Report of the Technical Advisory Committee
per the requirements of
Act 145 of the 2009-2010 Legislative Session

A Review of the "Overshadowing" of Water Supply–Wastewater System Isolation Distances

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Submitted by:

Craig Heindel

For Members of the Technical Advisory Committee

Gail Center, VT Health Department
David Cotton, P.E. (Licensed Designer) and Hydrogeologist
Philip Dechert, Town Planner
Spencer Harris, Licensed Designer
Craig Heindel, Hydrogeologist
Don Woods, P.E. (Licensed Designer)
Bruce Douglas, P.E. (Licensed Designer)
Jeff Fehrs, P.E., DEC, WWMD
Gerald Kittle, Licensed Designer
Rodney Pingree, DEC, WSD
Stephen Revell, Hydrogeologist and Licensed Designer
Roger Thompson, DEC, WWMD and Licensed Designer
Claude Chevalier, Well Driller
Christine Thompson, ANR Technical Staff
Justin Willis, Licensed Designer
Alt.: **Barb Willis**, Licensed Designer

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Executive Summary

The Technical Advisory Committee (TAC), as directed in Act 145 of the 2009-2010 legislative session, met repeatedly between June, 2010 and January, 2011 to thoroughly review the issues related to isolation distances between water and wastewater systems. The TAC also reviewed the issues related to situations where those isolation distances extend onto property owned by others.

Act 145 was passed in response to complaints about unfair effects on neighboring properties when a Wastewater System and Potable Water Supply Permit has been issued under the authority of 10 V.S.A., Chapter 64. Issuance of a permit, when the required isolation distances extend onto property owned by people other than the permittee, has the potential for restricting future development on the neighboring property. In some cases, the impact is negligible or minor, but in other cases the impact is severe. In the most severe cases, any development of a water supply or a wastewater disposal system on the neighboring property is greatly restricted or even prohibited.

The TAC reviewed the isolation distances currently in use in Vermont, in the other New England States, and in New York. The TAC reviewed the process that was used to establish the isolation distances and the scientific basis for those distances. The TAC also reviewed the current literature on the subject of pathogens in groundwater and how they move and survive in the soil and in the groundwater. After extensive review, the TAC has reached the conclusion that the existing Vermont isolation distances are scientifically based and appropriate for use in Vermont. The TAC, therefore, **strongly recommends** retention of the existing isolation distances.

A first-in-time approach is used when a Wastewater System and Potable Water Supply Permit is issued. Under the first-in-time approach, a permit is issued to the person who first applies for a permit, even if the required isolation distances extend onto property not owned by the applicant. The first-in-time approach has been used since the Agency of Natural Resources began issuing permits for water and wastewater systems starting in 1969 and tens of thousands of permits have been issued since then. The TAC examined alternative approaches, such as requiring all of the isolation distances to remain on property of the applicant, or allowing the isolation distances to extend off-lot when an applicant has obtained an easement or other property interest for the isolation distance. After considering the effect of these approaches, the TAC **strongly recommends** retaining the first-in-time approach.

The TAC also reviewed various technical approaches that might be used to reduce the required isolation distances so that the effect on a neighbor might be reduced or eliminated. These approaches are listed in the following table along with the TAC recommendations related to their use.

The TAC determined that a site-specific, hydrogeologic evaluation is a science based approach that is currently being used to determine the situations where an isolation distance can reasonably be reduced. The TAC recommends that this approach be supported and its use increased to the extent scientifically justified.

In addition, the TAC reviewed some non-technical approaches that might reduce the effect on neighboring landowners and these and the TAC recommendations are also included in the table. Finally, the TAC discussed other non-technical approaches that could reduce the effect on neighboring landowners, but has provided no recommendations due to the policy questions involved.

Summary of the Recommendations of the Technical Advisory Committee

Technical Issues Related to a Possible Reduction in Isolation Distances

Description of the Approach **And Report Section #**	**Recommended for Use for New Systems and Those with an Increase in Design Flow**	**Recommended for use as one Part of a Replacement of a Failed System**
Use of Hydrogeologic Analysis (3.1)	Yes	Yes
Use of Extended Well Casing and/or Grouting (3.2)	No	Yes
Use of Artificial Barriers such as Drains and Impermeable Materials (3.3)	No	Yes
Use of Potable Water Treatment Devices (3.4)	No	Yes
Use of Disinfection in Wastewater Treatment Systems (3.5)	No	Yes
Use of Groundwater Quality Monitoring Programs (3.6)	No	Yes

Use of Wastewater Treatment Systems that Depend on Surface Discharge (3.7)	No	No
Use of Separate Grey Water and Black Water Disposal Systems (3.8)	No	No

Other Issues Related to Possible Reductions in Effect on Neighboring Lots

Description of the Approach **And Report Section #**	**Recommendation for Adoption**
The Use of Easements or Other Forms of Control Over Isolation Distances Other than Fee Simple Ownership (4.1)	No
Maintaining the Isolation Distances Entirely on the Lot to be Developed (4.2)	No
Protecting Only One Water Supply for a Lot with One Single-Family Residence (4.3)	Yes
Allow a Permittee to Waive the Isolation Distances that Protect Their Own Water Supply (4.4)	No
Reduce Technical Standards for Existing Non-Complying Lots (4.5)	No
Prevent “Spite” Actions (4.6)	Yes
Maintaining the First-In-Time Concept (7.1)	Yes

1. Introduction

This report presents the results of an evaluation by the Technical Advisory Committee (TAC) which was appointed per Act 145 of the 2009 – 2010 Legislative Session (see Appendix 8.1 for a list of members). Specifically the TAC examined the impact of isolation distances associated with the installation of water supply and wastewater disposal systems. The water supply portion of this report deals only with **potable** water systems as defined in the Wastewater System and Potable Water Supply Rules, effective September 29, 2007 (Rules). Potable water systems by definition do not include **public** water systems which are defined in the Water Supply Rules, last revised on December 1, 2010 (WSR). These isolation distances were established in 1992, based on principles first used in the 1982 Environmental Protection Rules. The current isolation distances for wastewater systems are in Section 1-807 ("Isolation Distances") of the Rules. The current isolation distances for potable water supplies are in Section 11.4 of Appendix A of the WSR, as referenced in Section 1-801(b) of the Rules. These tables are included as Appendix 8.2 of this report.

The TAC reviewed the existing isolation distances used in the Rules as well as those used in other New England States and in the State of New York. The report examines the science behind the current Vermont isolation distances, using work previously done in Vermont and also including a review of the current literature. The TAC evaluated the methods used to establish the current isolation distances in the Rules, as well as the methods that are allowed by the Rules on a case-by-case basis to reduce the isolation distances. The TAC reviewed possible methods that are not currently approved in the Rules for allowing reductions in isolation distances, and makes recommendations related to their use. Finally, the report outlines the many policy decisions that must be made if considering changes to the Rules.

1.1 Statement of the Problem

The current isolation distances in the Rules pertaining to the installation of water supply and wastewater systems restrict the types of development that may occur within the specified isolation distances. For example, a permit will generally not granted for a leachfield that is proposed to be located within the isolation zone of an existing or permitted well. In many cases, these isolation distances and their associated restrictions on development extend onto property that is not owned by the applicant. Under the current Rules, decisions are made on a first-in-time basis.

The first-in-time approach can result in undesired impacts. One example is when an application is filed for development and the neighboring property does not have an existing or permitted water or wastewater system. If the isolation distances from the applicant's water or wastewater system extend onto the neighboring property (that is, if the isolation distances "overshadow" a neighboring property) the neighbor may be limited in where they can install a water or wastewater system at some time in the future.

A different example is when a landowner wishes to install a water or a wastewater system, but learns that an existing or permitted water or wastewater system on a neighbor's property interferes with his plans. Overshadowing is fundamentally an issue that affects development that had not occurred at the time that the water system or wastewater system that overshadows was constructed and/or permitted. Overshadowing may prevent a current attempt at development, as well as prevent some as yet unplanned future development. Overshadowing may also, however, occur with existing systems that were never required to obtain permits.

This concept of first-in-time has been applied by the State of Vermont for issuing permits for water and wastewater systems since the beginning of permitting programs. It has been the basis for issuing tens of thousands of permits by the Wastewater Management Division for subdivisions of land, public buildings, mobile home parks, and campgrounds. This concept has not only applied to issuing a permit to construct something that will then have a first-in-time status; it also recognizes the first-in-time status of everything that was built in the past without the need for any permits.

While the State of Vermont has been issuing permits that result in restrictions on neighboring properties for many decades, the impact on the neighboring property owners has become more apparent in recent years. As lot sizes have become smaller over the years, hastened by the closure of the 10-acre exemption as of 2002 and by anti-sprawl trends, the impact of overshadowing isolation distances on a neighboring lot has increased. This is because an overshadowing of 100 feet would only affect a small portion of a 10-acre lot, while it might cover a large portion of a 1-acre lot. Thus, for small overshadowed lots, the impact may be severe, including preventing any installation of water or wastewater systems. Another factor causing the increase in adverse impacts of overshadowing isolation distances was the July 1, 2007 closure of the exemption for construction of water and wastewater systems serving one single-family residence on an existing lot. Prior to that date, no State permits were required for the installation of water and wastewater systems, and therefore restrictions imposed in State-issued permits did not apply. While some towns had their own wastewater system permitting programs, not all did. Since the July 1, 2007 rule change, every property owner is subject to the State Rules for future activities.

It is important to emphasize the fact that not every overshadowing will restrict development. For example, the portion of a lot overshadowed by the isolation distance of a potable water supply might not be a suitable location for the construction of a permitted wastewater system. In fact, there may be no suitable soils on the overshadowed lot at all, in which case the overshadowed lot would need to build an off-lot wastewater system in order to be developed. In addition, using the same example, it might be possible to locate the new potable water supply on the overshadowed lot as two water supplies do not automatically conflict, although there are occasionally interference issues. It should be noted that a thorough site evaluation of the overshadowed lot when permitting the first-in-time lot could determine the actual future effects; however this type of evaluation is

not part of the current permitting process and would be both legally and logistically cumbersome.

Note: It is not clear if any other statutory changes, such as the public trust concept for groundwater, the application of the correlative rights concept to groundwater, or the right of action under 10 V.S.A., Chapter 48, have or will affect development patterns in Vermont. These legal and policy issues are beyond the scope of this report, and are not further addressed.

1.2 Act 145 of the 2010 Adjourned Session of the Vermont Legislature and the Reauthorization of the Technical Advisory Committee

A significant change directed by Act 145 was to require an applicant for a permit issued subject to 10 V.S.A. Chapter 64 (which regulates the installation of the majority of water and wastewater disposal systems) to notify the owner of any properties onto which an isolation distance from a proposed water and/or wastewater systems extends. The applicant is required to send a notice along with a copy of the complete application, including the plans, to all potentially affected property owners prior to submitting the application to the Agency for review. The Agency can not issue a permit until at least 7 days after receiving the applicant's certification that all potentially affected landowners have been notified. Act 145 did not impose any requirements other than that of notifying the potentially affected landowners. In other words, there is no relief available under the Act to a property owner when he or she is notified of an overshadowing situation. The Agency cannot deny a permit merely because an overshadowing situation exists. All that the potentially affected landowner can do is talk to the applicant in the hope that his or her concerns can be resolved voluntarily.

Act 145 also reauthorized the Technical Advisory Committee which was originally authorized for a 5-year period beginning in 2002. The statutory language specified that:

> The governor shall appoint the members of the committee and ensure that there is at least one representative of the following entities on the committee: professional engineers, site technicians, well drillers, hydrogeologists, town officials with jurisdiction over potable water supplies and wastewater systems, water quality specialists, technical staff of the agency of natural resources, and technical staff of the department of health. Administrative support for the advisory committee shall be provided by the secretary of the agency of natural resources.
>
> Members of the reauthorized TAC were appointed in the late summer of 2010. (See Appendix 8.1)

1.3 The Legislative Charge to the Technical Advisory Committee – Act 145

The reauthorized TAC is charged with submitting a report to the House Committee on Fish, Wildlife, and Water Resources, and the House and Senate Committees on Natural Resources by January 15, 2011 which shall:

1. Review alternatives that minimize the potential extension of potable water supply or wastewater system isolation distances onto property other than property on which the system is located;

2. Review alternatives such as easements or other land conveyances that require additional criteria or conditions in order for a potable water supply or wastewater system isolation distance to extend onto property other than the property on which the system is located; and

3. Ensure that the recommended technical standards are sufficient to protect public health and the environment.

1.4 Implementation of the Current Statutory Requirements for Notification of Impact on Property Not Owned by the Applicant

The statutory language in Act 145 related to the notification process became effective on June 1, 2010. Written guidance issued by DEC on June 2, 2010 and revised June 16, 2010 outlined the requirements that would be imposed on all applications filed after June 1, 2010. A copy of the guidance is included as Appendix 8.3 of this report.

The development of this guidance was difficult because the language in Act 145 did not provide definitive direction on the level of impact on neighboring properties that is to be considered. While the existing Rules provide protection for any existing water or wastewater system and for any water or wastewater system that has a valid permit, the notification requirements are related to potential future development. The future development on neighboring property might be one single-family residence, but it might also be multi-family dwellings or large commercial projects. The problem is that isolation distances vary substantially, depending on the size and type of the water and wastewater systems proposed to serve a project.

In the current Rules, the required isolation distances between a potable water supply and a wastewater disposal system depend on the design flow for the supply or system. One example is that the isolation distance between a 420 GPD wastewater disposal area (which would serve a 3 bedroom single-family residence) and a drilled well serving the same or a similar residence is a maximum of 200 feet. On the other hand, a well serving a building with a design flow of more than 2,880 GPD might need as much as 300 feet of isolation distance. For even larger projects at the upper ranges of design

flows, the required isolation distance may require a hydrogeologic analysis to predict the two-year time-of-travel distance from the wastewater disposal area to a water supply.

Act 145 is silent on this question of design flow. Based on discussion with legislators directly involved with the drafting of the statute and with the legislative counsel providing support, the Agency constructed the guidance to require notification based on isolation distances suitable for development of one single-family residence served by a drilled well on each potentially affected neighboring property. If the statutory requirement for notification is retained, the language should be clarified as to the level of future development that must be considered when determining when the notification requirements apply to a specific application.

Other clarifying language is also needed if the notification requirement is retained. The current Agency guidance does not require notification when an application is for a replacement water or wastewater system that does not result in an increase in design flow, or for situations where all water or wastewater systems are required to be connected to municipally owned water or wastewater systems. While this seems to be reasonable, clarifying language would eliminate future disputes, any of which might result in questions about property titles.

Those members of the Technical Advisory Committee who are in professions that routinely prepare applications for submission to the Agency (Licensed Designers and Professional Engineers) have found that the notification requirements add substantially to the cost of preparing an application. These costs include additional field work, such as surveying to determine ground contours (which are necessary to determine the upgradient versus downgradient relationships between properties); additional drafting work to add information to the plans; and the cost of copying, printing, and mailing a complete application package to all overshadowed landowners. The additional paperwork costs can be significant when there are several affected landowners. In addition, licensed designers must spend time explaining the potential impact to the overshadowed landowners who receive a notification statement. The designers estimate the additional costs may reach several hundred dollars.

Many landowners who receive notification are not adversely affected, and therefore have little or no concerns about the potential impacts of overshadowing. Many other landowners who receive notification have no idea whether they should be concerned or not. Some landowners retain a licensed designer or an attorney to review their situation. Those landowners who are concerned have been disappointed to learn that they have no rights within the permitting program, other than the right to be notified as outlined in Act 145.

It is clear from licensed designers that, in some cases, projects are being redesigned to avoid the Act 145 notification requirements. While this is a positive development in some cases, there are consequences including additional costs to the developer for the redesign of water and wastewater systems to areas that have less of an

overshadowing effect, but that also have less suitable characteristics for development. It may seem desirable and fair to impose these additional costs on the developer in order to reduce the impact on neighboring landowners, but if the costs are excessive relative to any potential adverse impact on neighboring landowners it simply adds to the cost of development, including that of affordable housing.

2. Vermont's Current Prescriptive Isolation Distances between Water and Wastewater Systems and the Practices of other States

The current Rules specify certain isolation distances between any drinking water source and any wastewater disposal system. Most of these isolation distances are prescriptive (i.e. isolation distances are specific or "prescribed") based on different land-use activities, on the design flow of the water or wastewater system, and whether or not the slope of the ground surface is toward or away from the water source. The isolation distances also vary depending on whether the water supply is drilled into bedrock or is considered to be a shallow well. In addition, the Rules require that large water or wastewater systems use the two-year-time of travel method to determine the isolation distances and are therefore site-specific rather than prescriptive in nature.

The TAC has reviewed the isolation distances in the current Vermont Rules and has compared them to the isolation distances required in other New England States and the State of New York. This information is presented in Appendix 8.4. The Committee has also reviewed the current scientific research that examines the potential for pathogen travel in the soil and in the groundwater.

Based on all of the information reviewed, the TAC **strongly recommends** maintaining the existing isolation distances in the current Vermont Rules.

2.1 History of Vermont's Isolation Distances

As part of a major update of the WSR in 1992, Agency Staff reviewed the then-existing isolation distances between sources of potable water and leachfields. At the time, the Regional Offices were using a set of rules titled Environmental Protection Rules that became effective as of September 10, 1982. While there were prescriptive isolation distances listed in the 1982 Rules, these distances assumed that the flow of the groundwater was from the well toward the leachfield, or that the elevation of the bottom of the well was above the elevation of the leachfield. In circumstances when the presumed groundwater flow was from the leachfield toward the well, documentation of a minimum time-of-travel of two years was required. The tables of isolation distances in the Rules and in the WSR are included as Appendix 8.2 of this report.

The two-year-time of travel concept was developed in 1982, based on work by the Agency of Natural Resources staff with the assistance of the Drinking Water Program at the Vermont Department of Health. A literature review found that bacteria and cysts tend to either be filtered out, adsorbed onto soil particles, or die out in relatively short

distances and over relatively short time periods. However, viruses were found to survive for extended periods of time, exceeding one year for some types, particularly in the colder groundwater found in Northern climates. Based on the survival times substantiated in the literature search and the lack of certainty about the subsurface geology, it was decided that a minimum two-year time-of-travel from a leachfield to a well would provide a sufficient safety margin in preventing virus contamination of water sources.

In 1985, the Department's Water Quality Division was asked to conduct a literature review and field study of the impact of subdivisions on groundwater quality, with a particular emphasis on nitrate concentrations in groundwater. The results of this study were never published, but a draft copy of the report (Vermont DEC, 1987, unpublished) was recently reviewed by this committee. The field study consisted of monitoring groundwater quality at six permitted multiple-lot subdivisions on a monthly basis for a year. Samples were collected from existing bedrock water supply wells and shallow monitoring wells. Generally, the hydraulic connection between on-site wastewater systems and shallow groundwater was confirmed. Additionally, the benefit of thick low-permeability overburden materials in protecting the quality of the underlying bedrock aquifer was documented, as was the connection between shallow groundwater quality and bedrock wells where overburden materials are thin and of moderate permeability. These unpublished results reinforced the need for appropriately protecting bedrock wells, shallow wells, and springs.

The implementation of the two-year time-of travel requirement in the 1982 Rules made the permitting process somewhat complex, particularly when shallow wells were involved. Unless it was clear that the groundwater flow was not toward the well, a hydrogeologic analysis was required, which added significant time, expense, and uncertainty to the process. The 1992 update to the WSR attempted to minimize the number of cases where a site-specific hydrogeologic analysis was required. The Agency staff used a public participation process during this rule revision that included review and input from water and wastewater system designers and hydrogeologists. The 1992 revised rules created isolation distances that increase when the leachfield is located upslope of the well. The minimum allowable distance between an upslope leachfield and a well drilled into bedrock was increased from 100 feet to 200 feet, and the distance between an upslope leachfield and a shallow well was set at 500 feet. These basic isolation distances apply to a large majority of projects, but they are increased when the design flow for a well or leachfield is large. Very large flows may require a site-specific hydrogeologic analysis. The selection in 1992 of the 200-foot and 500-foot isolation distances was based on a literature review that found little evidence of pathogen contamination at these distances. These distances were also reviewed and supported by the Vermont Department of Health as part of the 1992 rule revisions.

> Note: This report uses the term "shallow well", a phrase that is intended to include wells that are dug or driven, and which draw their water from an unconsolidated layer, often sand or gravel material. In many cases, the well draws from the same layer into which wastewater is being discharged. When this

occurs, a larger isolation distance is prescribed in order to reduce the chances that the well will become contaminated. Unconsolidated aquifers are sometimes overlain by layers that have low vertical permeability which protects them from contamination. This is further discussed in Section 3.1 of this Report.

A recent literature review by the TAC Committee has confirmed that the current state of knowledge continues to support the concept that a minimum two-year time-of-travel from a wastewater disposal system provides potable water supplies with a sufficient protection from virus contamination. References to this literature are included as Appendix 8.6

2.2 Review of Current Isolation Distances in Other New England States and the State of New York

The TAC's review found that a wide range of isolation distances are in use in the other New England States and in the State of New York for separation between a drilled bedrock well and a leachfield. The isolation distances used by other states are summarized in Appendix 8.4.

- New Hampshire and Connecticut require 75 feet of separation. All of the other states require a minimum of 100 feet and four states require increases in the isolation distance based on site-specific criteria.

- Rhode Island increases the distance from 100 feet to 150 feet when the soil is "single grain" (sand) or when the design flow exceeds 1,000 GPD.

- Connecticut increases the distance from 75 feet to 150 feet if the soil has a percolation rate of less than 1 minute/inch, and if there is less than 8 feet of soil above bedrock.

- New York, with a relatively recent change in their rules, increases the distance from 100 feet to 200 feet for all wells when the leachfield is upslope of the well. (We note that this is the same distance required by the current Vermont Rules for bedrock wells).

Typically the setback distances from water sources were extracted from United States Public Health Service "Standards for Septic Tank Practice" published in 1957, 1967 and 1973. With the exception of Vermont and New York, most northeastern states have not changed well isolation distances since 1977. This was determined by comparing the data from a US Dept. of Commerce report (US Dept Commerce, 1977) and the current isolation distances for each state. Apparently, these isolation distances were carried along from rule revision to rule revision, likely because there was no internal or external pressure to change these distances. Vermont was the exception, when

scientifically-based rules were developed in 1982. To reduce the extent of overshadowing by the isolation distances of small water systems, in 1992 the Vermont WSR was also revised to include some prescriptive well isolation distances that were both practical and scientifically-based.

3. Technical Approaches Considered Regarding Reducing Vermont's Current Isolation Distances

The TAC analyzed several technical approaches to reducing isolation distances including construction, operation, and monitoring concepts. These approaches are reviewed individually below and include TAC recommendations related to their use. The TAC considered the use of these techniques for new or increased design flow situations, as well as for replacement of failed systems. **The TAC supports the use of a technique for new or increased design flow situations only when the technique is expected to provide equal or better protection than the prescriptive isolation distance.**

The TAC did find that there are several technical methods that would be appropriate in certain circumstances for the repair or replacement of existing failed water or wastewater systems even though they do not provide protection equivalent to that of a fully complying system. The TAC concludes that these methods would be an improvement in mitigating the risk to public health and/or the environment, when compared to the less desirable options of either allowing a system to remain in its failed state or terminating its use (that is, closing a facility or residence). In most cases, these techniques would only be a part of a solution and would be supported with other methods. For example, when installing a replacement well in a situation where the standard isolation distance could not be maintained and extra well casing and grouting were specified, the well would still be located as far as possible from any leachfield -- rather than depending only on extra casing and grouting. In cases where the replacement well must be extremely close to a leachfield, ultraviolet disinfection for the water system might be required, in addition to extra well casing and grouting. **The TAC only recommends these technical methods be used as one piece of a "best fix" for the replacement of failed systems, and not for new projects or those with increased design flows.**

3.1 Hydrogeologic Analysis

The Rules allow for significant reductions in isolation distances when a hydrogeologic analysis demonstrates that the effluent from a leachfield will either flow away from the well or, when it flows toward the well, it will take at least two years to travel through the soil and/or the fractured bedrock before reaching the well.

A common situation justifying a reduction in isolation distance is when the groundwater does not flow toward the well, including under pumping conditions. In such

a case, the effluent from the leachfield infiltrates vertically downward until it encounters the water table, and then flows with the existing groundwater away from the well.

Another common situation that may justify a reduction in isolation distance is when there is a thick layer of silt or clay overburden above the bedrock aquifer. These fine-grained surficial materials have very low vertical groundwater flow rates, in some cases only a few feet per year. In such cases, a continuous silt or clay layer as thin as 20 to 30 feet may be sufficient to protect the bedrock aquifer. While this situation seems to be most common in Addison County and other areas with substantial areas of silt-clay overburden, it does occur to some degree in all counties. Where there are areas of deep glacial till or fine grained bottom sediments of glacial lakes, the thickness of these materials is sufficient to protect the bedrock aquifer.

The existing Rules allow for detailed site-specific hydrogeologic analyses. This approach requires a person with a high degree of hydrogeologic expertise. Depending on the amount of field work required, such an analysis may be expensive and time-consuming.

- The TAC **recommends** the continued and expanded use of hydrogeologic evaluations as a basis of reducing isolation distances between water and wastewater systems both for new or increased design flows and for the replacement of failed systems.

3.2 Extended Well Casing and/or Grouting for Bedrock Wells

A basic requirement for drilling a bedrock water supply well is to extend the steel casing material into competent bedrock. The minimum requirements are to use at least 20 feet of casing, and to set the casing firmly into bedrock in a manner that will prevent sediment or fluids from above the bottom of the casing from entering the well. Grouting of well casings (emplacing low-permeability materials such as clay or concrete in the annular space between the borehole wall and the well casing for potable water supplies drilled into bedrock is not required in the current Rules.

The Rules allow for a “best fix” variance using extra casing that extends further into, and is grouted into, bedrock only in the following circumstance: when a new well is replacing an existing water supply; when there is no increase in design flow; and when it is not possible to meet the standard isolation distances,

The use of extra casing grouted into bedrock in lieu of the standard isolation distances is not currently approved in the Rules for new projects or for increases in design flow for existing projects. The bedrock in Vermont generally has many fractures that can allow for rapid vertical flow once the wastewater effluent infiltrates into the top of the bedrock. The use of grout around the well casing only seals the space around the

well casing itself; it does not protect against vertical flow in the bedrock even a few feet away from the well casing.

One situation in which extending a grouted casing may create a basis for a reduction in the standard isolation distance is when the casing extends through a confining layer that has little vertical permeability and into a second layer that is under artesian pressure (has an upward hydraulic gradient). In this case, the artesian pressure, rather than the grouting, prevents any intrusion of wastewater down into the water producing zone of the bedrock aquifer.

- For new projects or those with an increase in design flow, the TAC **recommends against** a reduction in isolation distances between water and wastewater systems solely based on the use of extended well casing or grouting.

- For the replacement of a failed system, the TAC **supports the use** of extended casing and grouting as one part of a "best fix" when the usual isolation distances cannot be met.

3.3 Artificial Barriers such as Drains and Impermeable Materials

Drains can include surface ditches and subsurface drains. The concept is to capture groundwater or surface water that may be contaminated with wastewater and divert the captured water away from a water supply. These drains can supply a measure of protection by potentially directing effluent from a surfacing (failing) leachfield away from a well site. These are useful measures when dealing with a replacement for a failed wastewater disposal system where the standard isolation distances cannot be met.

These drains are not currently approved in the Rules as a basis for reduction in the standard isolation distances for new projects or for an increase in design flow for an existing project. It is very difficult to design and install a drain that will ensure that all of the water captured in the drain will only flow to the outlet of the drain, and will successfully and completely bypass any well site. Depending on the site conditions, groundwater flow may pass under the drain and continue flowing downslope toward a well. A reduction in isolation distance for a new project could theoretically be considered based on sufficient hydrogeologic analysis, but in many cases the cost of that analysis and the cost of the special construction measures to ensure proper operation of the drain system would be more than the project could support.

In certain situations, a barrier made of impermeable materials, such as those used as liners for landfills (synthetic materials or compacted clay), may be installed to divert the subsurface flow of effluent. One of the more common situations is when a leachfield must be installed very close to an existing building foundation and there is concern that effluent might pool under the building. The impermeable barrier material reduces this

possibility by diverting the groundwater and/or the effluent away from the foundation. This approach cannot prevent flow of effluent in the downslope direction, but may significantly reduce the lateral spread of the effluent. Because all barrier materials can leak over time, however, this approach is not suitable as a basis for a reduction in an isolation distance between a water and a wastewater system for a new project or one with an increase in design flow.

- For new projects or those with an increase in design flow, the TAC **recommends against** a reduction in isolation distances between water and wastewater systems solely based on the use of artificial barriers such as drains and impermeable materials.

- For the replacement of a failed system, the TAC **supports the use** of artificial barriers such as drains and impermeable materials as one part of a "best fix" approach.

3.4 Potable Water Treatment Devices

One possible approach for reducing the isolation distance between a water supply and a wastewater system is to rely on some form of disinfection of the water supply rather than relying on the naturally-occurring renovation of wastewater effluent during its passage through the soil between the wastewater system and the water supply.

While disinfection systems can be designed to treat all of the known pathogens, and can be quite reliable, the protection of public health depends on a failure rate of zero. Because all of the currently used systems have the potential for failure, and because there is a significant health risk if the water treatment system is the only barrier against drinking contaminated water, the TAC does not recommend this approach for new projects or those with an increase in design flow.

In addition, these treatment systems require proper periodic maintenance in order to operate as designed. Without some guarantee that the system will be properly maintained, the risk of system failure is high, and therefore potential for contamination of the water supply is great.

It can be appropriate to use disinfection systems when dealing with the replacement of failed water or wastewater systems and the standard isolation distance cannot be met.

- For new projects or those with an increase in design flow, the TAC **recommends against** a reduction in isolation distances between water and wastewater systems solely based on the use of potable water treatment devices.

- For the replacement of a failed system, the TAC **supports the use** of potable water treatment devices as one part of a "best fix" approach.

3.5 Wastewater Treatment Systems with Disinfection

The use of disinfection as part of wastewater treatment presents the same problems discussed above for water treatment disinfection systems and in addition is more expensive than disinfecting the drinking water. To even consider the use of a wastewater disinfection system, some form of advanced treatment is required in order to reduce the suspended solids in the wastewater. Unless the wastewater has been treated to an acceptable solids level, disinfection using chlorine or ultraviolet light will not be effective. While the treatment system and disinfection systems can be designed with equipment designed to stop the discharge whenever the treatment system fails, the equipment is not failsafe. While it is true that some municipal wastewater treatment facilities use ultraviolet disinfection, they are not required to meet safe drinking water standards and they are generally operated and maintained by full-time certified operators. The level of treatment needed for safe drinking water is much harder to achieve and leaves little margin for error if a process problem does occur. An additional concern with this approach is that if any untreated wastewater escapes into the ground, any water supply within the two-year time-of- travel zone would not be considered safe. Finally, these disinfection systems require proper periodic maintenance in order to operate as designed.

- For new projects or those with an increase in design flow, the TAC **recommends against** a reduction in isolation distances between water and wastewater systems solely based on the use of disinfection as a component of the wastewater treatment systems.

- For the replacement of a failed system, the TAC **supports the use** of wastewater treatment systems with disinfection as one part of a "best fix" approach.

3.6 Groundwater Quality Monitoring Programs

There are several problems with the concept of monitoring the groundwater quality at points in between a wastewater system and a potable water supply as a basis for a reduction in the standard isolation distance. Monitoring for several possible pathogenic viruses would be recommended, and testing for many of these viruses is extremely difficult and expensive. In some cases several hundred gallons of water must be processed in order to obtain valid test results. Also, several monitoring wells may be required in order to find the flow path of the effluent so that it can be adequately monitored. Depending on the specific sub-surface conditions, the groundwater flow may

not be directly toward the well and/or the flow may be at different rates if the soil varies in texture and density. Groundwater flow in bedrock is even more difficult to monitor as it may be controlled by fracture patterns not apparent from surface observation, and the installation of monitoring wells in bedrock is expensive.

Ultimately, because monitoring alone does not protect anything, there is the question of what to do if the monitoring finds a plume of effluent moving toward a well. If the water supply is no longer suitable for use, the landowner must find another source of acceptable potable water. Simply relocating the wastewater disposal system is not a short-term answer, as there will still be a plume of unsafe groundwater for at least two years.

The concept of monitoring the water source itself, rather than the groundwater at some intermediate point, would be even more risky. In that situation, people will have been consuming the water for some period of time prior to receiving the test results that show the water is contaminated.

- For new projects or those with an increase in design flow the TAC **recommends against** a reduction in isolation distances between water and wastewater systems solely based on the use of groundwater quality monitoring.

- For the replacement of a failed system the TAC **supports the use** of groundwater quality monitoring as one part of a "best fix" approach.

3.7 Wastewater Treatment Systems that Depend on Surface Discharge

Another concept that TAC considered is to use wastewater treatment and disposal systems that do not depend on infiltrating the wastewater into the soil and down into the groundwater. Systems of this type depend on direct or indirect flow into surface waters. The Technical Advisory Committee previously investigated these systems in a report entitled: Options for Rule Revisions to Allow Seasonally Discharging Systems in Areas with Soil Limited by Slow Permeability and/or Seasonal High Water Table which was issued on December 19, 2005. This report was submitted to the House Fish, Wildlife, and Natural Resources Committee and the Senate Natural Resources Committee by DEC Commissioner Jeffrey Wennberg. The report indicated that, in order to limit the adverse impacts on public health and the environment, any use of such systems should be limited; would be expensive; and would require extensive oversight and monitoring. The report assumed that all isolation distances between water and wastewater systems would be maintained. It was also noted that changes in Vermont Statutes would be required in order to allow surface-discharging systems unless such systems are permitted under NPDES (National Pollution Discharge Elimination System) per the Federal Clean Water Act authority which has been delegated to Vermont.

A copy of this 2005 report is available at:

http://www.anr.state.vt.us/dec/ww/protection/TAC/OptionsForRuleRevisionsToAllowSeasonallyDischargingSystems.121905.pdf

- The TAC **does not support** a reduction in isolation distances for either new or replacement systems solely based on the use of surface discharging systems.

3.8 Separate Grey Water and Black Water Disposal Systems

The only difference between grey water and black water disposal systems is that toilet waste is discharged to a black water system while toilet waste is not discharged to a grey water system. Both types of systems receive wastes from sinks, laundry, showers, etc. Both forms of wastewater contain similar contaminants and human pathogens, though the concentrations vary. The nature of grey water also varies a great deal, depending on the particular users. For instance, some families wash diapers rather than use disposable ones, which can greatly affect the quantity of human pathogens in the grey water. The discharges from showering and handwashing also contain human pathogens. Other contaminants such as soaps, food waste, and pharmaceutical use/disposal will be found in grey water at varying concentrations.

Because grey water systems have the potential to contain all of the same pathogens, and in some cases in similar concentrations as regular septic systems, the health risks associated with grey water and black water systems are substantially the same. Therefore, there is no basis for having different isolation distances, or any other siting or design factor, between grey water systems and water systems versus black water systems.

- The TAC **does not support** a reduction in isolation distances for either new projects or for the replacement of failed systems based on separation of black and grey water because black water and grey water system may both contain similar human pathogens.

4. Non-Technical TAC Recommendations

4.1 Evaluation of the Use of Easements or Forms of Control Over Isolation Distances Other than Fee Simple Ownership

One approach to the overshadowing issue could be to require ownership or control by a permittee of all the land affected by a wastewater system or potable water supply. Under the current Rules, if any physical portion of a wastewater system or potable water supply is located on land not owned in fee simple by an applicant, the

permit application must contain proof of "permanent legal access" to the wastewater system or potable water supply. Section 1-201(a)(43) of the Rules defines permanent legal access as follows:

> (43) Permanent Legal Access – means an easement, right of way, deed, or other legal document that creates an enforceable permanent property interest that provides access to a potable water supply or wastewater system located off the lot for the purposes of construction, operation, and maintenance of the supply or system.

The current Rules do not require that an applicant have permanent legal access for the isolation distances that overshadow other property. While this could be required and would resolve the issues created by overshadowing, it would create new issues. For example, if a landowner is developing a small lot and they cannot avoid isolation distances that extend onto other property, then that landowner would need to have a neighbor who would be willing to sell or grant them the required easement. Unfortunately, it has been the Agency's past experience that some people will refuse to grant the easement in order to prevent additional development near their property. This has been referred to as the "green belt" approach. Small lots, such as those in compact villages or for camps, could be particularly susceptible to this problem.

In addition, before the Agency had jurisdiction over all wastewater systems and potable water supplies, property owners were known install to "spite wells" – wells drilled at or near a property boundary specifically to preclude the development of a leachfield on an adjoining lot. Spite wells were often just shallow holes dug in the ground, and were sometimes not even connected to a building. This was not an uncommon situation, but it was mostly resolved by legislative action granting the Agency "universal jurisdiction" in 2007. Under universal jurisdiction, any new or replacement potable water supply requires a state permit or must qualify for an exemption. In addition, a well is not protected by the Rules unless it is approved in a state permit, or qualifies for an exemption and is actually placed in service as a potable water supply. The cost of obtaining a permit or an exemption, and the requirement to actually use the well, has made the installation of spite wells less common in recent years.

If the Rules were changed to require ownership or control of the isolation distance, this would allow actions similar to this pre-July 2007 situation, and the neighbor would not even have to pay to install the well -- he/she could just refuse to grant the easement. There is the potential that both lots might be developed under a mutual agreement accepting the overlapping isolation zones; by sharing water supply or wastewater systems; or through some other mutual arrangement. This would probably work well if both owners wished to develop their lots, and were open to the prospect of development on the neighboring lot, and restrained any impulse to wait out a neighbor who needed to develop immediately.

When such agreement is possible, it is likely there will be an increased cost of development, as one of the parties is likely to demand compensation in return for granting permanent legal access, even if granting the access did not interfere with any plans for development of their own property.

The TAC has another concern with a requirement to have ownership or control of isolation distances. There are some cases in which the isolation distances that overshadow onto adjoining property do not adversely affect the ability to develop that adjoining property. One example is the situation where the off-property isolation distance only covers the portion of the neighboring lot that is mapped as a Class One or Class Two Wetland, which is therefore already undevelopable to a significant degree. Other examples include the situation where an isolation zone for a wastewater disposal system extends onto a neighboring property, but that property is served by a public water supply; or where an isolation zone for a water supply extends onto a neighboring lot, but only into an area that is an existing isolation zone around an existing water supply. While the TAC does not recommend requiring ownership or control of all land overshadowed by isolation distances, if the legislature determines that this is the appropriate approach to resolving the overshadowing issue, the TAC recommends that there be an exclusion for the isolation zone ownership for the types of situations described above.

- Based on the discussion above, the Technical Advisory Committee **does not recommend** requiring permanent legal access for isolation distances extending onto property not owned by the applicant.

4.2 Evaluation of the Requirement to Maintain the Isolation Distances Entirely on the Lot to be Developed

Another approach to the overshadowing issue is to require an applicant to maintain their isolation distances entirely on their own lot. Some towns used this approach in their wastewater permitting program. Such an approach would result in significant impacts, including increased lot sizes and reductions in the amount of land that is permittable for development that requires water and wastewater systems.

For example, assume that the water and wastewater systems and their associated isolation distances are required to remain on the landowner's property. There are two landowners whose property is upslope/downslope from each other. The downhill landowner's well must be located at least 200 feet from his uphill property line. The uphill neighbor must keep his wastewater disposal system at least 200 feet upslope from the property line. This results in a 400-foot wide piece of land that is restricted for potential use for water and/or wastewater systems. In this situation, if the lots were only 200 feet wide in the upslope/downslope direction, both would be restricted from development that required the installation of a water and wastewater system. Even more

land is required in this type of situation if the water supply is a shallow well because the 200-foot isolation distance may need to be increased to as much as 500 feet.

In the example above, it is possible that both lots might be developed under a mutual agreement to share a water and/or wastewater system. This would probably work well if both owners wished to develop their lots and were open to the prospect of development on the neighboring lot. However, it is likely that, in many situations such as the example described above, no development will be able to occur because one landowner will have a greater interest in preventing the neighbor from developing than they have in developing their own property.

Therefore, while the existing Rules using the first-in-time concept may result in only one lot being developed, some of the possible changes that have been considered may result in no lots being developed.

In addition, the impact of imposing a requirement to keep the isolation distances on the lot is likely to be most strongly felt by owners of small pieces of land. Landowners developing larger pieces of land with multiple lots and/or buildings are less likely to be prohibited from completing their proposed development because they will have options such as sharing wells, locating several wells in a small area, and sharing or clustering leachfields. While a requirement to prevent isolation distances from extending onto neighboring properties may increase the cost of these larger developments, in most cases it will not prevent development. The impacts are most likely to be felt by owners of relatively small parcels who cannot keep the isolation distances on their lots. These impacts, therefore, could most strongly be felt by proposed infill development in densely settled village areas or in small-lot camp areas.

A sketch map in Appendix 8.5 depicts a potential lot arrangement to give a sense of the way in which lot sizes may change in the future if isolation distances cannot extend onto neighboring properties. While these limitations will depend upon the specific shape of the lot, it is likely that at least 3 to 5 acres will be required to maintain all isolation distances on the lot. Changing the Rules in a way that results in large lot sizes would be likely to increase the costs of lots, reduce the number of lots available, and work against smart growth concepts including promoting infill development in existing villages.

Finally, if the legislature decides to adopt this approach, there would need to be an exemption for all of the lots where there are no suitable locations for a water or wastewater system for reasons <u>other than</u> overshadowing. For years, the State has been permitting off-lot systems when there were no complying soils on the lot or there was no permittable well location. The TAC recommends that the ability to continue this practice, along with the requirements of permanent legal access found in the Rules, should be retained.

- Based on the discussion above, the TAC **does not recommend** adoption of the requirement to maintain isolation distances entirely on the lot to be developed.

4.3 Regulatory Protection of Only One Water Supply for a Lot with One Single-Family Residence

With this approach, each lot with one single-family residence would be permitted based on the use of a single well, unless the site conditions were such that more than one well must be in use at all times in order to support the project. This approach would most often affect those landowners who have, or wish to have, both a shallow well and a bedrock well serving the same building. Landowners who drill a bedrock well because their shallow well is inadequate frequently express a desire to retain the shallow well as a potential drinking water source. With two wells in service, each with their own isolation distances, the potential impact of those isolation distances on the development of neighboring properties could be greater than if only one well is protected under the jurisdiction of the Rules. Providing regulatory protection of only one well would reduce that impact. The TAC recommends that a variance should be allowed when two or more wells are required to provide adequate water for the lot or when the isolation distances are entirely on land owned or controlled by the applicant.

- The TAC **recommends** that the Rules provide regulatory protection for only one water supply for a lot with one single-family residence.

4.4 Allow a Permittee to Waive the Isolation Distances that Protect Their Own Water Supply

New Hampshire and Maine allow for the installation of wells that will not be provided regulatory protection by the State. In each case, the landowner is required to sign a waiver indicating they are aware of the risks to their water supply, and they assume the full burden of those risks. The waiver is subsequently filed on the land records.

The TAC has strong reservations about this option, for public health reasons. Many of the pathogens that contaminate water supplies result in human infections which are also transmissible by direct person to person contact outside of the immediate family. One common pathway is fecal-oral transmission. This most commonly occurs when people who are infected fail to wash their hands prior to preparing food as part of their work, for social functions, or for friends and neighbors to consume. As a result, using a contaminated well not only affects those that live on the property, it can affect other people they come in contact with.

- The TAC **does not recommend** allowing a permittee to waive the isolation distances pertinent to their own water supply.

4.5 Reduced Technical Standards for Existing, Non-complying Lots.

Under this concept, a landowner with an existing lot that is not currently developed with a water and a wastewater system, and which cannot meet the standards for isolation distances between water and wastewater systems, would be regulated under a different standard. This would require a presumption that the right to do at least some development on an existing lot justifies a greater health or environmental risk than that associated with development on a newly created lot. The TAC finds that this concept is not supported by a science-based evaluation.

- The TAC **does not recommend** adoption of different standards for pre-existing lots.

4.6 Spite Actions

One issue the Legislature might consider is the potential for "spite" actions, as discussed earlier in section 4.1 of this Report. The "spite well" is the example that is most commonly mentioned. Since July 1, 2007, the potential for "spite wells" has been reduced. Beginning July 1, 2007, any well that will be used for drinking water must be permitted, or qualify for an exemption. This exemption is currently limited to a replacement water supply for an existing single-family dwelling on its own lot (whether that water supply is failed or not). This exemption requires abandonment, for drinking water purposes, of an existing well at the same time as the replacement well is installed. There have been a few instances in which people have abandoned a perfectly good well and drilled a replacement well for no purpose other than to restrict development on the neighbor's land. This might be addressed by requiring some demonstration of the <u>need</u> to replace an existing well. Spite actions can also occur based on the installation of wastewater systems, though due to the cost, this has been rare.

- The TAC **recommends** that the necessary statutory changes be made to allow for changes to the Rules that would reduce the installation of spite wells and spite wastewater systems.

5. Requiring the Isolation Distances for Water and Wastewater Systems to be on the Applicant's Property "to the Extent Technically Possible"

This topic evokes a complex discussion because it involves many policy questions. The TAC has not recommended any approach using this concept because the policy issues surrounding this topic are significant, and beyond the range of the TAC's review of technical issues. Among the policy questions that TAC has identified are the following:

A. Is it more acceptable for an applicant to adversely impact a neighbor's use of his/her land if the applicant is doing as much as possible to minimize that impact, rather than proceeding in a manner that mostly benefits the applicant? In some cases, the best an applicant can do (other than not developing at all) still results in most of the required isolation distance zone extending onto neighboring properties.

If the answer is "yes, adverse impact is acceptable as long as the applicant is doing as much as possible to minimize the impact", how does the Agency determine "how much is possible"? What criteria should the Agency use to make this determination?

B. The next question is what impact is to be considered. Should the Rules consider the effect on a neighboring property relative to the neighbor's ability to obtain a permit to construct only one single-family residence? Or should the Rules consider the effect on the neighbor's ability to obtain a permit to construct anything that would otherwise be acceptable if the applicant did not get a permit?

For example: A landowner files a permit application. If the permit is issued, the neighbor will lose the ability to install a leachfield on one-half of their lot, all of which is suitable for onsite wastewater disposal. The remaining half is able to support one single-family residence, but if the landowner's permit is not issued the neighbor would be able to construct two single-family residences.

C. Should there be a balance between the value of the impact on the applicant, relative to the value of the impact on the neighbor? If the impact on the neighbor would be negligible (say for instance, only overshadowing 10 feet onto the neighboring property), should the applicant be required to spend $10,000 (or some other amount of money) to prevent that impact?

If there should be balance, how should it be proportioned?

D. Must the leachfield be relocated from a more suitable site to a less suitable site if that will result in less impact on the neighboring land? What if there is a significant cost difference? For example, should the applicant move from using a site that would allow a conventional in-ground system (at a cost of, say, less than $10,000) and instead use a location that requires a mound (at a cost of more than $20,000)?

E. If the isolation distances from a drilled bedrock well would have less impact on the neighbor than that of a shallow water supply, should the applicant be required to install a bedrock well? For instance, in a situation where a bedrock well would require a 200-foot isolation distance a shallow well would typically require a 500-foot isolation distance.

F. If the issuance of a permit would preclude the neighbor from installing a shallow well but would allow for the construction of a drilled bedrock well, must the impact be measured against the use of a shallow well? In most cases, the drilled bedrock well will provide a good quality and quantity of water -- but there are locations in Vermont in which a neighbor might prefer to have a shallow well because the shallow aquifer may have better water quality.

H. Should a reduced number of lots be required if the reduction would reduce the overshadowing impact on neighboring land?

For example: A four-lot subdivision is proposed, for which the isolation distances will extend onto neighboring property. If the project were reduced to only two lots, it could be designed such that no isolation distances would extend onto neighboring property.

6. Require any Lot that Can Connect to a Public Water System to Do So

This is another option that might be pursued in order to share the burdens associated with isolation distances. While few municipalities have a requirement that all those who can must connect to a municipal water system (unlike the requirement for connection to a municipal wastewater system, which is common), a municipality does have the authority to impose such a requirement, if they have the capacity to serve new customers. This approach would be particularly useful in a village setting where there are small lots and a mixture of municipal water and private water systems. The isolation distances associated with private water systems may be the only obstacle to installing a wastewater system on one of the small lots, thus preventing the infill that many towns support. Imposing the "must-connect" requirement might add to the development cost if the connection and annual operating fees exceed the cost of an individual water system. This policy call is beyond the TAC's charge.

7. Conclusions and Summary of TAC Recommendations

7.1 First in Time

After extensive review, the TAC recommends retention of the existing first-in-time approach. While this approach can result in unfair impacts on neighboring landowners, any other system creates different unfair impacts. The impact from the first-in-time approach is easy to understand. If an applicant receives a permit with isolation distances extending onto neighboring property which prevent the neighbor from developing, the impact on that neighbor is clear and obvious. If the first-in-time concept were replaced with an approach that requires ownership or control of the isolation zone, the neighbor could refuse to grant ownership or "permanent legal access" to an applicant. In many cases, the neighbor might have no plans or desire to develop their own property, but would merely wish to prevent development on the applicant's property. Denying the applicant the opportunity to develop, even when that development might have no actual

adverse impact on the neighbor, might be considered to be just as unfair as the first-in-time approach. While no system is perfect, the TAC's **recommendation** is to favor the person who proposes to actually construct a water and/or a wastewater system.

7.2 Current Isolation Distances

The TAC **strongly recommends** retaining the isolation distances between water and wastewater systems in the current Rules.

After a thorough review of the existing Rules and the current literature, the TAC believes that the existing isolation distances are appropriate. The literature supports the use of the two-year time-of-travel approach, and the existing Rules allow for a reduction in the prescriptive isolation distances when a hydrogeologic analysis demonstrates that a proposed construction of a water and/or a wastewater system will provide greater than a two-year time-of-travel even with a reduced isolation distance.

7.3 Hydrogeologic Analysis

The TAC **supports** the increased used of this scientific method in determining a site-specific distance that will be protective of a drinking water supply. The hydrogeologic analysis concept has been used successfully for more than 20 years without apparent negative consequences and the Agency should support its continued use with additional written guidance so that consulting hydrogeologists can focus their efforts on methods that are acceptable to the Agency.

8.1 TAC Membership

Bruce F. Douglas, P.E. – Professional Engineer (Licensed Designer)
Water Resources Management Group
Stone Environmental, Inc
535 Stone Cutters Way
Montpelier, Vermont 05602
Phone: 802-229-2193
bdouglas@stone-env.com

Don Woods, P.E. – Professional Engineer (Licensed Designer)
WOODS & Co. Civil Engineering
4175 Creek Road
N. Clarendon, VT 05759
802-773-0333
woodsco@comcast.net

Gerald Kittle - Licensed Designer and Town Regulator
PO Box 611
Colchester, VT 05446
802-264-5605
gkittle@town.colchester.vt.us

Justin (alt. Barbara) Willis – Licensed Designer
PO Box 98
Richmond, VT 05477-0098
802-434-3103
willisdesignvt@comcast.net

Spencer Harris – Licensed Designer
Vermont Contours
PO Box 384
Bristol, VT 05443
802-453-2351
spencerk@accessvt.com

Craig Heindel - Hydrogeologist
Heindel and Noyes, Inc.
PO Box 4503
Burlington, VT 05406-4503
802-658-0820 ext.15
cheindel@gmavt.net

8.1 TAC Membership

David Cotton, P.E. – Hydrogeologist/Professional Engineer (Licensed Designer)
Wastewater Technologies, Inc.
PO Box 868
Milton, VT 05468
802-233-0751
davidc@wastewatertechnologies.com

Stephen Revell – Hydrogeologist/Licensed Designer
Lincoln Applied Geology, Inc
163 Revell Road
Lincoln, Vermont 05443
802-453-4384
srevell@lagvt.com

Claude Chevalier – Well Driller
P.O. Box 164
Highgate Springs, VT 05460
802-868-7709
ChavalierDrilling@comcast.net

Phil Dechert – Town of Norwich Planning Coordinator
Town of Norwich
PO Box 376
Norwich, VT 05055
802-649-1204
planner@norwich.vt.us

Roger Thompson – ANR Technical Staff
Regional Office Programs Manager
Wastewater Management Division
103 South Main Street
Waterbury, VT 05671-0405
roger.b.thompson@state.vt.us

Christine Thompson – ANR Technical Staff
Wastewater Management Division Director
Wastewater Management Division
103 South Main Street
Waterbury, VT 05671-0405
christine.thompson@state.vt.us

8.1 TAC Membership

Jeff Fehrs, P.E. – ANR Technical Staff
Innovative/Alternative Systems and Underground Injection Control
Wastewater Management Division
103 South Main Street
Waterbury, VT 05671-0405
jeff.fehrs@state.vt.us

Rodney Pingree – ANR Technical Staff
Water Resources Section Chief
Wastewater Management Division
103 South Main Street
Waterbury, VT 05671-0403
rodney.pingree@state.vt.us

Gail Center, P.E. – Vermont Department of Health Technical Staff
Senior Environmental Health Engineer
Division of Health Surveillance
Vermont Department of Health
108 Cherry Street
PO Box 70
Burlington, VT 05402-0070

(802) 863-7233
gcenter@vdh.state.vt.us

Appendix 8.2 _____ Tables of Vermont Isolation Distances

§1-807 Isolation Distances

(a) All wastewater systems that are permitted under this Subchapter shall be designed so that they meet the following isolation distances:

Minimum Isolation Distances	Horizontal Distance (feet)		
Item	**Leachfield**	**Septic Tank**	**Sewer**
Drilled well	(b)	50	50
Gravel pack well, shallow well or spring	(b)	75	75
Lakes, ponds, and impoundments	50[1]	25	25
River, streams	50	25	10
Drainage swales, roadway ditches	25	--	--
Main or municipal water lines	50	50	(d)
Atmospheric Water Storage Tanks	50	50	50
Service water lines	25	25	(d)
Roadways, driveways, parking lots	10	5	(c)
Top of embankment, or slope greater than 30%	25	10	--
Property line (a)	25[2]	10	10
Trees	10	10	10
Other disposal field or replacement area	10[3]	--	--
Foundation, footing, or curtain drains	35[4]	10	--
Public Community Water Supply (e)	(f)	(f)	(f)
Suction water line	100	50	50

These distances may be reduced when evident that the distance is unnecessary to protect an item or increased if necessary to provide adequate protection.

Appendix 8.2 _____ Tables of Vermont Isolation Distances

Note: See footnotes and criteria on the following page.

§1-807 Isolation Distances

Footnotes **(General Criteria Regarding Isolation Distances)**

(a) Isolation distances apply regardless of property line location and ownership.

(b) Separation between potable water supplies and leachfields shall be determined by the methods in the Vermont Water Supply Rule, Appendix A, Part 11, §11.4.

(c) Sewers under roads, driveways, or parking lots may require protective conduits or sleeves.

(d) Separation of pressure water lines considered as "service connections" and sewer lines shall adhere to the Vermont Plumbing Rules. Separation of pressure water lines (considered to be part of a public water system as defined by the Vermont Water Supply Rule) and sewer lines shall adhere to the requirements of the Vermont Water Supply Rule.

(e) This refers to Public Community Water Systems, as defined in the Vermont Water Supply Rule.

(f) Contact the Department of Environmental Conservation's Water Supply Division, 103 South Main Street, Waterbury, Vermont for isolation distances relative to a public community water supply.

Footnotes **(Specific Criteria for Isolation Distances)**

1. The isolation distance to surface waters shall be measured from the nearest portion of the leachfield, which will be the toe of the system for mound and at-grade systems. The isolation distance must be satisfied on a year-round basis, therefore the edge of the surface water is the annual high water level.

2. For mound wastewater disposal systems, the limit of mound fill must be 25 feet from any downhill property line and 10 feet from all property lines on the side or uphill.

3. No leachfield or replacement area shall be closer than 10 feet to one another, except as allowed for absorption trench systems in §1-907(m) of these Rules.

4. If a curtain or foundation drain is downslope of the leachfield, the leachfield cannot be closer than 75 feet to the drain. If the curtain or foundation drain is upslope of the leachfield, it shall be 35' if possible, and a minimum of 20 feet to the leachfield. The isolation distances for mound systems shall be from the edge of the minimum basal area or the edge of the absorption bed or trench, whichever is closer. These distances may be reduced if the designer provides adequate data and analysis to show that effluent from the soil-based disposal system will not enter the drain. Conversely the distance may be increased if it is determined that effluent will enter the drain at the minimum separation distance.

Appendix 8.2 _____ Tables of Vermont Isolation Distances

Vermont Water Supply Rules

11.4 Isolation and Separation Distances

11.4.0 General

The proposed site of the water source for the building or project shall be approved by the Secretary before the source is developed.

Adequate horizontal isolation distances between wells and potential sources of contamination are required. The required horizontal minimum distances are listed in Tables A11-1 and A11-2

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Appendix 8.2 _____ Tables of Vermont Isolation Distances

below. Qualified consultants, Site Technicians, Professional Engineers or Hydrogeologists, as appropriate, are responsible for assuring that these minimums are adequate for individual cases, and should increase them as they deem appropriate in their professional judgement. The Secretary may increase the minimum horizontal isolation distances in Tables A11-1 and A11-2 or prescribe any additional safeguards it deems necessary when the depth to the aquifer or the nature of overburden material is not sufficient to protect the water source from pollution. The Secretary will consider permitting reductions of these individual cases only on the written request of the qualified consultants, which technically justifies the reduction in a particular case.

The minimum recommended horizontal isolation distances in these regulations from water systems to sewage systems are based on sewage treatment in soils, pathogen attenuation, effluent travel time in soil and dispersion, without site specific hydrogeologic information. Site specific data may be collected and justification made for reducing the distances listed in Tables A11-1 and A11-2.

Table A11-1 - REQUIRED HORIZONTAL MINIMUM SEPARATION DISTANCES

POTENTIAL SOURCE OF CONTAMINATION AND OTHER SITING LIMITATIONS	SEPARATION DISTANCE
Roadway, Parking Lot (outer edge of shoulder)	25 Feet
Driveway (Fewer than 3 residences)	15 Feet
Sewage System Disposal Fields	(See a.)
Subsurface Wastewater Piping and Related Tanks	50 Feet
Property Line	10 Feet (See b.)
Limit of Herbicide Application on utility R O W	100 Feet (See c.)
Surface Water	10 Feet (See d.)
Flood ways	(See e.)
Buildings	10 Feet
Concentrated Livestock Holding Areas and Manure Storage Systems	200 Feet
Hazardous or Solid Waste Disposal Site	(See f.)
Non-sewage Wastewater Disposal Fields	(See f.)

a. See Table A11-2
b. Increased to 50' when adjacent to agricultural cropland.
c. Applies to rights-of-way (ROW) where herbicides have been applied in the past 12 months or may be applied in the future. This distance may be increased to 200' depending on the active ingredient in the herbicide according to Vermont Regulations for Control of Pesticides.
d. For Public water sources, see Appendix A, Part 3, Subpart 3.4.
e. Water sources shall not be located in a flood way.

Appendix 8.2 _____ Tables of Vermont Isolation Distances

f. If a water source is potentially downgradient of a source of contamination, then the Secretary shall apply the criteria in Appendix A Subpart 11.4.2.2.

Table A11-2 - REQUIRED MINIMUM HORIZONTAL SEPARATION DISTANCES TO SEWAGE SYSTEM DISPOSAL FIELDS[1,2] (Feet)

Design Flow of Domestic Sewage System Disposal Field (GPD)	Water Source Maximum Daily Demand (GPM) 0-1.9	2.0-4.9	5.0-7.9	>8.0
Fewer than 2,000	100	150	200	200+[a]
2,000 through 6,499	150	150	200	200+[a]
Equal to or Greater than 6,500	200++[b]	200++[b]	200++[b]	200+[a]

1 The minimum separation distance, (X), is used to determine the minimum separation zone (see Appendix A Subpart 11.4.1 and Figure 11-1).

2 For shallow water sources the minimum separation distance, X, per Subpart 11.4.1, shall not be less than 150 feet, and the minimum upslope separations distance shall be 500 feet instead of 2X regardless of the minimum separation distance, X, listed. If the bottom of the well or spring is higher than the ground surface at the disposal field then the minimum separation distance, X, may be reduced to 50 feet.

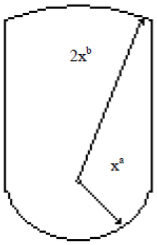
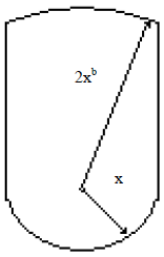
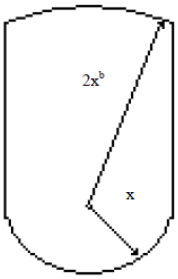
a Hydrogeologic evaluation required to define potential recharge area of the source and two year time of travel.

b For all water sources with less than 8 gpm maximum daily demand, the minimum presumptive upslope separation distance to greater than 6,500 gpd leachfields, per Appendix A Subpart 11.4.1, shall be 1,000 feet instead of 2X.

Appendix 8.2 _____ Tables of Vermont Isolation Distances

FIGURE 11-1.

PLAN VIEW OF
REQUIRED MINIMUM SEPERATION
DISTANCES TO DOMESTIC SEWAGE DISPOSAL FIELDS[1]

Domestic Sewage System Disposal Field Design Flow (gpd)	Water Source Maximum Daily Demand, MDD (gpm)			
	MDD < 2	2 ≤ MDD	5 ≤ MOD < 8	8 ≤ MDD
< 2000	X = 100′ 			X= 200′ For water source with demands of 6 gpm or greater, the well must be located outside the 2 year time of travel of all effluent plume paths.
≥ 2000 and < 6500		X = 150′ 	X = 200′ 	
≥ 6500	X= 200′ For septic systems over 6500 gpd wells must be located outside the 2 year time of travel effluent plume path, or greater than 1000′ from the disposal fields.			

1. These shapes assume parallel ground surface contours horizontally across page with a downslope direction toward the bottom of the page.

   a. For shallow water supplies X = 150′

   b. For shallow water supplies use 500′ distance instead of 2X

Appendix 8.2 _____ Tables of Vermont Isolation Distances

11.4.1.0 Separation Distances to Sewage System Disposal Fields

Wells and sewage system disposal fields should be located to optimize the hydrogeologic separation within the project limitations. The applicant's designer must establish a separation zone around the water source which defines the probable area of groundwater recharge to the water source. The separation zone may be established by a presumptive method which uses ground surface topography and minimum distances.

The minimum separation distances for leachfields can be also estimated by using methods to define Source Protection Areas in accord with procedures defined in this rule (see Appendix A Part 3), or with other methods approved by the Secretary.

11.4.1.1 Presumptive Minimum Separation Zone Methods for a Water Well

To determine the size and shape of the required minimum separation zone between sewage disposal fields and a water well the following steps should be taken (see Figure 11-1):

(a) draw a circle with a radius equal to the required minimum separation distance, X, from Table A11-2, around the well head or water source;

(b) now either:

(1) if the circle drawn intersects with the contour elevation of the source, then draw lines beginning at these intersections, extending upslope and perpendicular to the contours, until these lines intersect an arc with a radius equal to twice the minimum separation distance (2X) from the source. If necessary, to provide closure of the area draw an arc with radius 2X from the source; or

(2) if the circle drawn in Step 1 is in all cases at a lower elevation than the source elevation, no further delineation may be required (resulting in the smallest possible minimum separation zone of a circle with radius X); or,

(3) if the circle drawn in Step 1 is in all cases is above the elevation of the well, the water shed area or a circle with a radius of 2X, whichever is smaller, shall represent the minimum separation zone (resulting in the largest possible minimum separation zone of a circle with a radius 2X).

11.4.1.2 Presumptive Minimum Separation Zone Methods for a Shallow Water Source

To determine the size and shape of the required minimum separation zone between sewage disposal fields and a shallow water source, the following steps should be taken (see Figure A11-1):

(a) draw a circle with a radius equal to the required minimum separation distance, X, from Table A11-2, around the well head or water source;

(b) now either:

(1) if the circle drawn intersects with the contour elevation of the source, then draw lines beginning at these intersections, extending upslope and perpendicular to the contours, until these lines intersect an arc with a radius equal to 500 feet from the

Appendix 8.2 _____ Tables of Vermont Isolation Distances

source. If necessary, to provide closure of the area draw an arc with radius of 500 feet from the source; or

(2) if the circle drawn in Step 1 is in all cases at a lower elevation than the source elevation, no further delineation may be required (resulting in the smallest possible minimum separation zone of a circle with radius X); or

(3) if the circle drawn in Step 1 is in all cases above the elevation of the well, the water shed area or a circle with a radius of 500 feet, whichever is smaller, shall represent the minimum separation zone (resulting in the largest possible minimum separation zone of a circle with a radius of 500 feet).

11.4.2.0 Requirements for Investigation of Potential Hydrogeologic Connections Between Water Sources and Sewage Disposal Fields

This subpart applies when a hydrogeologic connection may exist between a sewage system disposal field and a potable water source.

These distances listed in Table A11-1 & A11-2 provide a minimal level of protection for water sources. These distances may be increased or reduced based on site specific data.

11.4.2.0.1 Increasing the Minimum Separation Zone

These distances may be increased up to a maximum of 500 feet if a sewage disposal field is discharging upgradient of a water source and to the same unconsolidated, unconfined aquifer from which the water source is withdrawing.

11.4.2.0.2 Reduction of the Minimum Separation Zone

These distances may be reduced with the use of site specific data under the following conditions:

(a) If there is a continuous impeding layer from the sewage system disposal field to the well head, and the well is properly sealed to prevent contaminant migration along the well casing then the minimum separation zone around the well head may be reduced to a radius of not less than 100 feet; or

(b) If the groundwater flow from beneath the sewage system disposal fields is not toward a minimum separation zone around the well head that has a radius of X; or

(c) If a detailed hydrogeologic investigation reveals that groundwater flow from beneath the sewage system disposal field does not flow toward the source under pumping conditions the minimum separation zone around the well head may be reduced to a radius of not less than 100 feet; or

(d) If a detailed hydrogeologic investigation demonstrates a time of travel exceeding two years in accordance with Appendix A Subpart 11.4.2.1, then the minimum separation zone around the well head may be reduced to a radius of not less than 100 feet.

(e) The horizontal isolation distance for non-public wells may be reduced to a minimum distance of 50 feet. The reduction will only be granted upon presentation of sufficient evidence that the site conditions, hydrogeology, and well construction ensure protection of the potable water system.

Appendix 8.2 _____ Tables of Vermont Isolation Distances

11.4.2.1 Two Year Time of Travel

If required elsewhere in Appendix A Subpart 11.4.2, then a minimum travel time of two years must exist in the materials between a potential source of contamination that may contain pathogenic microorganisms and the drinking water source. The two year travel time is based on the reasonable assurance of pathogen attenuation. Calculations of travel time must take into account hydraulic gradient, porosity, saturated hydraulic conductivities in the materials with the largest saturated hydraulic conductivity, the cone of influence of production wells or the recharge area of springs being considered, and mounding of the water table due to groundwater recharge by discharge of the sewage effluent.

11.4.2.2 Increased Level of Contamination

The potential source(s) of contamination may not increase the level of contamination in any drinking water source to more than the Maximum Contaminant Levels (MCL) of the Drinking Water Standards in Subchapter 21-6 of this rule. Nitrate (expressed as N) may be used as an indicator when dealing with domestic (non-industrial) wastes. Calculations must take into account the concentration of nitrate-nitrogen at the base of the leachfield, which is assumed to be 40 mg/l, dilution by precipitation and groundwater flow, dispersion, background concentrations of nitrate-nitrogen, and other existing sources of nitrate-nitrogen, including fertilizers, in the subsurface drainage basin, using the assumption that no denitrification takes place in the subsoil. Methods of calculation and evaluation must closely approximate actual conditions and should be determined in consultation with the Secretary before any work is done.

The minimum separation distances for leachfields can be also estimated by using methods to define Source Protection Areas as contained in Appendix A Part 3 or with other methods approved by the Secretary.

VERMONT

State of Vermont
Department of Environmental Conservation

Agency of Natural Resources

Guidance Related to the Wastewater System and Potable Water Supply Rules
Effective September 29, 2007

Guidance Document
2010-01

Notification Requirements

Issued June 2, 2010 (Revised 6/16/10)

Justin Johnson, DEC Commissioner

Background

Act 145 of the 2009-2010 Legislative Session was written to start to address the issue of isolation distances for potable water supplies and wastewater systems that extend onto property not owned by the applicant when applying for a Wastewater System and Potable Water Supply Permit. The extension of these isolation distances is often referred to as an "overshadowing" of property or properties not owned by the applicant. Currently, an evaluation of potential interference between existing wastewater systems and potable water supplies and newly proposed wastewater systems and potable water supplies is routinely done during the review of applications. However, this review does not assess the potential for proposed systems and supplies to affect/or restrict potential future development on properties not owned by the applicant that result from the required isolation distances between potable water supplies and wastewater systems.

The Legislature is concerned about this overshadowing potential because in some instances it could significantly limit/or preclude a person's ability to develop their own property. As a first step in trying to resolve this issue, Act 145 requires that an applicant for a Wastewater System and Potable Water Supply Permit notify other property owners when an overshadowing situation is created. Act 145 does not include concurrent ability to deny a permit application under the applicable rules when there is an overshadowing situation. The Legislature will be continuing to examine this issue next year, but rather than wait until a complete resolution was reached, the Legislature created the notification requirement so that neighbors have the opportunity to discuss the potential conflicts and potentially resolve them before a well is drilled or a soil-based wastewater disposal system is built.

The statutory language does not include directions for implementation and therefore the Secretary, after discussions with members of the Legislature who worked on this legislation, is writing this guidance to not only describe the notification process and requirements, but also to identify those situations where notification is not required.

Appendix 8.3_____ Guidance for the Implementation of Act 145

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Effective September 29, 2007

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Who is an "affected property" owner?

A. All proposed potable water supplies require a protective isolation zone around the water source and around the water system components. When the proposed isolation zone will not be contained on the applicant's property, the owner of any property that is reached by the isolation zone is deemed to be an affected property owner who must be notified. The size of the water source isolation zone is defined by the type of source, the design flow for the source, and the topography while the zone for other water system components is based on the required isolation distance for each component. The owner of any property reached by the isolation zone must be notified, not just the adjacent property owners.

B. All proposed wastewater disposal systems require a protective isolation zone around the leachfield and other components of the system. If the isolation zone related to the leachfield and the other system components would extend onto property not owned by the applicant, that other landowner is an affected landowner and must be notified. The isolation distances used for this calculation are those based on the size of the wastewater disposal system being permitted and which are sufficient to allow for a water source that is drilled into bedrock and of a capacity sufficient for a single family residence (with a design flow not exceeding 1,400 GPD) on the property or properties not owned by the applicant.

These situations do not require notification:

1. Applications for the installation of replacement water or wastewater systems when there is no increase in design flow do not require notification.

2. If a permit is not required for the proposed activity, notification is not required. This includes but is not limited to:

    A. Replacement of an existing water supply on its own individual lot when covered by exemption 1-304(a)(22).

    B. Minor repairs or replacement when covered by exemption 1-304(a)(12).

3. Permits, or amendments to permits, that do not approve construction of water or wastewater systems, do not require notification unless:

    A. The permit or amendment authorizes an increase in design flow from an existing potable water supply and/or to an existing wastewater system that changes the required isolation distances; and/or

B. The permit, or amendment, approves new replacement areas for either systems or supplies that are reserved for future use.

4. Displaying existing and/or previously approved (state and municipal) water and wastewater systems on the plans submitted with an application does not require notification.

5. Applications for construction of water and/or wastewater connections to municipal systems do not require notification.

6. An application to install a potable water supply does not require notification if the municipality prohibits the installation of any wastewater disposal system other than a connection to the municipal wastewater collection system. This municipal restriction may not apply throughout the municipality so use of this exemption from notification must be based on a determination that the restriction applies to all properties within the required isolation distances.

7. An application to install a soil-based wastewater disposal system does not require notification if the municipality prohibits the installation of any potable water supply other than a connection to the municipal water system. This municipal restriction may not apply throughout the municipality so use of this exemption from notification must be based on a determination that the restriction applies to all properties within the required isolation distances.

8. The extension of an isolation distance onto a roadway not owned by the applicant does not require notification.

9. A lessee is not the landowner and so notification to the lessee is not required.

Note: Even though a notification may not be required, either because there is an exemption or there are no affected landowners, all applicants will be required to submit a certification that no notification is required to avoid potential problems in the future.

How do you calculate the area that is affected by the proposed water supply and proposed wastewater system?

A. The water supply issue is simple. The application requires a depiction of the well isolation area (well shield) on the plans. If any portion of the isolation area extends onto property not owned by the applicant, the owner of that property must be notified. There are also specific isolation distances for components of the water

supply, including but not limited to, water lines that must be separated from any wastewater systems. If those isolation distances extend onto property not owned by the applicant, the notice requirements apply.

B. The wastewater disposal isolation area is developed using the same concepts. There is an area around the leachfield within which a bedrock well serving a single family residence would not be permitted. There are different methods that may be used to define the area which would trigger the notification requirement. The size of the required isolation zone may be different as you move from a prescriptive isolation distance into a more site specific determination. Generally, use of the more site specific methods will be more expensive but may define a smaller area that must be protected and therefore a reduction in the amount of the isolation zone extending onto property not owned by the applicant. If any portion of this area extends onto property not owned by the applicant, notification is required. In addition to the leachfield, a wastewater system has components, including but not limited to septic tanks and sewer lines, that require specific isolation distances to a water system. If any of these isolation distances extend onto property not owned by the applicant, notification is required. The isolation zone around the leachfield must be shown on the plans submitted with the permit application.

1. The simplest method of determining this isolation area is to draw a boundary 200' around the leachfield and notify any landowner when any portion of the area extends onto their property. This distance must be increased to 300' if the design flow of the wastewater system is 2000 gallons per day or more but less than 6500 gallons per day. Systems of 6500 gallons per day or more are subject to other rules and do not trigger notification requirements.

   Note #1: The measurements for mound systems are from the corners of the basal area.

2. Another method is to define the area by doing the following:

   i. For locations at or above the elevation of the leachfield, draw lines parallel to and X feet away from the sides and the uphill edge of the leachfield until the three lines intersect.

   ii. For locations below the elevation of the leachfield, beginning at the two lowermost corners of the leachfield, draw lines directly downslope and perpendicular to the contours for a distance of 2X feet from the leachfield. Then draw two additional lines parallel to

and X feet farther away from the leachfield as measured parallel to the contours. Then connect the lower ends of the two outer lines with a line drawn parallel to and 2X feet away from the downhill perimeter of the leachfield.

Note #1: The measurements for mound systems are from the corners of the basal area.

iii. For leachfields with a design flow of less than 2000 GPD, the X dimension equals 100. For leachfields of 2000 GPD or more and less than 6500 GPD, X equals 150.

3. A modification of the second method is to use a site specific analysis of the flow path from the leachfield area, prepared by a Qualified Hydrogeologist, to determine the "upslope" and "downslope" directions mentioned above. The analysis must be included with the application and the area must be shown on the plans.

What does notification require?

A. The applicant for a Wastewater System and Potable Water Supply Permit shall send a copy of the complete application, including any plans, and a cover letter referencing the statutory requirement for the notification, to any landowner affected by the proposed isolation distances no later than the date that the application is submitted to the secretary.

B. The applicant shall certify to the Secretary, using the following language, that a cover letter, a copy of the complete application, and a copy of any plans have been sent to the affected landowners.

I hereby certify that the attached list of names and addresses include all those whose property may be affected by the proposed water and wastewater systems, and their associated isolation distances and zones, and that all those listed have been sent a copy of the application and any associated plans.

In the event that notification is not required, either because there is an exemption or there are no affected landowners, the applicant is required to file the following statement:

I hereby certify that notification is not required either because there is an exemption or there are no landowners who may be affected by the proposed water and wastewater systems.

The certification shall specify the method used to send the materials and the date sent. The certification statement shall be signed by an applicant.

C. If revisions to the proposed location of water and/or wastewater systems are made during the course of review of the application, so that isolation distances will extend onto property not owned by the applicant, the affected property owners shall be sent the information required in (A) above and the certification required in (B) above shall be submitted to the Secretary.

If a notification was previously sent to the affected landowner/s, only the plans that have been revised must be sent to the affected landowner/s. The applicant shall also certify to the Secretary that a cover letter and any revised plans have been sent to the affected landowner/s. The certification statement shall include the names and addresses of the affected landowner/s.

D. When a certification is required under (A) or (C) above, a permit shall not be issued until 7 calendar days after the Secretary receives the certification statement. The 7 day notice period may be waived if all affected landowners agree in writing to waive the notice period. If there is more than one landowner of a particular property, all of the landowners of that property must sign the waiver statement.

E. If after a permit has been issued, the water and/or the wastewater system is not installed in the permitted location, and the isolation distances from the actual installed location extend onto property not owned by the applicant, the permittee shall send a copy of the record drawing to the affected landowner along with a cover letter that references the statutory requirement for the notification. The permittee shall also submit a certification statement to the Secretary. The certification shall state that a cover letter and the record plan/s were sent to any affected landowner/s. The certification shall also include the name and addresses of all affected landowners and the date that the required information was sent to any affected landowner/s.

What are the rights of affected landowners?

A. The statute does not create any rights other than notification. The notification process was established by the legislature to allow time for the applicant and the affected landowner to work together to potentially minimize the impact of isolation zones that extend onto property not owned by the applicant. If the applicant decides to proceed with a project following notification, a Wastewater

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System and Potable Water Supply Permit may be issued after the 7 day waiting period even if the overshadowing situation still exists.

Administration

A. The notification requirements apply to applications filed after June 1, 2010.

B. Permits issued based on applications filed prior to June 2, 2010 will not be subject to the notification requirements related to record drawings.

C. An application is not administratively complete if a required certification has not been filed. An incomplete application may be returned to the applicant.

D. Applications require the filing of a notification certification that either lists those notified or states that notification is not required.

Appendix 8.4 Table of Other States Requirements

State	Distance between a leachfield and a private well	Notes	Depth to SHWT (seasonal high water table) Depth to bedrock	Distance between a leachfield and a public well
New York	100' unless the soil is coarse gravel or the disposal field is upslope of a well when it is 200'	for a single family residence sized leachfield and well **first in time** – apparently few conflicts	24" to SHWT 24" to bedrock	
Rhode Island	100' for system of less than 1000 GPD unless the soil is single grain when it is 150'	can be reduced to 80' for less than 500 GPD, when using nitrogen reduction, pressure distribution, and has at least 3' to SHWT wells on property served by a public water system are not considered to be private drinking water wells nitrogen loading is an issue above 345 GPD/20,000 sqft of lot **first in time**	36" to SHWT 60" to bedrock	200' drilled (rock) 400' gravel
Massachusetts	100'	need special approval and to be less than 100' to a leachfield 4' to SHWT with perc more than 2 m/I and 5' to SHWT with perc less than 2m/i **First in time.**	48" to SHWT perc rate > 2 m/i 60" to SHWT perc rate < 2 m/i 48" to bedrock	radius in feet =(150 X log of pumping rate in GPM) – 350 This seems to work out as about 204' for a 5,000 GPD well and 350' for a 50,000 GPD well

Appendix 8.4 Table of Other States Requirements

State	Distance between a leachfield and a private well	Notes	Depth to SHWT (seasonal high water table) Depth to bedrock	Distance between a leachfield and a public well
Connecticut	75' from wells of less than 10 GPM demand – increased to 150' with fast perc rate bedrock well	Double to 150' if perc rate is faster than 1 m/i and there is less than 8' to bedrock. The 8' can be reduced to 4' if there will be at least 4' of soil with a perc rate slower than 1 m/i under the system minimum of 18" to SHWT and 48" to bedrock under the system **Private wells are first in time.** Note: Soil testing or other lot assessment can be considered first in time.	18" to SHWT 48" to bedrock unless perc rate is less than 1m/i then 24" and 96" to bedrock or double well isolation distance	Public wells must own/control protective zone.

Appendix 8.4 Table of Other States Requirements

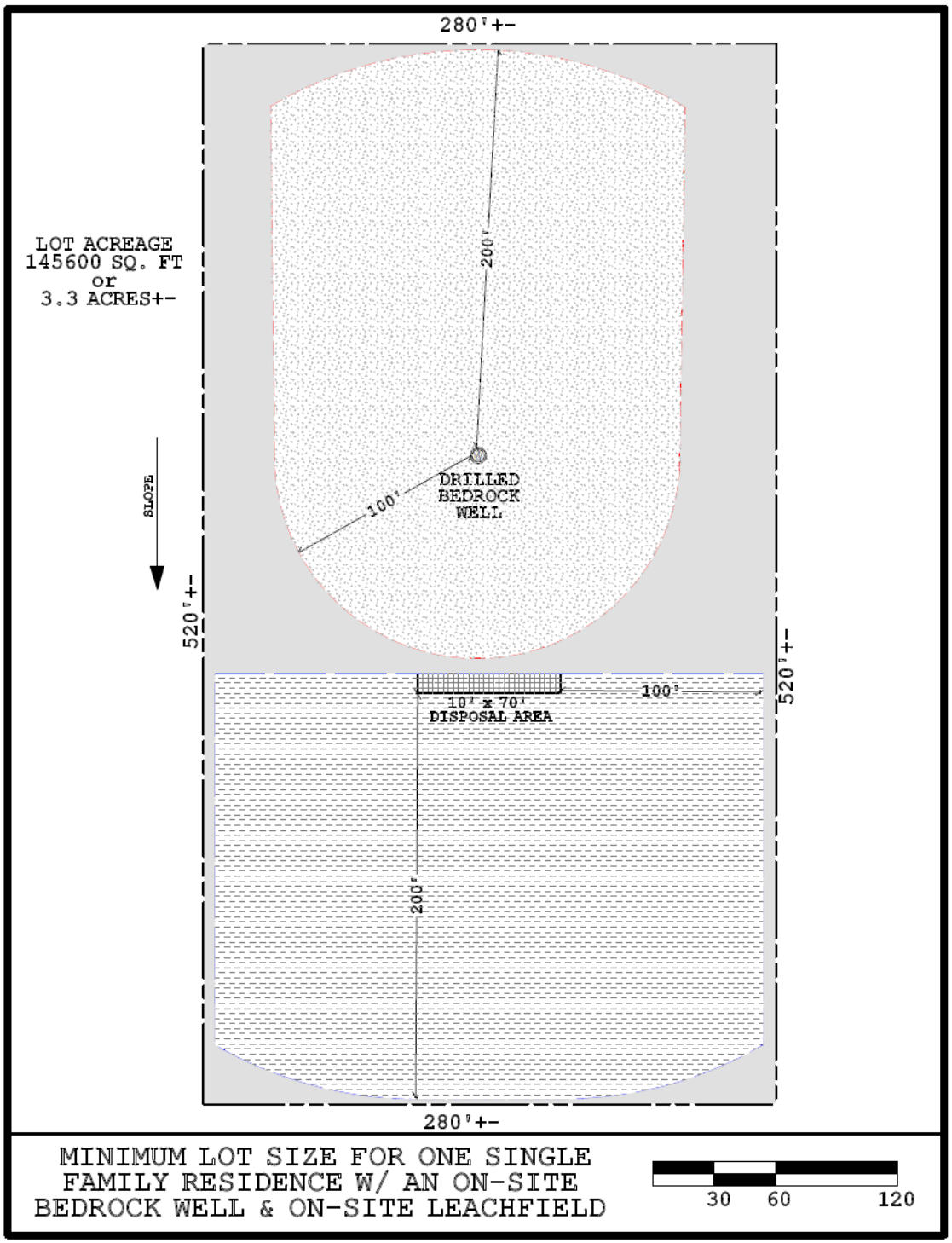
State	Distance between a leachfield and a private well	Notes	Depth to SHWT (seasonal high water table) Depth to bedrock	Distance between a leachfield and a public well
New Hampshire	75' for up to 750 GPD all well types	The full isolation distance must be on the lot or subject to an easement in order to be protected. The well will be approved at less than 75' to the property line if the owner signs a standard release form. There is an encroachment waiver that appears to be used when the applicant needs to build closer to the property line than normal but without the neighbor's agreement after the neighbor has been notified 1989 Rules say you can drill your well anywhere you want but it will not be protected unless it is at least 50' on your land. There is 75' isolation distance and leachfield is supposed to be 25' to the property line. Wells drilled before 1989 are protected at the 75' distance.	48" to SHWT 48" to bedrock unless there is a product specific approval at less separation. Presby EnviroSeptic is approved at 18" from the bottom of the system sand or 24" from the pipe itself	

Appendix 8.4 Table of Other States Requirements

State	Distance between a leachfield and a private well	Notes	Depth to SHWT (seasonal high water table) Depth to bedrock	Distance between a leachfield and a public well
Maine	100’ for up to 1000 GPD there are reductions for extra well casing bedrock well	There is a well setback release form that can be used to allow for less than 100’	12”-24” to SHWT depending on soil type 24” to bedrock	300’
Vermont	100’ in all directions and 200’ from upslope leachfields bedrock wells	can be reduced based on hydrogeologic assessment **first in time** – only notice to neighbors of overshadowing isolation distances	36” to SHWT 48” to bedrock	two year time of travel calculation

Appendix 8.5 Diagram of Isolation Distances Retained on a Lot

This diagram is one possible representation of the required isolation distances and the amount of land required to keep all of the isolation distances on the lot.



Appendix 8.6 References

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