursing homes, day cares, etc). Public wells also withdraw larger quantities of water, creating greater drawdown (water level or pressure drop in the aquifer and well), and larger zones of influence (the "radius" or "zone of influence" is the three dimensional area providing water to the well). It is reasonable to require a public well to be constructed to a higher standard.

4725.5825, Subpart 5 is proposed to require the installation of a sampling tap. Public wells are regulated under the federal Safe Drinking Water Act, and Minnesota Rules, Chapter 4720. Periodic testing of the water from all public supplies is required. Testing frequency for total coliform bacteria can vary from yearly for some small public systems, to multiple times daily for a large municipal system. A sampling tap is relatively inexpensive ($10 to $20), and can help eliminate false bacterial positives caused by a substandard faucet, or interference from water treatment or plumbing. False positives cause considerable inconvenience and expense for the state and well owner.

4725.5825, Subpart 6 is proposed to address conversion of an existing well to use as a public water-supply well. Periodically, a public water supplier wishes to use an old well for a public supply. This may be an older irrigation well on an existing property, a well on a newly acquired property, or an old well that someone wishes to use to start a new public water system. The first statewide well rule was promulgated in July 1974. Therefore, there are many wells in existence that were drilled before the first well construction standards. Some would meet the minimum standards, and some would be grossly substandard. The proposed subpart requires that a well, not previously used as a public water-supply well, must meet the minimum standards for a public water supply before it is converted to public use. This assures that the well serving the public meets minimum health and safety standards.

4725.5850 COMMUNITY PUBLIC WATER-SUPPLY WELLS.

A "community water system" provides water to 15 or more service connections used by year-round residents, or regularly serves at least 25 or more year-round residents. Examples of community water systems include municipalities, mobile home parks, and extended health care facilities. The populations served by these wells are often large (thousands of persons in the case of many municipal wells). The wells typically are the primary source of water consumed by the

residents. Many residents have long exposures to the water, consuming water from the same source over many years. The wells typically pump large quantities of water, draw water from larger distances underground compared to other wells, are in continuous use, and are designed to last for many, sometimes hundreds of, years. Lastly, large portions of the populations served are at higher risk--children, the elderly, and persons with illnesses.

4725.5850, Subpart 1 reminds the reader that a community public water-supply well must meet the general requirements for all water-supply wells, and the specific requirements of this rule part.

4725.5850, Subpart 1a. An amendment is proposed to subpart 1 to simply remind the reader of the requirements in part 4720.0010 that plans and specifications are required for work other than new well construction. Part 4720.0010 requires plans for the installation, alteration or extension of a public water system.

4725.5850, Subpart 2 is proposed for amendment to remove the referenced definition of "community water system" in the Code of Federal Regulations, since the term is now defined in part 4725.0100, subpart 23a. Subpart 2 is proposed to be separated into additional subparts, since many of the existing requirements do not pertain to site approval, but relate to contamination sources, flood protection, casing vents, and property ownership.

4725.5850, Subpart 3 is proposed to be separated from subpart 2 to include only requirements related to contamination sources. A proposed amendment references all of the setback distances in the rule.

4725.5850, Subpart 3, Item A. The isolation distance to a gravel pocket is now proposed to apply to all water-supply wells, so it has been moved to the isolation distance rule in part 4725.4450.

The existing rule requires that isolation distances less than 50 feet are increased to 50 feet for a community public supply well. This provides a greater degree of protection for community wells, since these wells provide water to a large number of persons, including some sensitive populations.

A number of new contaminant sources have been proposed for the 20-foot setback in part 4725.4450, subpart 1, item G. The sources in subpart 1, item G, subitems (2), (3), (8), (9), (11) and (12) are not typically contamination sources themselves, but can become a problem if not properly managed. Since the owner of a community public supply well must own or have control of the property within 50 feet of the well, these sources, if within the 50-foot radius, are typically under the control of the water utility. The utility must have one or more operators certified by the MDH. The facility is inspected by the MDH, and the utility also conducts its own maintenance and inspections. For these reasons, those listed sources present less of a hazard, and are proposed to remain at a 20-foot distance.

4725.5850, Subpart 3, Item B. The increased concerns for terrorism, and for response to natural disasters, have resulted in community water suppliers developing back-up power sources for community wells. Most community wells have a vertical turbine or submersible pump that

operates by electricity. An interruption in the electrical power grid will leave the pump non-functional, and the city without water. Backup electrical generators, powered by an on-site petroleum source, have been seen as the best option in case of emergency. The minimum setback between a petroleum tank of less than 1,100 gallons and a well is 20 feet. The distance is raised to 50 feet for a community well. In this case, however, the petroleum tank is owned and operated by the community water supplier, and is an integral part of the operation of the well. A separation of 50 feet creates practical problems. The required safeguards in the proposed rule, that are above and beyond normal petroleum tank safeguards, the oversight by the water utility, and the infrequent filling of the tanks, should minimize the risk, and make a 20-foot setback reasonable.

4725.5850, Subpart 3, Item C. Similar to the contamination sources mentioned in Item A, a hydrant as listed in part 4725.4450, subpart 1, item H is under the control of the community water supplier. The hydrant is also part of the public water system and presents a low risk. For those reasons it is proposed to require a 10-foot setback.

4725.5850, Subpart 3, item D. This amendment proposes to exempt a pipe or conduit carrying only clear water from a community well house, from the setback distances. The potable water entering a floor drain in a community well house should be of the same quality as the potable water discharged to the distribution system.

4725.5850, Subpart 5 is not a new requirement, all well and boring casings must extend 12 inches above grade in accordance with part 4725.2250, subpart 11. The reference here simply clarifies the existing minimum casing height requirement. The flood protection requirements in subpart 4 (the ground surface is required to be two feet above grade) and the casing vent requirements of subpart 6 (the vent must be 18 inches above grade) have led some to incorrectly assume the casing height is something other than 12 inches.

4725.5850, Subpart 6 is proposed for amendment to allow a welded or threaded vent fitting in addition to the currently approved pitless unit or adapter. The pitless fittings are all made at a 90 degree angle to the casing. This necessitates one or more elbows to turn the vent another 90 degrees to extend above the ground. These vents have historically been installed at a 45 degree angle to allow for other uses of the vent pipe including water level measurement, and disinfection. The welded fitting, in particular, allows for multiple uses of the vent, while maintaining the sanitary quality of the well.

4725.5850, Subpart 8 contains the language formerly in subpart 3 and is proposed for amendment to require that pump opening curbing for radial water collectors be a minimum of 4-inches high. This has historically been a requirement of public water supply plan review, and is a criterion of the "Ten States Standards," published by the Great Lakes--Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. The "Ten States Standards" are used by staff of the MDH Drinking Water Protection Section in their review of public water supply plans.

4725.6050 REMEDIAL WATER-SUPPLY WELLS.

A remedial well is a type of water-supply well used to remove groundwater in order to control or remove contamination.

4725.6050, Subpart 1. An amendment has been proposed to remind the reader that remedial wells are a type of water-supply well, and that construction must comply with the general well and boring requirements, the water-supply well requirements, and the requirements of this part unless exempted. The casing height exemption for at-grade wells has been moved to subpart 2. The correct reference for the air gap and back flow prevention requirements of the Plumbing Code have been added. The language in item D about at-grade construction has been deleted here and added to Subpart 2, since subpart 2 is the more appropriate place for this exemption. The language in item E about below grade completions has been deleted, since it should be clear that casing must extend 12 inches above grade unless completed as an "at-grade" in accordance with the rule.

4725.6050, Subpart 2 is proposed for amendment to contain all of the remedial well exemptions.

4725.6050, Subpart 2, Item C contains the at-grade exemption formerly in subpart 1, Item D. Remedial wells are often constructed in locations similar to monitoring wells, that is, close to the contamination. Commonly, this is at locations such as leaking underground petroleum tanks at gasoline stations. The area around the tanks and gasoline pumps is paved due to the large amount of vehicular traffic. The remedial well practically needs to be located where the contamination is located. Termination of the casing above grade in the driveway will create a traffic hazard.

4725.6050, Subpart 2, Item D is proposed to allow remedial wells completed in limestone or dolomite to draw water from near the surface of the water table. This is not allowed of other water-supply wells to prevent drawing contaminated water. A remedial well's purpose is to draw contaminated water. Intersecting the water surface will allow capture of floating products such as petroleum. However, proper construction is need to prevent surface contaminants from entering the ground water.

4725.6050, Subpart 2, Item E is proposed to exempt remedial wells from the venting requirement unless, as specified in subpart 1, toxic or flammable gases (vapors) exist. Existing rule part 4725.5450 exempts remedial wells from the venting requirement. Venting may interfere with some vacuum or sparge remediation systems, which require a sealed casing in order to draw contaminated gasses from the soil or groundwater.

4725.6050, Subpart 2, Item F is proposed to exempt remedial wells from the disinfection requirement where the disinfectant, commonly calcium or sodium hypochlorite (chlorine), will interfere with the remediation by altering the chemical compounds or reacting with the chemicals in the ground. Many contaminants are chlorinated solvents such as trichloroethylene or carbon tetrachloride. The addition of chlorine can alter the chemistry of a number of compounds, create toxic chlorine gas if in contact with acids, and react explosively with ether, turpentine, ammonia, and other chemicals.

4725.6050, Subpart 3 is proposed to allow remedial wells to have a screen or open hole across the contact of an unconsolidated formation and bedrock, similar to subpart 2, item D above. Remediation at the water table is critical for floating contaminants such as gasoline or other petroleum products. If the water table is at the contact, and if the contaminants are floating or buoyant, it is necessary to have a screen or open hole at the water surface to effectively remove the contaminants. While remediation of this contact is often necessary, limits must be set to prevent the remedial well from allowing the spread of contaminants, particularly when the remediation system is not running. Item A limits this interconnection of formations to water table, or unconfined, conditions. This type of aquifer is not pressurized, a condition that that could lead to flow outside the aquifer. Item B protects confining layers, and item C limits penetration into bedrock to conserve the bedrock, since a large amount of open hole should not be needed to remediate at the contact.

4725.6050, Subpart 4 is proposed to continue to allow remedial wells to be cased with stainless steel casing. The same specifications for stainless steel are included here as in existing part 4725.2450 (that is proposed for repeal). Stainless steel is chemically less reactive than mild steel, so as not to interfere with water quality analysis, is less corrodible so as to maintain its integrity in corrosive contaminants, and is considerably stronger than plastic.

G. Dewatering Wells.

4725.6150 DEWATERING WELL.

Dewatering wells are used to lower a groundwater level. Most dewatering wells are shallow, temporary, in water table unconsolidated formations, and used to lower groundwater in order to install underground utilities such as sewer or water pipes. However, dewatering wells have been drilled over 200 feet deep, may be permanent, such as those installed when a building is excavated below the water level, and have been completed in bedrock, penetrating confining layers.

4725.6150, Subpart 1. Amendments are proposed for subpart 1 that reflect statutory change, and clarify existing rule. The depth exemption in Minnesota Statutes, section 103I.15, sunseted on June 30, 1994, and was removed from the statute in the 2005 legislative session. The proposed addition of the terms "repaired, maintained, and sealed" is in conformance with Minnesota Statutes, section 103I.101, subdivision 5, clause (5), that states that the commissioner shall adopt rules including: "establishment of minimum standards for design, location, construction, repair, and sealing of wells to implement the purpose and intent of this chapter..." Lastly, this rule part contains additional requirements or exemptions specific to dewatering wells.

4725.6150, Subpart 6. Dewatering wells must meet the general standards for wells and borings, except as specified in this rule part. Subpart 6 contains exceptions for shallow dewatering wells less than 50 feet deep, installed in unconsolidated formations that are in use for less than 18 months. The modification proposed to subpart 6 clarifies that the exemptions are to the general rule requirements. Items A and B do not change the requirements, but are reworded for clarity.

Item C is proposed to be amended to allow up to10 additional feet of gravel pack above the static water level, consistent with part 4725.2850. Item D is amended to allow cuttings to the maximum depth of these types of dewatering wells--50 feet.

4725.6150, Subpart 7 is proposed as reorganization, since the requirement formerly in item F, is not so much an exception, and separation into a subpart will highlight the unique requirements of wells and borings in a special construction area.

H. Monitoring Wells.

Monitoring wells are excavations in the ground, regardless of depth or casing, used to collect a groundwater sample for testing.

4725.6450 APPLICABILITY AND USE.

Proposed amendments to this part do not change regulatory requirements, but only clarify requirements already in place.

4725.6650 CONSTRUCTION OF MONITORING WELLS.

4725.6650, Subpart 1 is proposed for amendment to reference all casing materials permitted for use in a monitoring well (and cased environmental bore hole). The approved materials have not changed; however, the F-480 standard for flush threaded PVC has been adopted. Previous editions of the F-480 standard contained a proprietary thread design, but excluded many other proprietary and standard thread designs. The 1988 standard was adopted and not updated, because it contained only standards for solvent welded casing and did not have this thread problem. The standard now has been revised, and the thread configuration been made consistent to include American Standard ACME 2G screw threads, American Standard Stub ACME 2G screw threads, Buttress screw threads, and Square Form threads in accordance with ANSI standards. The F-480 standard is used by most regulatory programs that allow plastic casing, and is the industry standard.

The standards for stainless steel casing have been moved from part 4725.2450 to this subpart. Stainless steel is corrosion resistant, non reactive, and relatively strong. However, it is expensive. Schedule 5 casing, while acceptable for welded casing, is too thin to thread, and in fact not permitted according to the American National Standard for Pipe Threads, ANSI Standard B1.20.1. The ASTM 312 Standard has been updated.

4725.6650, Subpart 2 is proposed for amendment to modify the cement grout termination for at-grade wells. The existing rule allows the cement grout to terminate 6 inches below the vault or manhole to allow for easier repair or salvage of the vault when the well is sealed. Termination 6 inches below the vault is not consistent with other elevations in the rule, and makes inspection more difficult. For those reasons, the MDH proposes to amend the rule to require termination of the grout at the base of the vault or manhole. The specifications for a layer of bentonite pellets between the gravel pack and grout are deleted here, since this will now be allowed for all wells and borings in part 4725.3050, subpart 8.

4725.6650, Subpart 4 is proposed, similar to the proposed revisions to remedial wells in part 4725.6050, subpart 3, and environmental bore holes in part 4725.7450, subpart 5, to allow monitoring of the top of the water table at the unconsolidated material/bedrock interface. These amendments allow for monitoring and remediation of contaminants at the water surface.

4725.6755 PROTECTION OF MONITORING WELLS.

4725.6755, Subpart 1 currently requires that the casing, or the protective outer casing, have a locked cap or wrench-tightened threaded metal cap. The purpose is to prevent vandalism, or unauthorized entry into the well. Existing requirements of subpart 2 require that the space between the casing and the outer protective casing be filled with neat cement or concrete. This is proposed for amendment to allow bentonite grout. Bentonite grout, unlike cement or concrete grout, is a soft material than can be easily dissolved in water, and washed out of the casing. For that reason, an amendment is proposed to subpart 1 to require a cap or cover on the outer casing when bentonite grout is used. The cap is not required to have a compression gasket. The cover or cap prevents rainwater from entering the space between the casing and outer protective casing. This will help prevent corrosion of the inner casing, the entry of vermin, bird droppings, or other undesirable materials, and prevent water in the space, which can potentially overflow into the inner casing, since the outer casing is commonly higher.

4725.6755, Subpart 1, Item A is proposed for amendment to clarify that at least one of the casings must have a vandal resistant covering.

4725.6755, Subpart 1, Item B is proposed for amendment to allow additional flood protection alternatives the same as, and as explained in the justification for water-supply wells in part 4725.4350.

4725.6755, Subpart 1, Item C is proposed for clarification without changing the requirements.

4725.6755, Subpart 1, Item D is proposed for deletion, since the requirement is now in the first sentence of subpart 1.

4725.6755, Subpart 2 is proposed for amendment to reduce the annular space between the protective outer casing (protop) and inner casing consistent with all other parts of the rule that reduced the space from 3.25 inches to 3.0 inches. Bentonite grout and cement-sand grout have been added as acceptable grout between the protective outer casing and inner casing to give flexibility, allow for easier removal when the well is sealed, and reduce costs.

4725.6850 AT-GRADE MONITORING WELL.

Proposed amendments do not change regulatory requirements, only update the AASHTO standard, and reference the specific rule part pertaining to the locking cap or cover.

I. Vertical Heat Exchangers.

4725.7050 VERTICAL HEAT EXCHANGERS.

A "vertical heat exchanger" is a type of boring used to extract heat from the ground in order to heat or cool a home, school, business, or other building. A hole is drilled in the earth. Two pipes are inserted into the hole and connected together with a "U" fitting at the bottom. A heat transfer fluid is pumped through the looped piping to extract or transfer heat from the earth. The fluid is circulated through a heat pump, coil, furnace or heat exchanger, and the heat supplied to a building. Vertical (and horizontal) heat exchangers are also referred to as "heat loops," "geothermal loops," or "closed loops."

4725.7050, Subpart 1. An amendment is proposed to remind the reader that both the general construction requirements of the rule and the specific requirements and exemptions of this part apply to vertical heat exchangers.

4725.7050, Subpart 1, Item A. An amendment to the vertical heat exchanger piping is proposed to no longer allow polybutylene pipe, and to amend the piping specifications. Polybutylene is no longer manufactured for heat exchanger piping, and it is therefore proposed for removal from the rule. The pressure rating designations, such as 160 psi, for plastic piping are being augmented, and in many cases replaced by, the Standard Dimension Ratio (SDR). The SDR is a ratio of the pipe diameter to the wall thickness. Polyethylene piping meeting the minimum 160 psi pressure rating (existing requirement) has a SDR of 11 (proposed new language) or less. The ASTM D3035 standard requires marking of the pipe with the SDR or the pressure rating. Including the SDR in the rule provides a means for the purchaser and installer to check that the pipe meets the standards. The ASTM D3035 standard is the industry-accepted material standard for vertical loop piping.

4725.7050, Subpart 1, Item C is proposed for amendment to modify the testing procedure. The existing rule requires testing to 1.5 times the system operating pressure. Typically, operating pressures do not exceed 20 psi. The industry standard piping is rated at 160 psi. Failures typically occur at joints and connections, or due to mechanical puncture. This proposed amendment requires a minimum pressure test of 75 psi pressure to accommodate usage of higher pressures at a later time (the rule does not require retesting if a higher pressure system is subsequently installed), or if higher pressures are caused by a system blockage or malfunction. Secondly, loops are typically constructed to depths of approximately 150 feet. The pressure exerted by a column of water is approximately 1 psi for each 2 feet of water. A column of water that is 150 feet deep exerts a pressure of approximately 75 psi.

4725.7050, Subpart 1, Item D. Amendments are proposed for item D to allow the use of cement-sand grout in any geologic formation, and the use of thermally enhanced grout in unconsolidated materials. The two pipes for a vertical loop are installed in a bigger drilled hole. The typical loop depth is 150 feet, but may be shallower or deeper. The average new drinking water well depth in Minnesota is approximately 130 feet. In many areas of the state, bedrock is encountered at depths less than 150 feet, although loop designers try to avoid completing loops in bedrock. Loops penetrate to depths equal to or greater than potable wells; penetrate various geologic

conditions including aquifers used for supplying drinking water, and confining layers protecting aquifers; and may penetrate bedrock. It is important to seal the annular space between the bore hole and the loop piping to prevent surface water and surface contaminants from entering the groundwater, and to prevent the flow from one aquifer to another. It is also important for the operation and thermal efficiency of the loop. The proposed amendments to this item allow the use of two additional grouts not previously permitted. The first is cement-sand grout that has been allowed everywhere else in the rule amendments where neat-cement grout is allowed. The second is a grout specifically developed for vertical loops, referred to here as "thermally enhanced bentonite grout." The grout is a mixture of bentonite, water, and sand that has a high coefficient of thermal conductivity (allows efficient transfer of heat to and from the ground) and a low hydraulic conductivity prevents the migration of fluids, including contaminants, through the grout). Variances have been granted to allow this product in the past, and the results have been favorable.

4725.7050, Subpart 1, Item E. Calcium chloride is a product no longer used by the industry in heat loops because it was found to be corrosive to some metal components of the pump, piping, and heat exchanger. In fact, manufacturers will typically void the system warranty if calcium chloride is used. For those reasons it is proposed to no longer allow the use of calcium chloride.

4725.7050, Subpart 1, Item F. The MDH does not regulate the flow characteristics of the system, so the flow meter requirement is proposed to be deleted. The existing rule requires a backflow prevention device meeting the standards of the Plumbing Code in part 4715.2110. However, the specific back flow prevention device use and installation requirements are contained in parts 4715.2000 to part 4715.2162. These are needed to assure proper design and installation.

4725.7050, Subpart 1, Item G. The existing rule does not contain a specific reference to an isolation distance between a water-supply well and a vertical heat exchanger. The existing rule does require a 50-foot setback between a water-supply well and a source of a pollutant, contaminant, or hazardous substance in part 4725.4450, subpart 1, item E, subitem (11), and based on this, the MDH has been requiring a 50-foot isolation distance. The MDH is now proposing a rule amendment to specifically require a setback.

A typical domestic vertical heat exchanger system consists of 3 to 5 loops, each 150 feet deep. The loops often penetrate confining layers and aquifers, and may be completed at the same depth as a drinking water well on the property, or on surrounding properties. The propylene glycol circulated through the loops is of low toxicity, but is not non-toxic, and propylene glycol can act as a food source for bacteria if released. A risk exists (in fact it has already happened) that a person now, or in the future, could use another much more toxic heat transfer fluid, such as ethylene glycol. Should a leak occur, the bentonite or thermal grouts in common usage would not prevent leakage into the aquifer. Systems will typically fail or shut down with the loss of a small quantity of fluid. The loop piping materials are a high quality product that is heat fused with a minimum of joints. The systems are permitted by the MDH, installed by licensed contractors, and can be inspected by the MDH. However, no requirements for periodic testing or inspection exist, and the systems are expected to be in use for tens of years, perhaps until they fail.

The MDH has regulated vertical loops since 1993, and has observed comparatively few problems. However, a longer experience record in Minnesota, or elsewhere, is lacking. Based on the known information and observed risk, the MDH is proposing to adopt a 35-foot minimum separation between a water-supply well and a vertical heat exchanger. While some have argued that a lesser setback is appropriate, 35 feet is the most reasonable. Should experience demonstrate that a reduced setback is appropriate, a future rule revision could address a change. It should also be noted that the variance provision is available when extenuating conditions exist.

A 10-foot separation is proposed for the horizontal piping (sometimes referred to as "headers"). This piping connects the vertical loops to the HVAC system and is typically buried 4 to 6 feet below the surface. The pipe contains the same propylene glycol, but does not penetrate aquifers or confining layers, so the risk to groundwater is less.

J. Elevator Borings.

4725.7250 ELEVATOR BORINGS.

Most elevators operate using one of two technologies. The first type is a cable system, which uses wire cables, an electric motor, a winch, and pulleys at the top of the elevator tower to essentially pull the elevator car up. The second system employs a hydraulic piston. A hole, sometimes referred to as a "jackhole," is drilled into the earth. A hydraulic piston or cylinder is then installed into the hole. The hydraulic cylinder, located in the boring, operates by forcing hydraulic oil to expand the piston and push the elevator car up. The boring for the hydraulic cylinder is essentially as deep as the building elevator is tall. The practical limit for a hydraulic elevator is approximately 7 stories; hence, the usual elevator boring is 70 feet deep or less. Historically, the piston was placed in an uncased hole, often in contact with groundwater. Leakage of hydraulic fluid into the ground was relatively common.

4725.7250, Subpart 1. This proposed amendment simply refers to the existing general requirements for elevator borings.

4725.7250, Subpart 4. This existing subpart contains three options for preventing leaked hydraulic fluid from entering and contaminating the groundwater. Since the hydraulic cylinder is inside the boring, a leak due to a mechanical failure or corrosion (that occurs with some frequency), will release tens or hundreds of gallons of hydraulic oil. Item A currently requires neat-cement or concrete grout to contain a hydraulic oil leak. An amendment is proposed to item A to change the term "concrete grout" to "cement-sand grout," which has been done consistently throughout the proposed rule. Proposed amendments to item B also change the term "concrete" to "cement-sand" grout, and reference an existing rule part without changing requirements.

4725.7250, Subpart 5. This is a new language proposed in response to the problem of leaking hydraulic cylinders in old elevators. The first statewide rule requirements for the construction of elevator borings were created in 1993. Therefore, the majority of hydraulic elevators in use today were installed prior to adoption of the standards. Historically, hydraulic cylinders were placed in a boring open to the earth, and in water, if the static water level was higher than the cylinder. A leak in the cylinder can send tens or hundreds of gallons of hydraulic fluid into the

ground. More recently, some elevator companies have started installing a plastic sleeve as a protective measure, even though the existing rule does not require it be done, when an old hydraulic cylinder is removed and reinstalled, or when a new cylinder is replaced in an old elevator boring. The proposed rule requires the cylinder to be protected by one of the techniques in the existing rule when the cylinder is removed. Usually, cylinders are only removed when they malfunction. The most likely retrofit will be a plastic sleeve. The material costs are small, and the sleeve will also provide corrosion protection that should extend the life of the cylinder.

4725.7250, Subpart 6. This rule is proposed to remind the reader that unsuccessful or "not in use" elevator borings must be sealed (as required by Minnesota Statutes, section 103I.401, subdivision 3). An elevator boring is not always straight or plumb (vertical), but the elevator cylinder must be plumb to operate the elevator car without excessive wear or binding. The hydraulic cylinder is hung in the boring so that the cylinder is straight and plumb. This may mean that the cylinder is not centered in the hole, nor exactly concentric with the hole. Historically, sand was often placed around the cylinder at the bottom to hold the cylinder plumb. Hydraulic cylinders may be below the water level, and may not be protected from corrosion or leakage if constructed before 1993. Elevator hydraulic cylinders are commonly not removed until they fail. When the cylinder of a pre-1993 elevator fails, hydraulic fluid often leaks into the sand. When an elevator boring is sealed, it is necessary to remove the cylinder, debris, and the sand to completely fill the hole.

K. Environmental Bore Holes.

4725.7450 ENVIRONMENTAL BORE HOLE.

"Environmental bore holes" are excavations in the earth that encounter groundwater, are deeper than 25 feet or penetrate a confining layer, are used to do testing without extracting water, or are used for vapor recover, venting or sparging. Common environmental bore holes include test drill holes for geologic information, piezometers for water level measurement, or vents and sparges for removal of contaminants.

4725.7450, Subpart 1. This proposed amendment references the general requirements in the existing rule, and corrects a miss-print from the 1993 revisions that referenced a repealed rule part 4725.6750.

4725.7450, Subpart 4. This proposed amendment adds a reference to the special requirements for sealing flowing wells and borings that take precedence over the general sealing requirements. Item C is amended to allow cement-sand grout in addition to neat-cement grout as it is consistently allowed throughout the proposed rule. The existing rule allows a considerably less stringent sealing method for borings that meet the listed criteria. This exception allows the boring to collapse due to the action of pulling the casing. The rule requires any remaining hole that does not naturally collapse to be filled with grout using a tremie pipe. Some individuals have, instead of filling the remaining hole with grout, left the hole unfilled, erroneously believing that the rule allows them to wait an indefinite amount of time for the hole to "collapse." However, the hole may never collapse. Instead, the hole may bridge, or the materials that are

later washed or dumped in the hole may not be appropriate. The proposed amendment to item C requires that any hole that does not naturally collapse when the casing is removed must be immediately filled with grout.

4725.7450, Subpart 5. This proposed amendment extends the same exemption to environmental bore holes that is granted to wells investigating or cleaning up groundwater contamination. The proposed amendment enables testing at the contact between unconsolidated materials and bedrock, so that contamination may be monitored and effectively remediated.

CONCLUSION

Based on the foregoing, the proposed rule is both needed and reasonable.

9 November 2007
Date

John Linc Stine, Director
Environmental Health Division

XII. APPENDIX

Minnesota Pollution Control Agency Comments on Proposed Changes to the Minnesota Department of Health Well Code

(Compiled by Tim Thurnblad on March 18, 2004)

The comments given below focus almost exclusively on issues related to *well setback distances*. The comments are primarily based on the August 25, 2003, draft of proposed revisions to the MDH well code and on various subsequent discussions between MPCA and MDH personnel.

List of Topics

Introduction

Comments from Mark Wespetal and/or Neal Wilson (revised 3/2/2004)

Last year the Minnesota Department of Health (MDH) requested input from the Minnesota Pollution Control Agency (MPCA) on revising their well code (MR Chapter 4725) as it relates to setbacks from municipal and domestic water supply wells from various activities regulated by the MPCA. It is the MDH's intent to revise their well code rules, later this year.

The activities regulated by the MPCA for which the MDH has requested setbacks from the MPCA include tanks and spills of petroleum products, various wastewater treatment systems (small and large), feedlots, landfills, stormwater infiltration basins, and biosolids land application sites. This submittal is structured to provide a discussion and recommendations primarily on domestic well setbacks to wastewater, biosolids and feedlot operations.

It should be understood that new NPDES/SDS facilities would need to observe MDH setbacks to existing water supply wells and new wells would need to meet these same setbacks.

Several states have implemented various setback distances. A discussion on setback distances from individual sewage treatment systems by MPCA staff Dr. Michael Trojan is provided in Appendix A. It should be noted that Dr. Trojan's work was based on a single family home individual sewage treatment system and his conclusions may not be accurate when extrapolating for a large individual sewage treatment system, mainly due to the greater width of larger

systems. The proposed MPCA large subsurface treatment system setback approach mimics Colorado's approach which is based on increasing setbacks in proportion to the volume discharged.

Two types of potable water supply wells are under consideration for this submittal: vulnerable and non-vulnerable domestic wells. A vulnerable well is a well with less than 50 feet of watertight casing and/or less than 10 feet of clay or shale penetrated. A non-vulnerable well is a well that has greater than 50 feet of water tight casing and/or penetrates 10 feet of clay or shale. Table 2 in the section on Recommended Well Setbacks for Sewage and Animal Manure Containment Vessels beginning on page 138 is intended for domestic wells only. Setbacks from high capacity municipal wells need to be undertaken based on a site-specific evaluation.

Well Setback Issues

Several issues have been identified that are associated with proposed setbacks, including the following:

1. The MDH has indicated that for simplicity they would prefer to have a single pre-determined number for each MPCA-regulated activity used for setbacks. In many cases however setbacks may be more site and project specific. To obtain site-specific setbacks a site evaluation by a professional would appear to be warranted. MPCA technical staff support this site-evaluation approach while at the same time recognizing that it may be cost-prohibitive, especially for siting individual domestic wells.
2. There is a lack of data to support many pre-determined setback numbers, as opposed to site-specific setbacks. A limited literature search was conducted by MPCA staff (see Appendix A), and several meetings were held by MPCA and MDH staff to discuss setbacks. Some suggested setback numbers in Table 2 in the section on Recommended Well Setbacks for Sewage and Animal Manure Containment Vessels beginning on page 138 were provided based on research, and some have been proposed based on subjective and pragmatic judgment of MPCA technical staff. Some estimates made by staff would indicate that much greater setbacks would be required to protect drinking water supplies.

Tanks and Spills and Petroleum Products
Comments from Jim Pennino (revised 3/3/2004):

In 4725.4450, "Water Supply Well Distances from Contamination Source" Subpart 1, third paragraph (page 83 of the August 25, 2003, draft rules) it mentions "tanks": it would be helpful to define or better explain the meaning of the word "tanks". In the next paragraph (4th paragraph in Subpart 1), I recommend deletion of the words "visibly contaminated soils have been removed." This seems redundant if all contaminants are removed from the source. Also the words "is use" should read "in use" in the previous sentence of this paragraph.

We held a hydro meeting with hydros from both the UST and AST program present. Although we felt that the 20 foot distance for small tanks near private wells was rather close, we agreed that changing any of the existing setback distances in the MDH rules would create problems for the petroleum remediation program. It might mean that well owners might find themselves out of compliance and it might mean making enforcement changes to our program. Even if we grand-fathered in existing tanks and wells, what would happen when a tank or well was upgraded? This might mean moving a well or tank on a small residential property or gas station where there was no room. So, we recommend leaving the setback distances as they are.

Demolition Landfills and Industrial Landfills
Comments from Jim Chiles (revised 2/20/2004):

Solid waste facilities fall into three broad groups.

"Permitted" - in our parlance this means a permit is issued by the MPCA board. These permits typically are limited to five years' duration and then may be reissued.

"Permit by rule" - if staff is notified that an applicant has met all the rule requirements and has received local approval, then a permit is granted automatically, without needing action by the MPCA board. Small demolition landfills, limited in duration and size, can fall under this category.

"Unpermitted dump" - this includes any other site with solid waste disposal on the land. It could be a promiscuous dump in a ravine that is being used by a few families, or as big as a city-run town dump that operated decades ago.

Because the active portions of mixed municipal solid waste (MMSW) landfills are all lined now, and the leachate they produce is collected and treated, it would be hard to say that they impose a greater risk than totally unlined landfills holding demolition and construction debris, or unlined dumps.

Our recommendation is to use your figure of 300 feet as a single setback distance for all permitted and permit-by-rule landfills, and for all unpermitted dumps that are still in place. (MDH might want to consider a variance process, though, to handle cases such as where a landfill operator might want a water well for the facility and can't put it that far away.)

Supporting this approach of treating them all alike for this purpose is the fact that very few MMSW landfills are totally lined from edge to edge. That is because many of them operated before liners were required. More common are landfills whose recently filled portions are on liners, while older waste is not on liners because rules in effect at the time did not require a liner.

Given a comprehensive knowledge of the subsurface and of all waste actually disposed, it would be possible to cut this setback distance on a site-specific basis. But rarely is the hydrogeology well-characterized, and even more rarely does the MPCA know what was actually disposed in any given dump or landfill.

Closed Landfills

Comments by Joe Julik (same as comments in 11/6/2004 submittal)

Our [Closed Landfills] group, in general, feels that the 300 feet setback from landfills is not bad for an arbitrary number but, something should be mentioned about the site specific nature of contaminant plumes from landfills and the need for looking at all available monitoring data in order to determine where, both in horizontal and vertical planes, it is appropriate to place potable water supplies. We are also concerned that in some areas high capacity (either municipal or irrigation, etc.) wells might divert a plume from its historic path and extent.

(I like your suggestion and) would like to support a 300 foot setback for low-capacity supply wells and a 500 foot setback for high-capacity supply wells.

Recommended Well Setbacks for
Sewage and Animal Manure Containment Vessels
Comments compiled primarily by Mark Wespetal and/or Neal Wilson (revised 3/2/2004)

For questions on specific numbers please contact:

Spray Irrigation Municipal - Neal Wilson
Spray Irrigation Industrial - Brad Sielaff
Land application - Biosolids - Jorja DuFresne
Land application - Septage - Mark Wespetal
Land application - Manure - Dave Wall
All feedlot and manure storage setbacks - Dave Wall
ISTS - Mark Wespetal, Mike Trojan or Neal Wilson
Waste Stab Ponds - Municipal - Neal Wilson
Waste Stab Ponds Industrial - Brad Sielaff
RI's - Neal Wilson
Wastewater Treatment Facility - Neal Wilson

Table 1 lists the current rules relating to setbacks. Table 2 represents MPCA recommendations on setbacks in lieu of site-specific evaluations. Setbacks in Table 2 that are recommendations based on professional judgment are denoted by the letter **R**.

Table 1
Current Status of Well Setbacks for Sewage and Animal Manure Containment Vessels

	Current Well Code			Current MPCA Rules		
	V. Well	Well	Community Water Supply	V. Well	Well	Community Water Supply
Waste Stab Pond	150' no down gradient wells	150' no down gradient wells		xxx	xxx	xxx
Manure Storage Basin	200'	100'		100	100	1,000*
Feedlot	100'	50'		100	100	1,000*
Cesspool, etc....	150'	75'		Well Code	Well Code	Well Code
Subsurface disposal field or privy	100'	50'		Well Code	Well Code	Well Code
Septic tank, sewage lift station, holding tank, non-watertight sewage pump	50'	50'		Well Code	Well Code	Well Code

*: Minn. feedlot rules ch. 7020 do not require a 1000' setback from all community wells. A 1000' setback is required when in a vulnerable drinking water supply management area, or the well does not have a delineated Drinking Water Supply Management Area. Otherwise, the same setbacks apply as for other wells.

Table 2
MPCA Staff Recommended Domestic Well Setbacks for Sewage and Animal Manure Containment Vessels

Source	MPCA Recommendations for Revisions to Well Code		Responsible Staff
	Vulnerable Well	Well	
Municipal Sewage Wastewater Stabilization Ponds, less than 500 gal/acre/day leakage and Industrial Waste Stabilization Ponds	300' **R**	100' **R**	Neal Wilson
Municipal Sewage Wastewater Stabilization Ponds 500 to 3500 gal/acre/day leakage	1,000' (limited literature, and R)	300' (limited literature, and R)	Neal Wilson
Liquid Manure Storage Areas and Unroofed Feedlots (except concrete or composite lined basins) *(MN R. Ch. 7020.0300 subp. 14 and 3)*	300'	100'	Dave Wall
Liquid Manure Storage Basins lined with concrete or composite liner and all Manure Stockpiles *(MN R. Ch. 7020.0300 subp. 14 and 3)*	200'	100'	Dave Wall
Roofed Feedlots *(without liquid storage) (MN R. Ch. 7020.0300 subp. 3)*	100'	50'	Dave Wall
Cesspools, Seepage Pits, Leaching Pits, Other Sewage Disposal Pits, Non-Watertight Sewage Sumps or Sewage Dry Wells *(MN R. Ch. 7080.0100 subp. 11 25a and 30)*	150'	75'	Current Well Code
Individual Sewage Treatment System Soil Absorption System designed for less than 6 dwelling units or for commercial establishments with a design flow of less than 2,000 gpd. *(MN R. Ch. 7080.0200 subp. 21 and 44).*	100' **R**	50' **R**	Current Well Code
Individual Sewage Treatment System Soil Absorption System designed for 6 dwelling units or more or for commercial establishments with a design flow of than 2,000 gpd or greater. *(MN R. Ch. 7080.0200 subp. 21 and 44)*	100' + [(average daily flow gpd* 5)/100] **R**	50' + [(average daily flow gpd * 2.5)/100] **R**	Mark Wespetal Mike Trojan Neal Wilson
Septic tanks, Aerobic Tanks, Sewage Lift Stations, Holding Tanks, Sewage Treatment Vessels, , Sewage Dosing Tank, Sewage Sump, Sand Filter, Peat Filter, Constructed Wetland or other watertight Sewage Holding or Sewage Treatment Device. *(MN R. Ch. 7080.0100 subp., 2, 19, 31a, 35)*	50'*	50'*	Current Well Code
Rapid Infiltration Basins of Municipal Wastewater	600' **R**	300' **R**	Neal Wilson
Spray Irrigation of Municipal Wastewater or Industrial Wastewater	300' **R**	150' **R**	Neal Wilson
Properly Abandoned Watertight Septic Tank, Sewage Dosing Tank, Sewage Lift Station, Sand Filter, Peat Filter,	50**	50**	Current Well Code

Constructed Wetland or Other Watertight properly abandoned Sewage Holding or Sewage Treatment Device, or properly abandoned Soil Treatment System.			
Properly Abandoned Cesspools, Seepage Pits, Leaching Pits, Other Sewage Disposal Pits, Non-Watertight Sewage Sumps or Sewage Dry Wells	75**	75**	Mark Wespetal
Interceptor *(MR 4715.0100, subpart 66)*		50	MDH
Buried Collector, municipal, pressurized (except single family), open jointed, non complying materials or tested sewer		50	MDH
Watertight Sump		20	MDH
Buried sewer, or pressurized sewer serving one single-family residence constructed of cast iron or plastic meeting the standards of MR 4715.0530 and air tested in accordance with MR 4715.2820. (proposed amendment to allow 20-foot distance for gravity and pressure sewers that are not collector or community sewers, or that do not serve sources like hospitals, health care facilities, meat processing facilities, mortuaries, etc.)		20	MDH
Replacement sewer constructed of solvent welded, schedule 40 plastic, which has been air tested and inspected.		10	MDH
Wastewater Treatment Facility *(MS, section 115.71, subd. 6)*		300	?

* If total capacity of all tanks or vessels within 50' of well exceeds 3,000 gallons, the setback is 100'.

** Setback eliminated 12 months after cessation of discharge and no contamination is visibly present or removed.

R: Recommendation based on best professional judgment

It is recommended that the above setbacks be met unless it can be determined that:

1. The well is up-gradient of the contaminant source and the draw-down of the up-gradient well does not reverse the groundwater flow direction and does not capture recharge from under the contaminant source; or
2. All potentially impacted ground water discharges to surface water before the setback is reached.

Recommended Well Setbacks for
Land Spreading Sites
Comments compiled primarily by Mark Wespetal and/or Neal Wilson (revised 3/2/2004)

For questions on specific numbers please contact:

Spray Irrigation Municipal - Neal Wilson
Spray Irrigation Industrial - Brad Sielaff
Land application - Biosolids - Jorja DuFresne
Land application - Septage - Mark Wespetal
Land application - Manure - Dave Wall
All feedlot and manure storage setbacks - Dave Wall
ISTS - Mark Wespetal, Mike Trojan or Neal Wilson
Waste Stab Ponds - Municipal - Neal Wilson
Waste Stab Ponds Industrial - Brad Sielaff
RI's - Neal Wilson
Wastewater Treatment Facility - Neal Wilson

Agency staff met and discussed appropriate water supply well setbacks for land spreading activities for municipal biosolids, animal manure, and domestic septage. These wastes are similar in nature and chosen setbacks should be similar.

Current Provisions

MN Rule 4725 (Well Code)

It is the agency's understanding that the setback from "a source of pollutant, contaminant, or hazardous substance……, as described in 4725.4450 subp. 1 E (11), is currently used as the setback requirement for a land application site, as no specific land spreading setback is currently listed in MN R. Chp. 4725. The current setback is 50 feet both from a vulnerable and non-vulnerable well.

MN Rules Chp 7020 (Feedlot Rules)

The current feedlot rules require a 50-foot setback to an active or inactive water supply well (7020.2225 subp. 8).

MN Rules Chp 7041 (Municipal Biosolids)

The current biosolids rules require the following (7041.1200) separation distance to wells when land applying biosolids:

	Surface Applied	Incorporation within 48 hrs.	Injection
Distance to wells			
Private supply	200 ft.	200 ft.	200 ft.
Public supply	1000 ft.	1000 ft.	1000 ft.
Irrigation	50 ft.	25 ft.	25 ft.

Septage Application Guidelines

There is no current state rule for land spreading of septage. So any enforceable setback will be contained in the well code. The current guidelines recommend are the same as Chp. 7041.1200.

MPCA Land Spreading Recommendation

1. It is the agency's recommendation that the current provision in 4725.4450 subp. 1 E (11) remain "as is", without change in the setback distance, or use of the term "a source of pollutant, contaminant……". It will be understood that this term refers to land application sites.
2. The well code should reference the reader to setbacks during land spreading activities as stipulated in 7020.2225 subp. 8 and 7041.1200.

Other Land Spreading Issues

1. The agency feels that pathogenic impacts from a land spread site will remain for approximately 1 year. Excessive soluble nutrients could impact wells for longer. Therefore the "source of a pollutant…." remains for a minimum of one year following the last land application of waste.
2. MN Rule Chop. 7041 has a setback for irrigation wells that is closer than what is found in the current and proposed well code. These conflicting setbacks for irrigation should be rectified.
3. Any agricultural land which receives fertilizer or pesticide application should also be considered a "source of a pollutant…….".

Land Spreading of Biosolids
Comments from Jorja DuFresne (revised 3/15/2004):

My position is that setbacks should not be [what they are in the 7041] for **construction** of a well. They should be 50 ft. from [basically] any farm field or other "source of pollution". It is the responsibility of the biosolids applier to maintain the setbacks that are greater, not the well driller. Land application sites come and go.
As mentioned above, any application of fertilizer, pesticides, etc. is a source of contamination. Therefore, it is my opinion that the separation distance be as is without elaboration to specific types of activities.

Appendix A -
Large Subsurface Treatment System Setback Distances
Mike Trojan
January 2004
(with minor revisions on March 18, 2004)

Introduction

There is limited information in the literature regarding setback distances for large, community systems. There is some concern that impacts from large systems are potentially greater than from individual sewage treatment systems (ISTS). The concern is based on the larger waste volume generated and possibly because of differences in waste chemistry. If the waste for a community system is from households, however, there is no basis for concluding that the chemistry differs significantly between ISTS and a community system. Similarly, if the ratio of waste volume to soil absorption area is the same for a community system and an ISTS, then the effective concentrations are the same. Consequently, the principles of contaminant fate and transport are the same for ISTS and community systems.

There is a large amount of information on contaminant fate for ISTS. For ground water wells, the primary contaminants of concern are nitrate and pathogens. VOCs are often found at low concentrations directly beneath the large subsurface treatment system (LSTS), but are rarely found more than 50 feet from the LSTS. Phosphorus and trace elements are largely attenuated within the LSTS or in ground water within 50 feet of the LSTS. Boron, chloride, and other mobile chemicals may move with ground water for several hundred feet down-gradient of the LSTS, but concentrations are typically below drinking water standards. The fate of some potential contaminants, such as pharmaceuticals, caffeine, and personal care products, are poorly understood. This discussion therefore focuses on nitrate and pathogens. For a literature review, see MPCA, 2000 (available at http://www.pca.state.mn.us/water/groundwater/gwmap/gwq-unseweredsub.pdf).

Nitrate

In oxygenated aquifers, nitrate is attenuated through dilution and dispersion. This leads to a gradual reduction in nitrate concentration in the septic plume with distance from the LSTS. In anaerobic aquifers, nitrate is rapidly denitrified within the septic plume. Setback distances for nitrate should therefore account for the likelihood that nitrate will be denitrified.

Table 1 summarizes data from several studies showing the distance required to reach 10 mg/L down-gradient of the LSTS. The mean distance is 123 feet, the median 95 feet, the upper 90 percent confidence interval 173 feet, and the 95% upper confidence level 184 feet. Harmon et al (1996) and Robertson et al (1991) derived retardation factors of 60 and 20, respectively, for two separate sites located in sandy soils. Assuming a plume concentration of 50 mg/L directly beneath the LSTS, the distance required to achieve 10 mg/L therefore ranges from 83 to 250 feet. The down-gradient length required to reach 10 mg/L can also be estimated assuming dilution of the plume. For a 300 gallon per day system, a LSTS of 1000 square feet, and a nitrate concentration of 50 mg/L beneath the LSTS, the required lengths are 105 feet, 210 feet, and 524 feet, respectively, if the LSTS width is 50, 25, and 10 feet perpendicular to ground water flow. This assumes complete mixing and a recharge rate of 12 inches per year, but assumes no dispersion or denitrification. These results suggest a setback distance of 200 to 250 feet will generally be protective of drinking water for nitrate in sandy soils with shallow aquifers. For

finer textured soils and aquifer materials, or for soils containing appreciable shale or organic carbon, nitrate will be denitrified rapidly in the aquifer, and a setback distance of 100 feet or less is appropriate. These setback distances are not appropriate for rapid transport systems such as karst.

Table 1:
Distance Down-Gradient of the LSTS Required to Achieve a Nitrate Concentration of 10 mg/L.

Study	Feet
Tinker	219
Perkins (1984)	95
Brown (1980)	50
Walker et al (1973)	63
Walker et al (1973)	221
MPCA (1999)	142
MPCA (1999)	126
MPCA (1999)	28
MPCA (1999)	348
MPCA (1999)	47
MPCA (1999)	95
MPCA (1999)	41
Mean	123
Median	95
90% UCL	173
95% UCL	184

Pathogens

There is limited information on pathogen transport in ground water. Most researchers agree that some pathogens can remain viable in ground water for 200 to 300 days. For ground water moving at a rate of 1 foot per day, a setback distance of 300 feet should achieve acceptable drinking water. Some researchers have observed virus transport of distances up to 400 feet, however. Presence of organic or soil colloids may enhance transport if the microbes can attach to the particles. Massachusetts utilizes a setback distance of 250 feet that is based on viral transport (see MPCA, 2000 for a literature review; http://www.buzzardsbay.org/ccmp/septicac.htm; see Keeley at al. for an extensive literature review and reference list).

Existing Setbacks

Several states and localities utilize setback distances for ISTS. Table 2 provides a summary of some setback distances for wells. Distances often vary for the septic tank and the LSTS, with the length being greater for the LSTS. Rationale for deriving these setback distances is not provided in the source documents, although exposure to pathogens is often cited as the

basis for a setback distance. Forty-one states have setback distances that are less than or equal to 100 feet for sources of microbial contaminants, while five States appear to require setback of more than 200 feet.

There appears to be good agreement between the values in Tables 1 and 2. It is unclear, however, if the values in Table 2 were derived for a specific contaminant. Wisconsin utilizes a value of 250 feet for larger systems, while Idaho utilizes a distance of 200 to 300 feet depending on texture. Vermont utilizes a travel time of two years, which may be several hundred feet for sand aquifers.

Table 2
Well Setback Distances (In Feet)

Location	Well	Comments
MSU	50	
MN	50-100	Distance varies for tank and soil absorption area
IN	50	
Hingham, MA	50-100	Distance varies for tank and soil absorption area
Erie Co., PA	200	
Nebraska	100-500	500 feet for a public supply well; distances vary between tank and absorption area
Ventura County, CA	50-100	Distances vary for septic tank and disposal field
Canada	100	
Florida	100-200	
MA	250	Distance is protective for viruses
Nebraska	100-1000	100 feet for private well; 500 for non-community; 1000 for community
Maryland	100	
Wyoming	50	
Idaho		Dependent on soil texture and flow rate
Colorado		200 feet plus 8 ft for each additional 100 gallons
Vermont		2-year travel time over 6500 gpd
Wisconsin		50 feet < 8000 gpd; 250 feet > 8000 gpd
Mean	127	
Median	100	
90% UCL	176	
95% UCL	194	

Summary

Nitrate and pathogens are likely to be the primary constituents of concern for community systems. Considering available research results, dilution and retardation models, and existing setbacks for states and localities, a setback distance of about 250 feet appears to be protective of drinking water wells.

A value of 250 feet exceeds current setback distances for ISTS. The difference may be justified, however, when considering the likelihood that a well will intercept a septic plume. For ISTS on one acre lots with a plume width of 25 feet perpendicular to flow, a well has about a 12 percent chance of intercepting a plume even if the plume were infinite in length. For LSTS, this percentage increases dramatically because of the larger plume width perpendicular to flow. Having greater setback distances for community systems compared to ISTS therefore adds an additional element of safety (due to increased dilution) warranted by the likelihood of a well intercepting a plume.