## Questions submitted to 11/16/10 Decentralized Wastewater Webcast:

**What are some of the disadvantages of using ELJEN drain fields.**
Like any gravelless alternative, ELGEN systems will likely disrupt the water carrying capacity of the soil less than if heavy equipment was used to fill trenches with aggregate. However, since only the company's home state gives it credit for reduced system sizing, and then only less than 10%, I suggest you might reverse the question. Is there any reason for a non-Connecticut homeowner to use this system? The answer is yes, if it saves you money, but check with your local or state health agent.

**What about the need to control surface water when dealing with a high groundwater table?**
Absolutely, when runoff from other areas moves across your infiltrative area, you should be concerned. The less permeable soils are most difficult when it comes to lowering the water table to allow for effective infiltration, so most places raise the infiltrative surface with mounds, at-grades, or just shallow trench placement.

**Robert Baggett: Here is a link to a report on the PPCP issue: http://pubs.usgs.gov/sir/2005/5055/index.html. I'm told this report supports the concept of PPCP treatment in the soil tested. Therefore some say the PPCP is a non issue. This study seems limited in scale and scope and more study is needed. The conclusions indicate this. What is your take?**
When we partially funded that work by USGS, we accepted those results for what they are…good removals of the PPCPs under a single set of physical conditions. I doubt that many places have the same set of hydrogeologic conditions. However, it appears hopeful that properly designed onsite systems do remove much of these compounds, a claim that cannot be duplicated by those systems that treat and discharge directly to surface waters.

**Do water softener regeneration wastewaters affect on-site design or performance?**
Here we go!!! This issue is still quite high on the discussion list among professionals. The chemistry says no, but there is no denying that problems are occurring in the field. WERF is presently researching this issue with the water conditioner manufacturers. Some think it is just from too much backwashing, others have a more dark take on the subject. If one switches to membrane softening, the problem may disappear, but until we understand the problem, we will have to design via state and local rules.

**On the PPCP issue, what about (effects) in rapid draining soils?**
Coarser soils have less surface area to capture PPCPs and virus. Thus, they are likely to reach saturation sooner. Noting the article cited above by Mr. Baggett, even the coarser soils do provide some treatment opportunities for those compounds, but for how long and how well will be determined over time.

**Are curtain drains worthwhile? Up gradient only?**
Curtain drains on sloped terrain can be effective at redirecting ground water and runoff away from the infiltrative area. The finer the soil, the less effective are curtain drains.

**Protecting surface water from excess nitrogen loading is very important. But groundwater is also a resource that must be protected from excessive nitrogen loading and a barrier does not accomplish that. Nitrogen must be lowered before it is introduced subsurface.**
Although generally true, there are exceptions. Some soils are blessed with organic or reduced sulfuric matter that drive denitrification. In those cases, there is no need to denitrify in the pretreatment phase. In some cases areas along the edges of surface waters we may not need to denitrify because no drinking water will be extracted before it is released. In these cases the transfer point from ground to surface water may be through thick layers of muck which may also provide conditions favorable to denitrification. In cases where very low nitrogen in the effluent is needed, there are commercially-available systems that do a good job of reaching those levels. For partial nitrogen removal there are several commercial and engineered systems that can reach about 50% removal levels.

**What experience do you have with dry season storage of NO3 in unsaturated soils with washout at first wet season storm event?**
In many soils that infiltrate septic tank effluent, which is about 75% ammonium-nitrogen and 25% organic nitrogen, early startup removals are due to adsorption of the former. Once the nitrification bacteria are fully functioning, these lower valence anions are bioconverted to nitrite and then nitrate nitrogen, which do not adsorb well to soil. During the dry season, the adsorbed ammonium ions are easily converted to nitrate, but won't leave until the first storm becomes available to wash them away. This phenomenon is not normally an issue with year round septic systems, but may be with seasonally occupied units.

**What about the need 2 control surface water when you are dealing with a high groundwater table?**
I think I answered that in an earlier question, however I would stress that runoff water should be directed away from the infiltrative area.

**Is there a chemical reason for the difference in the effects of nitrogen and phosphorous in salt and freshwater, i.e. what makes the limiting factor for these chemicals different?**
The rule of thumb is that the critical nutrient for marine waters is nitrogen, and for fresh water it is phosphorus. There are places where that does not always hold true. Specific local conditions need to be characterized to determine the nature of limiting nutrients.

**Are drip lines more maintenance intensive? I have seen drip lines that get chewed up by gophers and get crushed when driven over because they are so shallow, so we require them to be fenced and mowed to reduce those problems.**
I have heard of this method of control, and it makes sense. God's little creatures do adapt to their environment, don't they? I have not heard of too many drip horror stories, but the technology came from Israel agriculture and was buried much deeper for agrarian reasons there. I suspect if the lines are regularly flushed, there should be no great number of problems, but you may want to practice your aim with those gophers.

**Maybe it will be covered later, but we need discussion of challenges, such as high groundwater, heavy clay soil, and winter conditions.**
I am sure that Vic D'Amato's presentations will provide more information on these topics, but these webinars are limited in length, and full coverage of such issues might take much longer time than we have.

**Should a replacement pump for drip distribution be on-site given their expense or are they durable/reliable?**
I am a believer that ordering some number of spare components at the time of construction is a good practice. As to their reliability, we have little data to start such a dialogue. They are pumps, and thus will likely need replacement and/or repair in 5 to 10 years.

**How many drip zones required for a typical residential parcel - 2 -120 x `15' primary and 2-120 x 15' back-up?**
This is a question for your regulators, and depends on soil and other conditions.

**Are there freezing issues with dispersal systems high in soil profile, in particular with intermittent use?**
Studies from Minnesota and northern Wisconsin tend to recommend burial of no more than 12 inches and coverage of the surface with high quality mulch is sufficient.

**I'm interested in same info that Michael Vidrine brought up in chat: Do you have specs on the constructed wetlands for a single home?**
The keyword here is specs. The design information provided in USEPA's Constructed Wetlands Treatment (EPA 625/R-99/010) and Onsite (EPA 625/R-00/008) Manuals is the best we have for a conservative design.

**How to prevent root problems when discharging to root zone?**
I assume that you are referring to infiltrative trenches. The root issue raises its ugly head periodically, but the use of aggregate and gravelless designs should minimize most problems related to system functioning.

**Can you go into more detail about the testing conditions (in-situ or lab, type of soil, UV exposure, etc.) for the "Non-Detect" Fecal C. and Virus lines on the table in slide 34 of the PDF? It seems a bit non-intuitive that filtration would cause this much removal.**
That is a generic slide that we created from several sources. Your concern is over filtration, and you should be aware that you have a biomat on the infiltrative surface, uniform distribution over the entire surface, and a long retention time in the unsaturated soil. So you have much more than just "filtration" going on, eg, adsorption, oxidation, etc. We probably should change the column headings to soil treatment instead of filtration.

**When discussing the effect of soil on removal of constituents, you were saying "one foot" and "first foot", but the diagram said 24" and 48". Which is correct?**
In that package of discussion the slide was to illustrate what unsaturated soil can do to some pollutants, while I did note that the conversion of ammonium-nitrogen to nitrate occurred in the first 6 to 12 inches below the infiltrative surface. I suspect that was the source of your confusion.

**Are there defensible de-nitrification rates for soil?**
The researchers at Colorado School of Mines (Professor John Mhave done quite a bit of work on soil denitrification rates. They have found a wide range of values and some concerns about the methodology that was used.

**What is his opinion of surface applied treated effluent via sprinkler systems that have not been disinfected?**
Spray irrigation is a fully acceptable alternative for community systems. For onsite systems they may not be practical given the required setbacks established by health officials over concerns regarding odors and health. This is something that you must clear with your local health department before considering.

**In comparison to septic systems, how effective are SBR and MBR centralized systems for dealing with Nitrate and PPCP?**
If the SBR and MBR effluents are going to the soil for treatment, there is little advantage and lots of unnecessary expense in adding these pretreatment processes. If your state is one of the handful that has a general permit that allows you to discharge directly to surface water, those may be good choices. Otherwise, the additional removal of those unit processes will merely reduce the load on the soil, but will unlikely improve the effluent quality with regard to PPCP. Regarding nitrogen removal those two systems can remove somewhat more nitrogen, but not enough to meet restrictive nitrogen discharge standards without a denitrification step. They would be somewhat less efficient at nitrogen removal than a RMF or a drip/pressure dispersal system.

**Although septic tanks don't remove enough virus to render the percolate harmless, soils remove several logs of virus concentration (Anderson, Lewis and Sherman, 1991). Did I hear you incorrectly? Perhaps you were speaking of septic tank effluent.**
Septic tanks remove a very small percentage (if any) of those microbes. What I spoke of was the ability of a properly designed soil system to remove virtually all of them from the septic tank effluent. I hope this explains your concern.

**Are wetland systems common in cold winter states? How do they do in such winters?**
Actually, wetlands are used in the far north. I noted that only the vegetated submerged bed (VSB) would be practical for an onsite system. VSBs do not need any plants to perform removal. So the only concern in northern areas is freezing. However the gravel bed and mulch that make up the bed are generally sufficient to avoid freezing, unless there are long periods of snowless, cold weather with no system use.

**Can you address drip irrigation in cold climates also?**
See earlier answer to this question.

**Can you please explain spray irrigation?**
Spray irrigation is method of spraying fine droplets of liquid through the air to distribute the liquid somewhat evenly over the surface of the ground.

**Does the reactive barrier for nitrogen capture get saturated and need to be replaced?**
That technology comes from Canada. The US licensee claims that they have systems that are more than 15 years old that are still functioning fine. Certainly, you are correct to assume that it will eventually be saturated and need to be replaced. As of yet we have not seen that problem and what the replacement will cost.

**What is the N conversion barrier made of?**
The most popular materials are sawdust and limestone, but at least two other sources of commercial designs exist, and one uses newspapers as the carbon source for this heterotrophic reaction. Tests have been run in the state of Florida on sulfur based materials to perform the denitrification via an autotrophic path, and these worked well.

**Re:Nitrogen reduction in pressure-dosed systems. Comparison to intermittent sand filters, and some studies (NJ Pine Lands and Florida Keys) seem to indicate little improvement compared to gravity systems. What is the controlling factor to improve nitrogen removal effectiveness in pressure dosed systems?**
It does appear that the effluent quality going to the pressurized dosing step may have some impact on the degree of denitrification. The pressurized dispersal processes may require some external carbon source to get the maximum removal. More data are needed to determine the reason for the differences in observed effects.

**What would a typical RMA look like size wise?**
I am not sure what you mean by RMA? If you mean a RMF, I showed some pictures. If you mean an RME, you will have to wait for Juli Beth Hinds' presentation in December. If the former is the case, there are two or three tanks needed. One is the septic tank, and the second is the filter. The third may be a separate recirculation tank or some designers just use the bottom layer of the filter or back end of the septic tank for the recirculation tank. The flow goes to the septic tank and then is mixed with filtered effluent to induce denitrification. From there the mixture is goes to the filter after which it is either discharged or returned to recirculation tank.