

Engineering Design Review Panel

Informal Fact Finding Conference

February 12, 2010

Richmond, VA

Northumberland County, TM 54-7-7; Tolbert Trust property
Matthews County, TM 15-A-38; Mohorko property

An informal fact finding conference was convened, in accordance with Code of Virginia 32.1-163.6, to hear two similar cases, in different counties, but involving the same VDH senior personnel and the same private sector design engineer. In attendance were Rick Blackwell III, P.E. representing VSPE, Gary Phillips, P.E. representing DEQ, and this writer, John Schofield, P.E. representing VDH. One panel member representing ACEC did not attend the meeting. The EDRP had no legal counsel and so the question of the validity of the conference with a missing panel member could not be resolved. It was a consensus among all involved to proceed. The appellants did have legal counsel who testified and also responded directly to the VDH presenters. The Panel had no legal counsel to comment on his testimony or his remarks. Representing VDH were David Fridley, John Aulbach, P.E., and Patricia Duttry. Representing the appellants were Joel Pinnix, P.E., Bevin Alexander, Esq., and the contractor for Mohorko, Allen Farmer.

The system designs consist of a Clearstream 600 gpd aerobic treatment unit (ATU); a pumping system to an elevated drip mound providing a functional 12 inches of separation to the seasonal high water table elevation [the ground surface]; and a sand-filled trench located under the basal section of the mound offset five feet laterally from the active area to create a preferential flow path. The VDH denial was based upon the trench not being standard engineering practice and the determination that by having a trench that replaced soil of a low permeability with coarse sand, there would be more of a tendency to pollute the groundwater, which is one of the criteria precluded by the Board of Health performance criteria. The design without the trench would be acceptable to VDH.

David Fridley explained the site is located on a low island about 1500 feet wide with a 700 feet wide flat spot at an elevation approximately 2 feet above the surrounding water level. The site is poorly drained and has discontinuous sand lenses mixed with clay. Auger holes immediately filled with water and have remained full, above the mineral surface and into the vegetative litter, for over 13 weeks. The VPI soil scientist, Jay Conta, stated in his report that the site soils were hydric and poorly drained and thus not well suited for an onsite sewage system. He also reported that his borings did not detect a deep continuous sand strata.

The appellant's engineer presented a systematic argument accompanied by fifteen exhibits which are attached to this document. The appellant's counsel also had exhibits which were a memorandum of his legal opinion addressed to the Panel and a copy of a Virginia Supreme Court case regarding engineering practice.

Much of the presentation was intended to show that the treatment was adequate for the site conditions. This included documentation of the Clearstream ATU performance and an article demonstrating fecal removal through a sand bed.

There was a comparison of VDH regulations or policy documents governing onsite designs sited above a water table and how this design compares. The conclusion can be drawn that if the appropriate standoff is provided then adequate treatment occurs before effluent comingles with the water table. These are:

Pit privy: 24 inches

Septic effluent: 18 inches

Secondary effluent: 6 to 12 inches

Elevated sand mound using secondary treatment: 10 inches.

Since the trench was the component deemed not standard and contributory to pollution of the groundwater, the engineer offered the Code of Virginia 62.1-44.3 definition of pollution of state waters, excerpted as follows:

...such alteration of the physical, chemical, or biological properties of any state waters as will or is likely to create a nuisance or render such waters

(a) harmful or detrimental or injurious to the public health, safety, or welfare or to the health of animal, fish, aquatic life;

(b) unsuitable with reasonable treatment for use as present or possible future sources of public water supply; ...

The engineer provided a cross sectional drawing and Darcy's Law calculation of the conveyance capacity of the trench showing it capable of carrying significantly more than the system design flow.

He presented a list of 21 permits issued for similar trench designs questioning why so many were approved prior to these two, Tolbert and Mohorko, being deemed unacceptable. The VDH staff pointed out that many were not at all similar in that some were well drained and some had a deep sand layer that was not saturated.

Mr. Pinnix presented excerpts from two engineering references detailing sand drains, the practice of removing slowly permeable soil and replacing it with graded sand, a highly permeable medium, for purposes of lowering the water table or draining a site. These engineering references consisted of the Army TM 5-818-5 manual, "Dewatering and Groundwater Control" and an engineering textbook, "Construction Dewatering, New Methods and Applications", second edition, by J. Patrick Powers, P.E.

Mr. Alexander stated the term "standard engineering practice" is not defined in the statute and in his opinion it means a design consistent with what a reasonably prudent engineer would offer.

A plat of the Tolbert trust subdivision was presented with a corresponding US Fish and Wildlife map of wetlands delineation to demonstrate the Tolbert lot was not located within a mapped wetland.

When Mr. Pinnix was asked, "Why not simply remove the trench from this design?" he responded, "The trench is the factor of safety."

VDH uses the Wisconsin Mound Manual as its guidance for mound designs and it indicates elevating the mound to get above a high seasonal water table will increase the likelihood of effluent breaking out at the toeslope. This is apparently acceptable in Wisconsin but is defined as a system failure in Virginia. Mr. Pinnix contended the sand trench is needed to mitigate ponding of effluent around the mound.

Mr. Aulbach repeated the VDH position that the trench is not standard engineering practice in onsite sewage designs and the Army reference, of which he is quite familiar, is for groundwater control and management in construction projects, not intended for onsite designs.

After the Tolbert case was completed all parties agreed to proceed to hearing the Mohorko case. Mr. Aulbach informed the Panel that the Mohorko property had a valid construction permit for a peat/ pad system. Allen Farmer testified that he, the contractor for Mohorko, hired Joel Pinnix to design a new system because the permitted design would require a construction road that would be very expensive. Mr Pinnix indicated he evaluated the soils at the permitted site and those at a site closer to the road and felt the two were comparable.

The panel asked the room be cleared for deliberations. Each member expressed his own concerns and discussion continued until a consensus was obtained. The performance standards of the Board of Health require no surfacing of effluent and no pollution of the groundwater. The pollution definition from the Code defines a condition where the groundwater would be:

1. identifiable as detrimental to the public health and,
2. rendered unsuitable as possible use for a public water supply source.

Surfacing of effluent represents a direct health risk and is deemed a system failure. The Panel concluded that keeping this water in the ground is a safer situation and it in no way renders the groundwater unusable as a public water supply source. The low nature of the island with its flooding potential makes it an unlikely site for a public supply well. Most public wells are constructed to Class I standards and are several hundred feet deep and VDH requires casing and grouting typically of a minimum of 100 feet but also “to a depth to exclude undesirable groundwater.” The sand trench is only four feet deep. By the design engineer’s statement the trench is the safety factor that mitigates the potential for effluent surfacing. While not seen before in Virginia onsite design, the trench is certainly a recognized engineering practice. Borrowing technology from other disciplines is commonplace. The elevated sand mound concept used in these two designs was borrowed from the older intermittent sand filter circa 1950 which was borrowed from the slow sandfilter used in drinking water treatment circa 1900. It is a recognized technology in the Regulations. The dispersal method, pressure compensating drip tubing, was borrowed from the irrigation industry and is recognized technology by a VDH policy.

The Panel concluded that it is the engineer’s prerogative to use a sand drain trench if his site evaluation concludes it is prudent. On sensitive sites such as these two cases, the Panel recommended the engineer consider providing disinfection. The Panel recommended that potential wetlands sites be looked at closely.

The Engineering Design Review Panel hereby recommends to the State Health Commissioner that the permit denials in the Tolbert and Mohorko cases be overturned.



COMMONWEALTH of VIRGINIA

THREE RIVERS HEALTH DISTRICT

SERVING ESSEX, GLOUCESTER, KING & QUEEN, KING WILLIAM, LANCASTER, MATHEWS, MIDDLESEX, NORTHUMBERLAND, RICHMOND, & WESTMORELAND COUNTIES

THOMAS K. IRUNGU, MD, MPH
P. O. BOX 415
DIRECTOR
2381

SALUDA, VA 23149
TELEPHONE: (804)758-

FAX: (804)758-4828

CERTIFIED MAIL# _____

March 17, 2010

Benmono1, LLC c/o Frank Mohorko
P.O. Box 67
Moon, VA 23119

Re: denial of onsite sewage system construction permit, 157-09-0219, Mathews Tax parcel 15-A-038

Dear Mr. Mohorko:

This letter is intended to summarize the response of the Virginia Department of Health (VDH) to the recommendations of an informal fact finding conference held at your request, following the denial of your onsite sewage system construction permit application to the local health department for the above-referenced property.

On November 24, 2009 you applied to the local health department for a permit pursuant to §32.1-163.6 of the Code of Virginia, which requires the local health department to accept designs for onsite sewage systems which are compliant with standard engineering practice and performance requirements established by the Board of Health, be appropriate for the particular soil characteristics of the site, and ensure that the treatment works will exceed the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board.

The VDH engineering staff determined that the proposed design does not follow standard engineering practice and may present a greater risk to the environment and pollution potential, with adverse impact on groundwater, than a regulatory-compliant design. The application was denied on December 15, 2009 and as provided by the Code, you requested an informal fact finding conference before the engineering design review panel.

On February 12, 2010, three members of the panel met and recommended that the permit denial be overturned. They concluded that it is the engineer's prerogative to use a sand drain trench if his site evaluation concludes it is prudent, and that on sensitive sites the engineer should consider providing disinfection. They also noted, addressing the system's potential to pollute, that the proposals would not make the groundwater unusable as a public water supply source ["with reasonable treatment" as noted in §62.1-44.3 of the Code].

VDH has carefully considered the recommendation of the panel, but upholds the case decision of the local health department. VDH does not feel that the engineering aspects of the design were incorporated into the proposal in the manner of a standard practice, or that they are appropriate to the particular soil characteristics of the site, or that they ensure compliance with the performance standards of the Board of Health. While not an exhaustive discussion of these issues, the following points indicate the major aspects of the design that form the basis for denial.

The system consists of a septic tank, an aerobic treatment unit listed under NSF Standard 40, and an elevated sand mound, constructed of un-graded fill sand and incorporating drip dispersal twelve inches above original grade, situated atop an excavated trench filled with graded sand. The site morphology indicates high seasonal water table at or above the native mineral surface.

The trench is intended both to effect final disposal of the effluent and, in addition, partially dewater this very wet site. However, the material your engineer presented in support of its use at the review panel (no supporting information had been supplied with the original submission) was incomplete in reference. "Army TM 5-815-5 – Dewatering and Groundwater Control" and "Construction Dewatering, New Methods and Applications" indicate that vertical sand drains must be designed upon a definite radius of influence, with the use of well points and pumping or positive drainage as an integral part of the groundwater control process. No destination of the rerouted waters was established, nor control of its outlet, nor an effective zone of influence for the drainage trench. Neither was it established that the property owner had a practical opportunity to maintain or control those aspects of the proposed groundwater management.

As a disposal mechanism, the design was not judged by the local health department to be appropriate to the particular soil characteristics of the site. This broad, flat area is subject to prolonged saturation both of the surface and subsurface soil horizons. The local health department has made a number of visits to the property during the winter season, and has observed free-standing water over the absorption area site and surrounding landscape at every visit. Jay Conta, Virginia Tech contract professional soil scientist to VDH, did not confirm the reported highly restrictive clay strata which may have characterized the surface ponding of water as merely "perched" seasonally. Because the soil column is already hydraulically connected (no highly restrictive layer creating a perched water table condition), the addition of a sand trench will not affect the drainage of the site.

The VDH local office, the Virginia Tech contract professional soil scientist, and the Office of Environmental Health Services engineering staff are in accord that the proposed trench has not been shown an effective means to disperse sewage effluent into the groundwater under the design conditions proposed for this site. VDH has reviewed the individual characteristics of the site with relation to the effectiveness of a sand drain and the elements needed for the drain to work are not present.

Irrespective of the trench element of the design, VDH is of the judgment that the prolonged presence of surface ponding at the site makes it unsuitable for onsite disposal. The primary goal of the Board of Health in onsite sewage disposal is that an onsite system will assure that all sewage is disposed underground in a safe and sanitary manner; the presence of raw or partially treated sewage on the ground's surface or in adjacent ditches or waterways or exposure to insects, animals or humans is self-evident proof of system failure and a violation of the regulations of the Board (12 VAC 5-610-20, 350 of the *Sewage Handling and Disposal Regulations*). With or without the trench, this onsite system design, on this site, is expected to directly mix effluent and open surface water during the wet season of the year, *prima facie* failure.

Therefore, our primary performance standard will not be met. In addition, the confluence of sewage effluent and groundwater resulting from this design may present a significantly greater threat to the public health and environment than a compliant system. The potentially unhindered transmission of public health concerns such as viruses, call into question the adequacy of any onsite treatment works for this site.

The *Regulations* (Table 4.4) also establish a minimum vertical separation of ten inches between an installed elevated sand mound (incorporating secondary treatment) and the high seasonal water table. These ten inches are to be found *in situ* when siting the mound (§597.B of the *Regulations*). While a design proposed under §32.1-163.6 of the Code of Virginia is understood to be exempt from many of the prescriptive elements of the *Regulations*, it must still ensure that the treatment works will exceed the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board. This site exhibits a high seasonal water table at or above the mineral soil surface, with an effective “zero” vertical separation. The design proposal does not address how this sand mound, incorporating secondary treatment, provides equivalent public health protection to a design compliant with the prescriptive requirements. In addition, as noted in the *Wisconsin Mound Soil Absorption System Siting, Design and Construction Manual* by James C. Converse and E. Jerry Tyler (January, 2000), “The recommended depth to seasonal saturation is 10 in. beneath the ground surface (Table 1). It is extremely important to note that as the depth to seasonal saturation decreases (< 10 in.), the chance of toe leakage during seasonal saturation increases greatly.”

To review, in order to receive a permit under §32.1-163.6 of the Code of Virginia, an onsite sewage system design must be compliant with standard engineering practice and performance requirements established by the Board of Health, be appropriate for the particular soil characteristics of the site, and ensure that the treatment works will exceed

the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board. In my position as a designee of the State Health Commissioner, I find that the proposed design fails each of these criteria, and that the denial was properly issued.

When the Department denies an application following review by the engineering design review panel, the owner may appeal that decision in accordance with §32.1-164.1 of the Code of Virginia. Should you wish to appeal this decision, you may do so by requesting a formal hearing before the Sewage Handling and Disposal Appeal Review Board. Your request must be in writing, must include the required \$135 appeal fee, and may be addressed to the Secretary, Sewage Handling and Disposal Appeal Review Board, Virginia Department of Health, 109 Governor Street, Richmond, Virginia 23219.

Sincerely,

Thomas K. Irungu, MD, MPH
Director
Three Rivers Health District

CC:
Joel S. Pinnix, PE
P.O. Box 100
Tappahannock, VA 22560



COMMONWEALTH of VIRGINIA

THREE RIVERS HEALTH DISTRICT

SERVING ESSEX, GLOUCESTER, KING & QUEEN, KING WILLIAM, LANCASTER, MATHEWS, MIDDLESEX, NORTHUMBERLAND, RICHMOND, & WESTMORELAND COUNTIES

THOMAS K. IRUNGU, MD, MPH
P. O. BOX 415
DIRECTOR
2381

SALUDA, VA 23149
TELEPHONE: (804)758-

FAX: (804)758-4828

CERTIFIED MAIL# _____

March 17, 2010

The Tolbert Trust, c/o Susie Fox
5430 Clubside Lane
Centreville, VA 20120

Re: Denial of onsite sewage system construction permit HDID 166-09-297,
Northumberland Tax parcel 54-7-07

Dear Ms. Fox:

This letter is intended to summarize the response of the Virginia Department of Health (VDH) to the recommendations of an informal fact finding conference held at your request, following the denial of your onsite sewage system construction permit application to the local health department for the above-referenced property.

On November 2, 2009 you applied to the local health department for a permit pursuant to §32.1-163.6 of the Code of Virginia, which requires the local health department to accept designs for onsite sewage systems which are compliant with standard engineering practice and performance requirements established by the Board of Health, be appropriate for the particular soil characteristics of the site, and ensure that the treatment works will exceed the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board.

The VDH engineering staff determined that the proposed design does not follow standard engineering practice and may present a greater risk to the environment and pollution potential, with adverse impact on groundwater, than a regulatory-compliant design. The application was denied on December 8, 2009 and as provided by the Code, you requested an informal fact finding conference before the engineering design review panel. On February 12, 2010, three members of the panel met and recommended that the permit

denial be overturned. They concluded that it is the engineer's prerogative to use a sand drain trench if his site evaluation concludes it is prudent, and that on sensitive sites the engineer should consider providing disinfection. They also noted, addressing the system's potential to pollute, that the proposals would not make the groundwater unusable as a public water supply source ["with reasonable treatment" as noted in §62.1-44.3 of the Code].

VDH has carefully considered the recommendation of the panel, but upholds the case decision of the local health department. VDH does not feel that the engineering aspects of the design were incorporated into the proposal in the manner of a standard practice, or that they are appropriate to the particular soil characteristics of the site, or that they ensure compliance with the performance standards of the Board of Health. While not an exhaustive discussion of these issues, the following points indicate the major aspects of the design that form the basis for denial.

The system consists of a septic tank, an aerobic treatment unit listed under NSF Standard 40, and an elevated sand mound, constructed of un-graded fill sand and incorporating drip dispersal twelve inches above original grade, situated atop an excavated trench filled with graded sand. The site morphology indicates high seasonal water table at or above the native mineral surface.

The trench is intended both to effect final disposal of the effluent and, in addition, partially dewater this very wet site. However, the material your engineer presented in support of its use at the review panel (no supporting information had been supplied with the original submission) was incomplete in reference. "Army TM 5-815-5 – Dewatering and Groundwater Control" and "Construction Dewatering, New Methods and Applications" indicate that vertical sand drains must be designed upon a definite radius of influence, with the use of well points and pumping or positive drainage as an integral part of the groundwater control process. No destination of the rerouted waters was established, nor control of its outlet, nor an effective zone of influence for the drainage trench. Neither was it established that the property owner had a practical opportunity to maintain or control those aspects of the proposed groundwater management.

As a disposal mechanism, the design was not judged by the local health department to be appropriate to the particular soil characteristics of the site. This broad, flat area is subject to prolonged saturation both of the surface and subsurface soil horizons. The local health department has made visits on approximately a weekly basis to observe site conditions on the property. The site and surrounding landscape has exhibited free-standing water above the mineral soil surface for over one third of a year, as of this writing. Jay Conta, Virginia Tech contract professional soil scientist to VDH, did not confirm the claimed lenses of highly permeable sands reported by the engineer, or the highly restrictive clay strata which may have characterized the surface ponding of water as merely "perched" seasonally. Because the soil column is already hydraulically connected (no highly restrictive layer creating a perched water table condition), the addition of a sand trench will not affect the drainage of the site.

The VDH local office, the Virginia Tech contract professional soil scientist, and the Office of Environmental Health Services engineering staff are in accord that the proposed trench has not been shown an effective means to disperse sewage effluent into the groundwater under the design conditions proposed for this site. VDH has reviewed the individual characteristics of the site with relation to the effectiveness of a sand drain and the elements needed for the drain to work are not present.

Irrespective of the trench element of the design, VDH is of the judgment that the prolonged presence of surface ponding at the site makes it unsuitable for onsite disposal. The primary goal of the Board of Health in onsite sewage disposal is that an onsite system will assure that all sewage is disposed underground in a safe and sanitary manner; the presence of raw or partially treated sewage on the ground's surface or in adjacent ditches or waterways or exposure to insects, animals or humans is self-evident proof of system failure and a violation of the regulations of the Board (12 VAC 5-610-20, 350 of the *Sewage Handling and Disposal Regulations*). With or without the trench, this onsite system design, on this site, is expected to directly mix effluent and open surface water during the wet season of the year, *prima facie* failure.

Therefore, our primary performance standard will not be met. In addition, the confluence of sewage effluent and groundwater resulting from this design may present a significantly greater threat to the public health and environment than a compliant system. The potentially unhindered transmission of public health concerns such as viruses, call into question the adequacy of any onsite treatment works for this site.

The *Regulations* (Table 4.4) also establish a minimum vertical separation of ten inches between an installed elevated sand mound (incorporating secondary treatment) and the high seasonal water table. These ten inches are to be found *in situ* when siting the mound (§597.B of the *Regulations*). While a design proposed under §32.1-163.6 of the Code of Virginia is understood to be exempt from many of the prescriptive elements of the *Regulations*, it must still ensure that the treatment works will exceed the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board. This site exhibits a high seasonal water table at or above the mineral soil surface, with an effective “zero” vertical separation. The design proposal does not address how this sand mound, incorporating secondary treatment, provides equivalent public health protection to a design compliant with the prescriptive requirements. In addition, as noted in the *Wisconsin Mound Soil Absorption System Siting, Design and Construction Manual* by James C. Converse and E. Jerry Tyler (January, 2000), “The recommended depth to seasonal saturation is 10 in. beneath the ground surface (Table 1). It is extremely important to note that as the depth to seasonal saturation decreases (< 10 in.), the chance of toe leakage during seasonal saturation increases greatly.”

To review, in order to receive a permit under §32.1-163.6 of the Code of Virginia, an onsite sewage system design must be compliant with standard engineering practice and performance requirements established by the Board of Health, be appropriate for the

particular soil characteristics of the site, and ensure that the treatment works will exceed the discharge, effluent, and surface and ground water quality standards for systems otherwise permitted under the regulations adopted by the Board. In my position as a designee of the State Health Commissioner, I find that the proposed design fails each of these criteria, and that the denial was properly issued.

When the Department denies an application following review by the engineering design review panel, the owner may appeal that decision in accordance with §32.1-164.1 of the Code of Virginia. Should you wish to appeal this decision, you may do so by requesting a formal hearing before the Sewage Handling and Disposal Appeal Review Board. Your request must be in writing, must include the required \$135 appeal fee, and may be addressed to the Secretary, Sewage Handling and Disposal Appeal Review Board, Virginia Department of Health, 109 Governor Street, Richmond, Virginia 23219.

Sincerely,

Thomas K. Irungu, MD, MPH, Director
Three Rivers Health District

Cc:
Joel S. Pinnix, PE
P.O. Box 100
Tappahannock, VA 22560