

**Queen Anne's County – Sanitary District  
Kent Narrows/Stevensville/Grasonville  
Wastewater Treatment Capacity Issue**

**Opinion Strategy – No. 1  
Short Term Option – Re-rating of Plant**

**Introduction** – The existing 3 million gallons per day (MGD) capacity at the County's Kent Narrows/Stevensville/Grasonville Wastewater Treatment Plant (KNSG) is now nearly fully obligated using the existing and estimated future capacity commitments (see below – 'Schedule A – Summation'). These commitments are calculated using a combination of the reported actual hydraulic flow through the plant and the reserved flow allocations for unbuilt development. The resulting estimates conclude that there is an insignificant amount of remaining available capacity.

Discharge of the plant is limited not so much by 'gallons', but by the 'pounds of nutrients' allocated to the plant via the Chesapeake Bay Total Maximum Daily Load (TMDL) program, which is a component of the 1972 Federal Clean Water Act. In accordance with the wastewater plant's current National Permit Discharge Elimination System (NPDES) permit, KNSG may only discharge 36,547 pounds of nitrogen and 2,741 pounds of phosphorous per year. Nitrogen is the primary constraining factor, and the existing plant is operating with the best available nitrogen removal technology. The NPDES permit is the subject of Federal and State review and renewal every five-years. The next renewal application is on November 1, 2023. These nutrient limits, known as the Waste Load Allocation (WLA), are assigned to the wastewater plant by the NPDES discharge permit. The controlling nutrient concentrations equate to 4 mg/l for nitrogen and 0.3 mg/l for phosphorous at the design flow of 3 MGD.

The KNSG Plant has demonstrated outstanding operating performance and specifically has a superior nitrogen removal record. As a function of the permit renewal of the plant, the quality of the discharge will be assessed along with the nutrient load reduction achievement. This exercise may result in a modest re-rating of the plant capacity based on its nutrient removal performance. This could yield a modest increase in the overall maximum capacity. It is, therefore, essential to realistically prioritize any performance re-rating capacity which may be gained. It is hoped that the re-rating will increase the flow-through capacity of the plant by 10 percent or an additional 300,000-gpd of capacity. If so, the maximum nitrogen concentration allowed would be reduced from 4.0 mg/l to 3.6 mg/l. To be eligible for this re-rating, an engineering analysis would have to be undertaken and reviewed by MDE.

Once this re-rated capacity is consumed, it will be very difficult and very expensive to add additional capacity, if that is even possible given the nitrogen constraint (pounds of nitrogen credits would have to be obtained from another source). In addition, capacity brings both debt and growth. New growth would be essential to fund the debt of a potential plant capacity expansion.

The following measures are suggested to be incorporated into the Comprehensive Plan to address both the short term (prior to the re-rating) and subsequent to the re-rating until such time a strategy to expand the plant further is developed, if such an expansion is deemed both feasible and desirable.

1. Reserve capacity for commercial uses
  - a. There remains considerable vacant lands in the Chesapeake Bay Business Park that hold insufficient capacity to develop as well as a lot in the Matapeake Professional Park.
  - b. Average allocation sold annually for commercial for the past 20-years ~7500-gpd (vs. ~25,000-gpd for residential).
2. Allow minor residential development
  - a. Minor subdivisions – 7 lots or less (or allocation equivalent, i.e., 1,750-gpd max per project)
  - b. Infill (should already hold a service commitment)
  - c. TRUE commercial apartments – zoning may need to be refined such that the apartments would be ancillary to the commercial, not the other way around.
3. Prohibit any further large-scale residential development.
  - a. Remove large vacant parcels from the growth area – rezone/downzone if required
  - b. And/or remove large S-3 parcels from the sewer service area or downgrade to S-4 or S-5 to acknowledge available treatment constraints.
4. Reserve capacity (130,000 gallons per day) to service Marling Farms and Dominion. Both subdivisions have been shown as problem areas for as long as Kent Island Estates and Romancoke.
  - a. Dominion seems to be the worse of the two areas given its age. It consists of 192 parcels of which ~150 are single family homes. Note there is some waterfront commercial potential there. Estimated capacity to serve is 50,000 gpd.
  - b. Marling Farms consists of 389 parcels of which ~340 are single family homes. Estimated capacity to serve is 80,000 gpd

<b>SCHEDULE A - SUMMATION</b>			
<b>KNSG Sewer Capacity Estimate</b>			
			<b>August-21</b>
<b>Current Parameters:</b>			
Current Total Permitted Treatment Capacity			3,000,000 gallons per day
Current 3-year Average Flow Through Plant			(2,346,783) gallons per day
Capacity Remaining - Overall			653,217 gallons per day
<b>Ongoing Projects Previously Granted Allocation</b>			
Residential Units	1,595 dwellings		(319,000) gallons per day
Commercial Projects	(176 commercial apartments, 169 hotel rooms, 56,000-ft2 other)		(88,660) gallons per day
Reserve for SKI Failing Septic Areas	1,140 dwellings & commercial		(242,155) gallons per day
Reserve for Commercial/Institutional Use (04-68) - approx	750,000 ft2 floor area		(57,370) gallons per day
<b>Capacity Remaining</b>			<b>(53,968) gallons per day</b>

## **Opinion Strategy – No. 2**

### **Long Term Options – Plant Capacity Expansion**

**Introduction** – The existing 3 million gallons per day (MGD) capacity at the County’s Kent Narrows/Stevensville/Grasonville Wastewater Treatment Plant (KNSG) is now nearly fully obligated using the existing and estimated future capacity commitments. These commitments are calculated using a combination of the reported actual hydraulic flow through the plant and the reserved flow allocations for unbuilt development. The resulting estimates conclude that there is an insignificant amount of remaining available capacity. Discharge capacity of the plant is currently capped by the ‘pounds of nutrients’ allocated to the plant via the National Permit Discharge Elimination System (NPDES) permit that fixes our Waste Allocation Load (WLA) at 36,547 pounds of nitrogen and 2,741 pounds of phosphorous per year.

Below are several explorable options to expand the capacity of the KNSG wastewater plant. Each option has its pros and cons. Each would require a modification of the discharge permit, which is a public process and depending on the level of concern and opposition, can take years to permit. A discharge permit is valid for five years. The current permit will renew on November 1, 2023 at which time a plant capacity re-rating may be under consideration (refer to Opinion Strategy No. 1). Permit re-applications are required ~18 months in advance of the permit renewal date. Any of the below options, if pursued, will need to be incorporated into the permit renewal process.

#### **Option 1 – Expand the Capacity of the Plant - Spray Irrigation**

This would require construction of new treatment facilities on the site of the current wastewater plant and would be very expensive. Agricultural lands would have to be purchased, pipes installed from the plant to the spray fields, and irrigation pivots constructed. The advantage of this option is that the flow would not count against our ‘nutrient budget’, in other words any nitrogen discharged on land via spray irrigation would not count against the 36,547-pound limitation. However, the acreage of the lands required are a direct function of the soil types, i.e. how naturally well drained they are (ponding and run-off would be strictly prohibited), and soils on Kent Island are typically poorly drained. As an example, Centreville requires 300-acres to spray 542,000 gallons per day on well drained soils.

Pros – Don’t need Nitrogen Credits

Cons – Most expensive option, need to expand the plant, need to run pipe to fields, need to buy fields, need to buy irrigation pivots. Need well drained soils to be effective. Unlikely to be able to spray year-round so would still have some impact on nutrient budget.

#### **Option 2 - Expand the Capacity of the Plant – Nutrient Credits**

This too would require construction of new facilities on the site of the current wastewater plant and could be very expensive, however, probably less than the spray irrigation option. However, this expansion could not be undertaken without additional nutrient credits. There are some sub-options in this regard:

A. Retirement of Existing Septic Systems – The SKI project is generating nitrogen credits. These credits could then be incorporated into the discharge permit (they don’t officially exist until incorporated).

Pros – While still very expensive, may be the least expensive option.

Cons – Need nutrient credits. Places the County at risk in assuming a great amount of debt to expand the wastewater plant with no commitment from future developers to purchase the allocation gained.

B. Upgrade of other existing In-County Treatment Plants – If the County were to upgrade another treatment plant within the County that is still operating at non-nutrient removal discharge levels, then the County could transfer the nutrient credits gained from that upgrade to the Kent Island plant. Only Church Hill has not upgraded its plant, and the cost per pound achieved is likely to be prohibitively expensive (you would have to build a new plant for Church Hill as well as add new treatment capacity at Kent Island).

Pros – Does not need nutrient credits

Cons – Very expensive option, requires another jurisdiction's approval and may likely require the County to operate their plant in perpetuity, or other perpetual considerations. Capacity gained would be minimal (assuming Church Hill would want twice their current capacity (80,000-gpd) for their own growth, only 120,000-gpd would be gained).

C. Trading – Approach another jurisdiction that may have unused nutrient credits that would be willing to sell/trade. This would require a perpetual trade agreement (i.e. the trade would have to be 'forever'). Unclear if such a trade has yet occurred, certainly not at the magnitude of pounds necessary to be of any value to the County.

Pros – Uses another jurisdiction's nutrient credits.

Cons – Many unknowns, trading is still in its infancy. Certainly, there will be a cost, most likely a perpetual cost, for the trade, and still need to expand the Kent Island plant. May not be enough credits available.

### **Other Considerations**

**Economics** – All of the above options cost something. There are two costs that need to be considered.

Cost per Pound of Nitrogen Removed – This should be the primary cost consideration in evaluating the various options. One suggestion is to add a new, or another type of technology, to the existing plant to remove more nitrogen. Hypothetically, you could add a reverse osmosis train to the end of the plant to remove 'all' nitrogen (although how would you dispose of the nitrogen enriched reject water – can't dump it in the sewer!). Reverse osmosis is quite expensive to construct and very expensive to operate – you need to generate intense pressure to force molecules through the filter membrane – pressure = energy. A similar analysis could be undertaken for each option. Any 'innovative' process will require MDE approval and may need a pilot project to demonstrate its effectiveness.

Cost per Gallon – Allocation is sold 'per gallon'. The 2021 rate 'per gallon' is \$36.73. The cost per gallon is set, in large part, to recover the cost to construct the plant's treatment capacity, or more to the point, to pay off the debt service on the new plant. If the cost of the new treatment plant is too high on a per gallon basis, new development may be unable or unwilling to pay that cost.

## **Debt**

All the above options cost something, which equates to debt that the County must pay, regardless of developer demand. The last 'expansion' of 1 million gallons (which was truthfully the construction of 3 million gallons of capacity as little of the existing 2-million-gallon plant was salvageable) cost \$34M – 45% of which was funded by grants. This equated to 20-years debt at \$1M per year. Prior to executing that construction contract, we already had an executed DRRRA with Four Seasons which guaranteed the payment of 1/3 of that cost. Even so, we had a very difficult time paying the debt until just recently. Indeed, we almost exhausted 30-years' worth of accumulated reserve funds to pay debt service. The cost of adding capacity is largely unknown. It is also unknown if any grant funds would be available to assist in the capital cost, past grant funds were solely to upgrade the plants nutrient removal ability, not to fund expansion, hence the 45% share.

## **SKI Nitrogen Credits**

Each time a septic system is connected to our plant, a few pounds of nitrogen credit is eventually earned. The amount credited is a function of the location of the septic system to tidal waters (i.e., in the Critical Area or not) or proximity to perennial streams. Once all 4 phases of SKI's septic systems are connected, the County will gain approximately 13,000 pounds of nitrogen credits. As noted above, those credits don't 'exist' until incorporated into the plant's discharge permit – so probably 10 years from now. This would equate to about 1 million gallons of flow. Note this only allows you to expand your flow, you still need to expand the capacity of the treatment process at the plant.

## **MS4 vs. SKI Nitrogen Credits**

The County remains in litigation with MDE on the implementation of the Municipal Separate Storm Sewer System (MS4) permit. Even so, it is a foregone conclusion that the County will not escape the permit, the litigation at this point is to seek clarity of certain aspects of the permit.

This permit is much like the County's sewer discharge permit except that it is designed to 'treat' rain runoff, not sewage. 'Treatment' of the runoff is via various, and numerous, (and costly) small ponds, constructed wetlands, and other naturally filtering features. If areas are currently untreated, the permit requires the County to 'treat' the runoff by constructing various features.

In accordance with the permit, as currently written, the County is required to treat 200-acres of existing impervious area by 2025. Note these are not impervious acres that the County owns, the vast majority is on private property. The estimated cost to achieve this (ignoring the fact it would take numerous private property owners permission as well as their lands) was estimated to be \$10 to \$15 million. In addition to the construction cost, there is also a perpetual maintenance obligation that the County would have to assume.

However, in lieu of actual treatment, the permit allows nutrient credits as an 'in lieu' method of treatment. The 'in lieu' computation is on a 'so many acres per retired septic system' basis. The current metric is 0.39 acres per septic system, however that metric is subject to change. Assuming it doesn't, that would equate to about 500 septic systems.