

## **Wastewater Treatment on the Outer Banks**

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### *Part Three: Cluster Systems – Our Best Option*

In Part One of this series we took a brief tour of the different possible wastewater treatment solutions currently in use on the Outer Banks. In Part Two we concentrated on the various on-site options, other than the septic tank, available to area developers and homeowners. We also went into some of the inherent problems with what most people want -- “David Copperfield technology...where waste goes in, clean water comes out, and what happens in the middle is magic!” Now, let's look at what might be one of the most viable options for our area – the cluster or neighborhood wastewater treatment system. Cluster systems combine the best of both worlds – a size that is easy to deal with and the efficiency and effective treatment of a larger system. They also can combine the best option available for the local environment and for the pocketbook.

Cluster wastewater systems are, by nature, not centralized and serve a large area...they don't have to cover everyone and everything. Where we have the basics of a central water system for much of the Outer Banks, there is no central wastewater treatment system. The principal idea of a cluster system is to collect, treat—and reuse where practical and beneficial—the "waste" water as close to where it is generated as practical. The theory being that these smaller, neighborhood systems combine the treatment technology of a large treatment system without the costs associated with having to transport the waste generated in the neighborhood to a distant treatment center. While the "on-site" system is the most obvious example of this concept, an individual system for each generator is not the only—and often not the best—way to organize the overall wastewater system. A cluster treatment system might serve a group of homes, a commercial center, a whole subdivision, or a section of a community.

Many considerations would determine how close to the source of generation it is practical to place the treatment center. One very important factor is the potential for beneficial reuse of reclaimed water, challenging the very concept of "waste" water. Other considerations include topography, soil conditions, development density (existing or desired), type of land use, and environmental impacts of the wastewater management function in any given locale. These factors need to be carefully considered when developing a cluster system.

While there are environmental advantages of the cluster system, most developers are drawn to them for their financial benefits. Compared to a centralized, municipal wastewater system, the cluster system eliminates a very large portion of the very expensive system of piping that transports the waste to a central treatment facility some distance away. While the collection system (that system of pipes, lift stations, which moves the waste from point to point) can be expensive to build and operate, the cluster concept is also a possible answer to the growing environmental concern of centralizing that point where the waste enters the environment.

We are all generally familiar with the two treatment options on each end of the spectrum: the individual septic tank and the large, municipal wastewater system that provides us with that “David Copperfield” approach to wastewater. It is this in-between area...systems that are large

enough to use modern technology and treatment methods but at the same time being neighborhood, or local area, oriented....small enough to be individualized in its creation and operation to serve that particular community.

Environmentalists today are growing in their concern about large, central wastewater systems and the concentrated point of discharge of waste back into the ground and water. The irony is that the original reason for creating the central sewer system in the first place was to eliminate public health problems by piping the wastewater "away" from where we lived. Unfortunately, the places that we thought were "far away" are now places that we live and play. In addition, we have found that it is better to spread a little waste over a large area than to concentrate the point where the waste is finally released back into nature.

Through the elimination of much of the conveyance system the system of that transports the waste back to the central treatment location, the use of lower cost effluent sewerage systems, and the use of low maintenance treatment methods that are cost effective to deploy at small scale, a decentralized concept system will quite often be far less expensive to install and to operate and maintain than a conventional, centralized system. Many examples of this have been generated all over the country.

Besides the environmental and fiscal aspects, a number of "societal" factors differentiate the cluster system from individual septic tanks and central, municipal systems. One, referred to previously, is that beneficial reuse of effluent can become more cost efficient when integrated into the cluster or neighborhood concept. The reclaimed water would be made available throughout the service area, nearer to points of potential reuse, decreasing the cost of the redistribution system. Non-potable demands for water are being served such as landscape irrigation -- with appropriately treated reclaimed water. In many areas, including here on the Outer Banks, this could be a significant contribution to the regional water economy, a factor that will likely become more important as fresh water supplies become increasingly strained.

Regarding water conservation, a little noted feature of using decentralized concept systems is that they would accommodate any level of water conservation found to be economically attractive or ecologically necessary. Only liquid effluent is transported, so reduced wastewater flows due to water conservation measures would not cause clogging problems in the collection system, as has occurred in conventional, centralized systems.

A decentralized concept system can also be easier to plan and finance. Each project would be small in comparison to the typical "regional" system expansion. The management needs of each area or new development would be considered directly and could be generated independently. Also, much of the cost of the decentralized concept system could be privatized to those who directly benefit from those investments, or assigned directly to the activity generating new demands on a much fairer basis. Quite often, the full cost of conventional, centralized system expansion and upgrading is "buried" in bonds and service charges which are born by all customers regardless of whether the expansion project benefits them in any way except to keep the overall system in compliance.

The decentralized concept also provides greater flexibility to address a variety of situations within a service area in the most cost efficient, environmentally sound and socially responsible manner. With the system facilities decentralized, there would be no compelling reason to impose a "one size fits all" management approach. Different strategies could be employed in various parts of the service area—e.g., individual on-site systems in low density areas, cluster systems for pockets of development, and more centralized systems in more impacted areas. In some area, a centralized concept may be applicable, but in many areas, a system of decentralized or cluster systems might be the more practical and efficient solution.

While the centralized, municipal wastewater system is often considered to be the most logical option by governmental units, the Outer Banks is just the opposite. The individual, on-site septic tank is generally favored by governments because it helps keep density low. The feeling has been that a required septic field and repair area help keep lots large and thus, housing density down. The decision on the proper choice of wastewater treatment should not be adversely affected by individual lot coverage issues.

Those whose job is to select and design appropriate systems for the collection and treatment of sewage must bear in mind that European and North American practices, from which most of our current technology is derived, do not represent the zenith of scientific achievement, nor are they necessarily the product of a logical and rational process. Rather, our treatment choices today are the product of history, a history that started about 100 years ago when little was known about the fundamental physics and chemistry of the subject and when practically no applicable microbiology had been discovered. Mistakes, on top of mistakes, have plagued the wastewater treatment industry and our practices today are not necessarily what would be done today if we had the chance to start again.

The decentralized concept of wastewater management provides a framework for producing "alternative" systems which meet this need -- systems which in many situations may also be more fiscally reasonable, more socially responsible, and more environmentally benign than conventional practice. Stated most simply, the decentralized concept holds that wastewater should be treated-and beneficially reused, where this is practical-as close to where it is generated as practical to eliminate a costly pipe network that does nothing but move pollution from one place to another.

In fact, many in the wastewater field see management as a dichotomy in which the ONLY choices are individual on-site systems under the sole control of property owners, or a centralized sewer system. Therefore, when people think of decentralized management, they most often presume the discussion is about individual septic systems, and it is just this one extreme of that "dichotomy view" which the suggestion of decentralized management conjures up in their minds. On-site systems-especially "alternative" systems (like sand filter treatment and drip irrigation dispersal) which can cope with severe site limitations and effectively provide beneficial reuse-may indeed be components of an overall decentralized concept system that might include the use of several compatible technologies working together. However, the decentralized concept goes beyond merely managing individual on-site systems. The decentralized concept adopts a "continuum view" that expands the choices, filling the gap between on-lot systems and conventional, centralized systems.

Given the use of appropriate technologies, the decentralized concept offers several environmental, fiscal and societal benefits relative to both extremes of today's conventional practice. We need to pursue the many advantages of cluster systems here on the Outer Banks.



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