CHESAPEAKE ENVIRONMENTAL PROTECTION ASSOCIATION, INC.
P.O. Box 117, Galesville, Maryland 20765

NEWSLETTER Winter 2015-2016

PRESIDENT'S MESSAGE

By Al Tucker, President, 2015

Broadly speaking, CEPA's core interests remain the declining availability of source water resources (both quality and quantity), nutrient and pollutant infusion into the Bay, marine life sustainability, invasive species, effects of climate change, and effects resulting from unchecked population growth and irresponsible land development.

For this year's forum topic we have chosen to re-examine the policies that impact growth and their influence on the environment. At a past forum (2010) Tom Horton spoke about his study Going, Going, Gone!, which outlined the excessive environmental footprint of today's inhabitants of the Bay's watershed.

Unfortunately, the financial crisis pushed what would have driven critical environmental discussions into the background and delayed the significant actions that we need to take if we were going to return the Bay to a sustainable ecosystem. Tom rightfully pointed out that reducing the load on the Bay requires addressing two factors:

TMDL = (Daily Load per person) x (number of persons)

The Total Maximum Daily Load (TMDL) represents the goal scientists have determined that will produce a sustainable ecosystem. It is a fixed, constant immutable number, which is about 25% lower than the pollution produced today. The contribution of each person plus the additional persons added by growth will require everyone's environmental footprint to be constantly reduced to maintain the TMDL limit.

Reducing or maintaining the population will be extremely difficult. Currently, zoning classifications control development. The classifications were generally adopted during the period of explosive growth from 1971 to 2000. The developable land was generally classified into four broad categories: residential/agricultural, commercial, industrial and other. Often the undevelopable land was considered open space. As awareness of the environmental problems associated with development grew, layers of restrictions were placed on these categories for stormwater run-off, impervious surfaces, leaching from septic fields, deforestation, etc. In 1999 the State recognized the issues associated with explosive development and passed the Smart Growth legislation, which designated urban areas for priority funding. The goal of Smart Growth was to increase the population density in urban areas, where it would be easier to control the per capita pollution of the residents. Smart Growth would concentrate new development and redevelopment in areas that have existing or planned infrastructure to avoid sprawl. In return, counties could receive state aid for channeling development into these areas. However, for most counties, the land use designations from the era of high growth still persist today.

By law the general development plans for each county must estimate the population or number of households that each county can hold. This process is often referred to as "buildout". The process examines all the land in each category and determines which residential lots remain undeveloped. In theory this places a de facto limit on the population in each county. It is interesting to contrast how the processes for Anne Arundel and Calvert Counties were handled.

In 2008 Anne Arundel County estimated that only 20,000 undeveloped residential units remained and by 2020 the county would be fully developed. Comparing the patterns of development in Anne Arundel, since the implementation of Smart Growth, the data show that development continued at the same pace in in the non-priority areas with no shift to the higher density priority areas.

On the other hand, Calvert County was actively concerned about its ability to handle the projected growth of 54,000 housing units predicted by their buildout analysis in the mid-1990s. Fearing that the growth was a threat to their quality of life and their ability to pay for it, the county undertook the radical approach of downzoning, once in 1997 and again in 2006. The revised limit is now 37,000 units. Currently, Calvert is close to its buildout limit with 4000 units remaining. The downzoning was developed in conjunction with the transfer of development rights that compensated rural landowners for their development rights that were then transferred to the higher density priority funding areas. As a result, the growth in Calvert predominated in the priority funding areas. Another difference between the two counties is that Calvert is one of nine counties that use excise taxes instead of impact fees for new development. Impact fees are required to be spent on the infrastructure to support the new additional development, whereas excise taxes are not. Excise taxes can be used generally in the area of the development to support maintenance, recreation & parks, etc. This significant difference is that excise taxes are not limited to pay for new infrastructure. Impact fees drive new growth, create new infrastructure and requires other funding for maintenance and additional services.

The fiscal impact study of growth in Anne Arundel in 2009 clearly outlined what the planners in Calvert had anticipated a decade before. Namely, surpluses generated by projected

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growth "are insufficient to cover the estimated costs to correct the existing backlog of infrastructure needs." Stated succinctly, growth does not pay.

It remains to be seen how it will play out when the buildout limits are reached in each county. Each has chosen a different path. Calvert County has done an admirable job of channeling its increased density into its priority funding areas, where managing pollution is easier. In addition, Calvert has been able to meet its goals for open space and rural agricultural land preservation. In contrast, most of the development in Anne Arundel continues in the low-density areas. Anne Arundel County is significantly behind its goal for agricultural preservation. It is not clear that it will ever be able to meet the goal, since development has fragmented many large tracts.

The primary question is what do we want our future to be? Calvert County decided over two decades ago to make some difficult decisions that have changed their future. Anne Arundel, a much larger county, attempted to downzone. Anne Arundel instituted 20 acre rural zoning, but it contained an ill-conceived loophole, called family conveyances. It resulted in immediate subdivisions that were then sold on the open market or created many undeveloped lots in the rural zone. The loophole has been closed, but the damage has already been done.

Both counties are facing their buildout limits in the very near future. It remains to be seen whether or not Calvert will remain steadfast and move to a sustainable, equilibrium state or will it lift the current housing limits. Anne Arundel faces a different issue; it has only one choice, to upzone.

In the forum we intend to explore the following questions:

- How do local tax structures influence growth?
- Is growth predicated on future revenues from new properties?
- What should the tax structure be to implement an sustainable economy?
- Do we know the limits of our natural resources?
- Is current zoning adequate to protect our natural resources?

If you would like to contribute to the discussion, I invite you to send your questions and comments to me (altucker@cepaonline.org).

NEW DEVELOPMENTS IN BIOFUELS

By Gary Antonides

Ethanol in Gasoline.

A few years ago, almost all the ethanol in gasoline was produced from edible corn, but there was an expectation that cellulosic ethanol would become a major source as production techniques improved. This was eagerly anticipated by conservationists because producing ethanol from corn has many problems. It uses a lot of land that could be used for other food production. Corn uses a lot of water and fertilizer to produce, depleting aquifers and polluting streams and rivers. It uses almost as much energy to produce as it yields in combustion. However, in 2005 and 2007, Congress mandated that we use certain amounts of ethanol in our gasoline, increasing year by year, in order to decrease our dependence on foreign oil and reduce tailpipe emissions. Congress also recognized that cellulosic ethanol was environmentally friendlier and mandated that an increasing share of the required amounts be cellulosic.

Now the situation is quite different than what was anticipated. The U.S. is producing lots of oil domestically, but consumers are using less. The lesser amount of gasoline used requires less ethanol if we continue to use the 10% blend (E10) that is common today. But the mandated amounts, which were expressed as definitive quantities rather than percentages, are greater than we can use in E10. As a result, E15 (15% ethanol) has been approved for cars built after 2000. The ethanol industry, which has some of its more than 200 plants idle is, of course, all for that. The oil industry, understandably, is against it. But almost everybody acknowledges there are problems with E15. It can't be used in ATVs, lawn mowers, other small engines, boats, etc., and there are claims that only cars built after 2012 can use it. Some say that auto manufacturers will not honor warranties if E15 is used. Gas stations must install new pumps if both E10 and E15 are sold. Blending pumps could be used instead, but the hose would hold about 1/3 of a gallon of whatever the previous customer bought. It has been proposed that cars be required to buy at least 4 gallons of gas to dilute what may be in the hose. Labeling is apparently up to the states, and not all require labeling ethanol content. To solve some of these problems, the EPA requires "Misfueling Mitigation Plans." The EPA apparently has some flexibility in setting ethanol quotas lower than the original law requires. The regulatory details and nuances are complex, but the EPA does seem to be setting quotas that are favorable to ethanol proponents. Obviously, the land use, water use, and fertilizer use problems are exacerbated by producing more corn ethanol.

At present, we are still dealing primarily with corn ethanol because production techniques for cellulosic ethanol, which can be produced from corn stalks, switchgrass, and many other plants, and which does not use nearly as much water or fertilizer, have not improved as much as anticipated. But there are some new promising developments as reported below.

Cellulosic Ethanol.

http://www.nature.com/news/cellulosic-ethanol-fights-for-life-1.14856**,** March 2014, reports that pioneering cellulosic biofuel producers feel they need US government aid to break into today's tough market. As an example, when this report was written, Abengoa Bioenergy's cellulosic ethanol plant near Hugoton, Kansas, was about to start production, and its owners expected it to join a fermented-fuel revolution. Unlike conventional ethanol factories, in which yeast feeds on sugars in foodstuffs such as corn kernels, the Hugoton facility will make use of what is largely agricultural waste – the cellulose in thousands of tons of corn stover (the leaves, stalks and husks left over after the corn harvest) which is much less controversial than conventional corn ethanol. Ethanol made from corn stover produces at least 60% less greenhouse-gas emissions than gasoline, and making it does not require any extra farmland.

Abengoa is a multinational company from Spain, and its plant is one of three US facilities that were to start commercial production of cellulosic ethanol in 2014. (The others are both in Iowa). Yet just as the fuel is on the cusp of making it big, a glut in the market and government policies could choke its progress, in addition to the fact that producing cellulosic ethanol is difficult.

Producers must dismember large, indigestible molecules such as cellulose and hemicellulose to yield fermentable sugars. This requires the biomass to be ground up and pretreated with acids. A cocktail of enzymes must then be applied to chop up the tough biological polymers inside, and then yeast is added to the resulting sugars.

Corn ethanol is now slightly cheaper than gasoline, but cellulosic ethanol is more expensive than both. A cellulosic-ethanol plant's capital costs are roughly twice those of a corn-ethanol plant. Unable to undercut its rivals, cellulosic ethanol will be heavily dependent on the Renewable Fuel Standard (RFS). Yet the problems with cellulosic and its delayed production has prompted the EPA to reduce the amount of cellulosic ethanol that refiners are required to blend into their gasoline. The RFS plan for 2014 originally called for 100 times what the EPA eventually proposed. Groups working on renewable fuel say that producers will easily make more than that once they get going, and the expensive excess ethanol might have to be sold at a loss on the open market, potentially crippling the fledgling cellulosic industry.

Cellulosic ethanol could get cheaper with more efficient stover harvesting, beefier enzymes and cheaper pretreatments. The industry has already cut costs from as much as $9 per gallon five or six years ago to close to $2 today, says Thomas Foust, director of the National Bioenergy Center, part of the National Renewable Energy Laboratory in Golden, Colorado.

In 2014, there were 6 cellulosic ethanol plants in North America, designed to produce 30 to 114 million liters each:

Biological Process

Location	Product	Feedstock
Emmetsburg, Iowa	Ethanol	Corn Stover
Nevada, Iowa	Ethanol	Agricultural Residues
Hugoton, Kansas	Ethanol	Corn stover/Ag Residues

Thermochemical Process

Location	Product	Feedstock
Edmonton, Alberta	Methanol	Municipal Solid Waste
Columbus, Miss.	Gas/Diesel	Woody Biomass
Vero Beach, Florida	Ethanol	Ag/Municipal Solid Waste

Thermochemical Processes

The costs mentioned above apply to the "Biological" process in the above list. But some see more promise in a different approach to breaking up cellulose, the "Thermochemical" process mentioned in the above list. This process is a brute-force combination of temperature, pressure and chemistry. It can produce either a crude bio-oil (by means of pyrolysis) or a stream of carbon monoxide and hydrogen known as syngas (by means of gasification). After further treatment and refining with the help of chemical catalysts, both can be turned into hydrocarbons such as gasoline, diesel and jet fuel. Crucially, these can replace normal fuels with no adjustments to engines, and don't contribute to the oversupply of ethanol.

Thermochemical processes can also use lower-quality feedstocks, anything from wood chips to municipal solid waste. For example, the plant in Edmonton will be able to transform syngas into methanol, then methanol into ethanol, and it will hopefully be cheaper than corn ethanol. This is mostly because the feedstock is cheap, if they are not actually paid to take it. If there's too much ethanol on the market, producing syngas also gives the company a lot of flexibility. If there are changes to policy mandates or to the market, the system could be switched to making hydrocarbon fuels or higher-value chemical products.

Research funding is shifting to thermochemical methods. In 2013, an energy-department project to supply the US Navy with advanced biofuels provided funding for four facilities that will all use thermochemical methods to make drop-in fuels. Thermochemical processes are also used in the first two commercial cellulosic plants in the United States, in Columbus, Mississippi and near Vero Beach, Florida.

In spite of these advantages, the biological approach may still be able to compete by using ever-cheaper feedstocks, and a new generation of enzymes that can turn municipal waste into ethanol. A pilot plant in Spain was built to demonstrate this approach, which may be eventually be used in the US.

In http://www.nature.com/news/renewable-energy-biofuels-heat-up-1.15074, April 2014, Kim Krieger describes some of the specifics of this new generation of thermochemical plants. After biomass is heated to 900 °C, it gives off hydrogen and carbon monoxide (gasification). These gases can be turned into liquid fuels by Fischer–Tropsch reactors, such as the one in the figure, which was built by Velocys in Plain City, Ohio.

One of the efforts (unfortunately unsuccessful) to use the thermochemical process was in London. By the end of 2015, all British Airways flights out of London City Airport were to be fueled by the rubbish discarded by the city's residents. The rubbish was to be processed at a biofuels plant to be constructed on the eastern side of the city. Each year it was to turn some 500,000 tons of the city's waste into 60,000 tons of jet fuel, a similar quantity of diesel fuel and 40 megawatts of power. This level of output would hardly be noticed at conventional petroleum refineries, which typically generate as much product in a week, but gathering enough biomass to run a petroleum-scale refinery is impractical. For this reason,

many new biofuel reactors that take agricultural or other waste are small. The idea is that they can cut transportation costs by locating the reactors close to the feedstock. But it was reported in Sept. 2015 that the company contracted for this went bankrupt.

Thermochemical process proponents argue that novel catalytic techniques and compact designs will make these second-generation biofuel plants not just environmentally friendly, but also profitable enough to compete with petroleum-based fuels without subsidies. Commercial units have begun to spring up from Finland to Mississippi to Alaska. If these second-generation plants do succeed, they will have an advantage over their predecessors in that they create fuels in a low-carbon way that suits existing vehicles. Although fuel prices are low now, several years of historically high oil prices has spurred vigorous research into thermochemical reactors.

Gasification.

The most common thermochemical approach is gasification, in which carbon-rich materials such as coal, wood chips or municipal waste are heated to high temperatures (>700 C) in a controlled environment to produce synthesis gas or 'syngas', a mixture of mainly hydrogen and carbon monoxide. Usually, a limited amount of oxygen or steam is injected into the reaction chamber. The key is that combustion does not occur.

Some gasifier units vaporize the waste with jets of ionized plasma that heat the material to some 3,500 °C. Such torches are more energy intensive than other methods of gasification, but the plasma torches are better for municipal waste, whose contents can vary markedly, because the composition of the syngas can be kept consistent by adjusting the temperature of the torches. Consistency is important for optimizing the second step of the process, in which the syngas is sent into a chemical reactor where it undergoes the Fischer–Tropsch reaction, which fuses hydrogen and carbon monoxide into long-chain hydrocarbons.

The BioMax gasifier, developed by the Community Power Corporation in Englewood, Colorado, is small enough that four can fit into a standard shipping container, and can run on almost any kind of shredded biomass, from food scraps to cardboard to wood chips. The resulting syngas can then be used in place of natural gas for heating, cooling or electricity generation. A typical unit generates about 150 kilowatts, enough to power between 25 and 50 homes. And in the near future, BioMax units should be able to plug in a Fischer–Tropsch reactor and produce biodiesel as well. They hope to sell the units throughout Alaska and northern Canada, where electricity and transportation fuels are expensive.

Among the strongest selling points of the two-step gasification approach to biofuels is the fact that almost all the syngas gets turned into hydrocarbons of the kind that produce fuels that burn cleanly and completely. But that advantage has not kept researchers from exploring a single-step alternative. In the pyrolysis approach, the biomass is heated in the absence of oxygen to some 500 °C and converted into organic liquids directly. These liquids can then be refined into fuels using standard technology. Several companies are already testing the commercial viability of the technology. For example, Ensyn Technologies in Ottawa is marketing units which they would install next to lumber mills, where each one would be capable of turning waste wood into some 76 million liters of pyrolysis oil a year. That would be enough to warm 31,000 homes or to fuel about 35,000 automobiles. Green Fuel Nordic, from Finland, is planning to install at least one such unit in a Finnish town where it will process waste from the country's forestry industry.

The financial viability of any of the second-generation biofuel technologies is still an open question. For example, one of the world's most advanced pyrolysis biorefineries in Columbus, Mississippi. demonstrated its technical viability by producing some 3.5 million liters of gasoline and diesel fuel from wood waste in 2013. This is about as much as a conventional petroleum refinery produces in a day. Unfortunately, they expected to run out of operating funds last August.

https://www.wm.com/about/press-room/2010/20100303-energy-solutions-announces-plasma-gasification.jsp reports on a recent breakthrough in the gasification process. While this process has historically resulted in low yields, the University of Minnesota has recently developed a metal catalyst, which reduces the reaction time for biomass by up to a factor of 100.

It also points out that, in industrial settings such as steel milling and petroleum refining, large amounts of waste gas are produced. Rather than vent these toxic gases into the atmosphere, they are captured and used to produce syngas. Doing so not only benefits the environment, but the products derived can be sold or used in cogeneration facilities.

Syngas can be used for the production of Hydrogen, Nitrogen, Ammonia, Carbon Monoxide, Carbon Dioxide, Steam, Minerals and Solids, and Sulfur, depending on the original feedstock. Though synthesis gas need only contain hydrogen and carbon monoxide, it frequently contains other components as well. Microbial fermentation of syngas can be used to develop, among other things, Ethanol, Butanol, Acetic Acid, Butyric Acid, and Methane.

The benefit of fermentation is that it is simpler and takes place at lower temperatures than chemical conversion. Biologic fermentation can also tolerate high levels of sulfur, making it ideal for use in steel factories and power plants that burn coal. In general, the biologic process is simpler because it does not require careful control of reaction conditions. The biggest disadvantage is its low throughput. It takes days to produce what a thermochemical process can produce in minutes. Another advantage of gasification is that it is able to extract more energy (about twice as much) from the biomass as biological processes.

It is estimated that as much as 1.2 billion dry tons of biomass could be available for conversion to syngas in the U.S. by 2050. This would result in about 21 quadrillion BTU/year of energy, which is well above the 16 quadrillion BTU/year used in transport and roughly 21% of the total 98 billion BTU of energy used each year in the United States.

ALL ABOUT CHICKEN MANURE

By Gary Antonides

The excess amount of chicken manure generated by Maryland's chicken farms has been an issue with many twists and turns in the last several years. When used as a fertilizer, too much of it runs off into the Bay, resulting in, among other things, excessive amounts of phosphorous in the Bay. New requirements, especially those to reduce the amount of phosphorous in the Bay, have led to efforts to build manure-to-energy systems in Maryland. This could be a very positive development, but is complicated by Maryland's

Renewable Fuel Standard (RFS) which designates energy derived from manure as clean energy. This makes it part of the 20% clean energy that is mandated by 2025, reducing the amounts of other clean energy needed. And the amount of pollution in such a system depends on the technology used.

http://thinkprogress.org/climate/2015/11/18/3722590/maryland-chicken-manure-clean-energy/ explains that under Maryland's current renewable portfolio standards, chicken manure is classified as a "tier one" renewable resource, the same designation offered to things like wind, solar, and geothermal. To some, this is a smart compromise that allows Maryland to meet its renewable energy goals while dealing with the millions of tons of chicken waste produced each year by poultry farms. But to others, the rule gives factory farms an excuse for their pollution at the expense of public health.

"Burning chicken poop is not clean," says Taylor Billings, a field organizer with Food & Water Watch, a national group that opposes industrial-scale agriculture. "It's really toxic. It emits any chemical you can think of from carbon monoxide to sulfur dioxide. They are trying to burn chicken poop and trash and call it renewable energy."

In Maryland, with around 350,000 people employed in some aspect of agriculture, chicken farming is the largest commercial industry in the state. Within Maryland agriculture, poultry production accounts for 40 percent of Maryland's total cash farm income. Perdue, the country's third-largest producer of broiler chickens, is based on the Delmarva Peninsula where some 1,700 chicken farms are located.

Such large-scale poultry production leaves Maryland with around 650 million pounds of chicken manure each year. Some farmers use the manure, which is especially high in phosphorus, an important nutrient for plant growth, on their fields. But some manure from chicken producing operations or over-saturated fields makes its way into the Chesapeake Bay, where it stimulates the growth of algae and creates areas of low oxygen known as "dead zones." According to a 2012 report by the Chesapeake Bay Commission, 15 percent of the nitrogen and 36 percent of the phosphorus in the Chesapeake Bay comes from manure.

In 2010, the EPA established a pollution diet that required Maryland, as well as other states within the Chesapeake Bay watershed, to reduce the amount of nitrogen and phosphorous reaching the bay each year. As part of the state's phosphorous management plan, farmers stopped using chicken manure as heavily as fertilizer, turning to nitrogen fertilizer or using legume cover crops to add nitrogen to the soil. In 2011, Maryland legislators, looking for a solution to both the excess amount of waste and the pollution in the bay, added chicken manure to "tier one" of the state's renewable portfolio standard, putting the incineration of chicken manure in the same category as solar and wind. That same year, they also called for proposals for manure-to-energy projects.

The most common technology used to turn manure into energy utilizes incinerators that burn the manure to produce heat and energy. A 2013 report on the feasibility of manure-to-energy projects in Virginia conducted by the Center on Human Needs at Virginia Commonwealth University found that a large-scale chicken manure incinerator would result in a higher concentration of things like nitrous oxide, sulfur oxides, and particulate matter. Such pollutants have been shown to lead to an increased risk of asthma, cancer, heart disease, and other health impacts in surrounding communities.

However, an anaerobic digester, which is what was recently proposed for Maryland, creates energy by converting manure into methane gas. As of March, there are 247 manure-to-biogas operations being used on commercial livestock farms around the country. With anaerobic digesters, the only byproduct, other than methane, is carbon dioxide. Dangerous particulates are not released into the air as part of the process.

But Doug Myers, senior Maryland scientist with the Chesapeake Bay Foundation points to the fact that Maryland's renewable portfolio standard mandates that only 20 percent of the state's energy come from renewable resources, with 80 percent of Maryland's energy portfolio allowed for fossil fuels. "Even though they've listed anaerobic digestion and biogas as a tier one source, the existing sources like wind and solar feel like their slice of the pie is carved up even smaller, because there's such a small percentage going into the RPS," he said.

According to Myers, some environmental groups in Maryland wanted the renewable fuel standard to widen its renewable targets from 20 percent by 2025 to 40 percent by 2020. That has been met with a great deal of pushback from the fossil fuel industry. However, leading environmentalists and the renewable industry are pushing for 25 percent by 2020 in the upcoming legislative session. If the renewable portfolio standards were to be expanded, Myers said, there would be room for manure-to-energy projects as well as wind and solar.

The anaerobic digester plant proposed for Maryland's Eastern Shore is a joint effort between a New Hampshire-based company, AgEnergyUSA, and Perdue, and would cost $200 million. Officials with AgEnergyUSA are seeking support and legislation worth tens of millions of dollars for their project.

While some remain wary because little has come of previous plans for dealing with the Shore's poultry pollution, this one comes from a company with a prominent partner, EDF Renewable Energy, an arm of a French power company, that is already building a manure-to-energy facility in Colorado.

The anaerobic digestion plant they want to build near Salisbury could handle up to 200,000 tons of chicken litter a year, which is close to what officials estimate is the excess amount being spread on the Shore each year. Environmentalists like this process better than burning manure because of the much lower air pollution. With Perdue involved, farm groups sound cautiously hopeful. Lawmakers say they're inclined to be supportive, but want more details.

http://www.baltimoresun.com/features/green/blog/bs-md-poultry-litter-plant-20150320-story.html, March 22, 2015 gives some of the details of an anaerobic digester plant. It would use bacteria to extract methane-rich bio-gas for industrial use. The residue would be processed so that the bay-fouling nutrients in chicken waste could be separated and used in a more environmentally friendly manner. The nitrogen could be sold back to farmers as liquid fertilizer, which crops need every year, while the problematic phosphorus that's built up in Shore soils could be sold as peat moss.

This is not the first effort to build a manure-to-energy plant on the Shore. In 2013, also in partnership with Perdue, AgEnergyUSA made an unsuccessful bid for a contract to have the state buy electricity from a manure-burning power plant they would have built. The pair lost to a California company, Green Planet Power Solutions of California, a company that has never built such a facility. With just two years to go before it must begin generating power, the company has yet to apply for any permits from the Maryland Department of the Environment. Sen. Thomas Middleton, a Charles County Democrat and Chairman of the Finance Committee said he's convinced it can't meet the deadline and has asked the attorney general's office for an opinion on whether the contract can be nullified. The company's CEO is seeking an extension of the contract.

PROFILE OF A TRUSTEE

BILL KLEPCZYNSKI

Dr. William J. Klepczynski became a CEPA Trustee in 2004 and has been instrumental in establishing CEPA's website and in organizing our mailing list. He is serving on the Communications, Forum, and Groundwater Committees

He is an astronomer, having received a Ph.D in Astronomy from Yale University in 1968, an M.A. from Georgetown University in 1964, and a B.A. form the University of Pennsylvania in 1961.

Bill was formerly head of the Time Service Department of the U.S. Naval Observatory before he retired. There, he managed the USNO Master Clock, timing operations for the Global Positioning System (GPS), and time distribution systems that utilize communications satellites or other navigation systems for high precision synchronization of globally spaced timing centers. While at the USNO, he was involved with minimizing "light pollution" from nearby lights, a form of pollution not yet of much interest to CEPA and the environmental community.

He has been a member of the Institute of Navigation (ION) since 1963, served as Editor of the Journal of the ION, *NAVIGATION* from 1971 to 1978 and was President from 1987 to 1988. He was elected a Fellow of the ION in 2000.

He was an Association for the Advancement of Science Fellow (2005-2006) sponsored by the Institute of Navigation, and was assigned to the Space and Advanced Technology Office of the U.S. State Department. Prior to this he provided consultation for the Wide Area Augmentation System (WAAS) architecture and systems design for GPS, and analysis of the timing of the WAAS network. He is also Chairperson of the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) Consultative Committee on Time and Frequency Working Group on two way satellite time and frequency transfer.

He currently lives in Arnold with his wife, Gloria, and spends part of each winter near Portland , Oregon , where their son and his family live. He is also a member of the Annapolis Sail & Power Squadron and teaches public boating courses.

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