



# COMMONWEALTH of VIRGINIA

## DEPARTMENT OF ENVIRONMENTAL QUALITY

### PIEDMONT REGIONAL OFFICE

4949-A Cox Road, Glen Allen, Virginia 23060

(804) 527-5020 Fax (804) 527-5106

[www.deq.virginia.gov](http://www.deq.virginia.gov)

L. Preston Bryant, Jr.  
Secretary of Natural Resources

David K. Paylor  
Director

Gerard Seeley, Jr.  
Regional Director

August 27, 2008

Dr. Lynton S. Land  
PO Box 539  
Ophelia, VA 22530

Dear Dr. Lynton S. Land,

Thank you for your email which was received by DEQ on July 3, 2008 and your addendum email which was received on July 13, 2008. We appreciate and value your concerns as a citizen of the Northern Neck area. We regret that you were unable to attend the two final meetings DEQ hosted on June 18th, 2008 at the Blake T. Newton Library in Hague.

The following numbers address the comments in your letter received by DEQ on July 3rd. Your comments are underlined in italics and are followed by DEQ and Map Tech's answers in bold;

Comment 1) *The sources of bacteria are not identified with any certainty in the report and a massive source of bacterial contamination, namely the land application of sewage sludge, is completely ignored.*

**DEQ Response:** Some sources are identified with a high degree of certainty (e.g., the shoreline survey), while others are identified more generally (e.g., human, pet, livestock and wildlife based on BST results). It is beyond the scope of a typical fecal bacterial TMDL to identify each specific source, as they vary over time (e.g., herd sizes, failure and repair of septic systems, and human populations). So, sources are identified in more general terms, and addressed through a process of staged implementation. DEQ has checked biosolids applications for the year of 2004 in the Lower Machodoc watershed. That information is discussed in answer #11 below, and we will add a statement of findings regarding biosolids in the report. However, this information would not change the TMDL allocations because they are based on in-stream fecal coliform monitoring data rather than land-based biosolids applications. The instream fecal coliform data should reflect any transport of applied biosolids to the shellfish waters.

Comment 2) *The technique of BST (Bacterial Source Tracking) used, namely ARA (Antibiotic Resistance Analysis) is not adequate... No single technique of*

BST (which is more properly labeled MST, or Microbial Source Tracking) is satisfactory at this stage of our knowledge.

**DEQ Response:** Each BST (or MST) technique, and specifically ARA, is one general tool among many for assessing bacterial water quality. The results should not be considered as precise. However, the ARA source information can be very useful when considered with land use, VDH sanitary surveys, VDH fecal coliform sample data and human/mammal/bird population and fecal bacteria loading data. Considering the number of bacteria TMDLs being developed, DEQ considers ARA the best MST technique available to supplement the watershed information. This information, combined with the input from residents who have personal knowledge of the watershed is used to identify sources.

**Comment 3)** Without confirmation using other techniques, the "identifications" that have been made are not believable. For example, Tables 4.3 and 4.4 show tremendous variation for two very closely spaced stations in Lower Machodoc Creek through the year. It is impossible that such wide temporal variations in the source of bacterial contamination are real in the relatively uninhabited headwaters of the creek.

**DEQ Response:** The two "very closely spaced stations" have approximately a 2-fold difference in drainage areas. With one station draining approximately twice the area of the other, differences in results are not surprising. Another explanation for the temporal variation is due to "clumping" of the bacteria in a particular sample. For example, two 100-ml samples collected in the same location, but with one sample capturing a recently deposited microgram of raccoon scat (approximately 1 billion colonies per gram). This would result in a difference of 1,000 cfu/100 ml. Given that potential level of variability, the results from the two stations are remarkably similar.

Tidal movements also affect bacterial results. Station 5-23 lies just downstream of a high percentage of agriculture and wildlife land use. You could expect to see high agriculture and wildlife inputs in samples collected on outgoing tides. At station 5-20, which is located downstream of high residential concentrations surrounding Drum Bay and Chatham Village Road, you could expect higher human inputs due to the residential land use when samples are collected on the outgoing tide. We have not considered tidal variances. Comparing the MST data per station to the land use data map and percentages, the MST data supports what one could expect to find as chief sources of fecal coliform bacteria.

Stations 5-23 and 5-20 are actually not located in "relatively uninhabited headwaters" as suggested in your comments. Looking at the land use map compared to the condemnation map illustrating the location of these stations, station 5-23 is located between two highly residential areas just upstream of Drum Bay. Station 5-20 is just downstream of Drum Bay and is likely receiving upstream human input of the high residential land use area (near Chatham Village Road) which lies just north of this station and inputs from Drum Bay as well. This may be why there is a lower MST human input average (16%) upstream of

Drum Bay at station 5-23, and a higher MST human input average (26%) downstream at station 5-20.

Comment 4) No correlation between human and pet contamination exists, which would certainly be expected.

**DEQ Response:** Correlations between bacteria sources are a function of fate and delivery, as well as association among species. For instance, a straight-pipe or failing septic system that is in close proximity to the shore will provide a relatively constant input of human fecal matter to the stream as compared to dog feces that are deposited in upland locations and wash off during rainfall events. Although one might expect a correlation between pet and human contamination because of their close association with each other, but the delivery mechanisms can be very different.

Comment 5) There is no indication that "blind duplicate" samples were analyzed, nor is there any suggestion that "known" sources of bacteria were analyzed as "unknowns" in order to test the procedure.

**Response:** The ARA process was thoroughly assessed, as documented in:  
<https://www.deq.virginia.gov/tmdl/pdf/bstreports/122005bst.pdf>

Comment 6) *It is obvious that either the estimates of wildlife contribution are wildly inaccurate, or, more likely, the ARA data are flawed.*

**DEQ Response:** Your statement is based upon adding up the estimated number of animals (all species) within groups (i.e., human, livestock, pet, and wildlife) and determining a percentage per group. These percentages were then compared to the percentages resulting from the ARA analysis. This approach is different from the one used because it does not consider the differences between species in:

- production of fecal matter,
- concentration of bacteria in fecal matter,
- fate of fecal matter on land, and
- delivery mechanisms to the stream.

ARA measures the relative contribution of bacteria to the water body from the source groups. These percentages would not relate directly to the number of animals in the watershed, unless each type of animal produced the same amount of feces, containing the same amount of bacteria, and the fecal matter was deposited on the same land areas or delivered to the water body in the same manner.

Comment 7) The number of residences in the headwaters of Lower Machodoc Creek is very much lower than in areas where residential development is much higher (Figure 3.1), but the bacterial contamination of the headwaters is highest, suggesting that human and pet contamination are unlikely to be significant.

**DEQ Response:** Another factor that influences the differences in fecal bacteria concentrations in upstream vs. downstream areas is dilution. The same amount of bacteria delivered to a smaller water body (headwaters) will produce higher concentrations than those produced when that same amount of bacteria is delivered to a larger water body (main stem). Figure 3.1 indicates a significant amount of residential development as well as agricultural lands upstream from stations 5-20 and 5-23. Residential and agricultural lands may have significant inputs from both human and pet sources, as in the case of a straight pipe or septic failure from a farm home, or hunting dog kennels near the waterbody. While station 5-8Z has less residential development upstream, there does appear to be development adjacent to and just downstream of the station. In a tidally influenced area, sources “downstream” can influence “upstream” conditions during the flood tide. Additionally, the shoreline survey indicates that 2 marinas are present in Branson’s Cove.

Comment 8) *A map of actual residences would emphasize this point, but is not presented.*

**DEQ Response:** We do not currently have access to a map of actual residences in the Lower Machodoc watershed. We do however have access to aerial photography. In order to adequately view maps of homes using aerial photography, one must use a fine resolution which would result in many maps to cover the entire watershed. To include this in the report would likely increase it greatly in size.

Human and pet bacterial loads are calculated from the census population data, as are the number of actual residences. In the development of the TMDL report we investigate what the most probable contributors are within the watershed. The land use map identifies certain areas as “urban” which indicate that we may expect higher human and pet sources of bacteria in that portion of the watershed.

Comment 9) *DEQ is remiss in ignoring a massive source of human bacterial contamination, namely the land application of Class B municipal sludge. “Biosolids,” a euphemism for municipal sewage sludge, appears on p.vi, but nowhere else in the document, as it should, e.g. on p. 3 and 19, and in Appendix A. Only Amelia, Dinwiddie, Culpeper, Buckingham, and Fauquier Counties received more sewer sludge in 2004 than did Westmoreland County, according to Table D1 in 2005 House Document No. 89, “Review of the Land Application of Biosolids in Virginia” authored by the Joint Legislative Audit and Review Committee. According to that document, Westmoreland County received 10,770 dry tons of sludge in 2004. DEQ does not present a map/table of the fields that received sludge, or acknowledge the magnitude of sludge disposal, which constitutes a major and unacceptable omission. Given the large amount of agricultural cropland east of Lower Machodoc Creek and around its western arm, it is highly likely that sludge (or poultry litter) was applied within the watershed. It is certain that sludge was applied to fields within “gull range” of the watershed” ...Any competent microbiologist will*

certify that, given the immense numbers of bacteria involved and the large number of vectors (raccoons, other vertebrates, gulls, other birds, runoff, etc.), bacterial contamination of waterways from fields where sewage sludge is applied is a certainty.

**DEQ Response:** It is quite possible that 10,770 dry tons of biosolids were applied in all of Westmoreland County in 2004, as the report states. However, within the area of the Lower Machodoc watershed, about 110 dry tons of biosolids were applied to approximately 82 acres in 2004. DEQ evaluated the location and timing of the applications and compared them to the VDH – DSS monitoring data to see if applied biosolids might have affected the fecal coliform results.

The DSS data indicated that on 8/4/04, 11/3/04, and 12/2/2004 there had been elevated spikes in fecal coliform bacteria at monitoring stations 22 and 24. These three sample dates elevated the 2004 average fecal coliform values at these stations. The rest of the monthly fecal coliform results were lower in comparison. These stations were downstream of fields where biosolids were applied in 2004 near non-tidal portions of Thompson Branch and an upstream section of non-tidal Lower Machodoc Creek. Two different biosolid applicators provided us with the records for two different farm location applications within the watershed. Both farms had some field applications which were relatively close to if not directly adjacent to the receiving waters of the Lower Machodoc. The first farm evaluated had received biosolids applications in March and April of 2004, four months before the large fecal coliform spikes occurred. In March, April, and May of 2004, the DSS fecal coliform samples taken at stations 22 and 24 below these fields following applications had much lower bacteria concentrations than those of the spike dates. The second farm received land applied biosolids on 1/20/04, 2/5/04, and 12/30/04. In the DSS fecal coliform sample of February of 2004, stations 22 and 24 had their lowest bacteria numbers for all of 2004. The 12/30/04 biosolid application date follows the date of the spike in December, and the VDH-DSS sample date of 1/5/05 at stations 22 and 24 showed much lower values. Therefore, it is unlikely that biosolids applied in January, February, March, April, and in late December 2004, were major contributors of fecal coliform bacteria to the Lower Machodoc watershed in August, November and early December 2004.

Regarding your gull vector statement, DEQ is unable to differentiate human source fecal coliforms delivered by gulls from the more standard vectors of septic failure, straight pipes, pit privies or boat discharges. Therefore we target these potential sources in the TMDL.

Comment 10)

If “The TMDL seeks to eliminate 100% of the human derived fecal component...” (p 27) then there can be no excuse for not banning the land application of sewage sludge in the watershed, and, indeed, within “gull-range” of all impaired waterways in the State...A ban would”...eliminate 100% of the human derived fecal component...” from this source.

**DEQ Response:** When properly treated, stabilized, and land applied, DEQ has found that biosolids applications typically do not result in fecal coliform water quality standard violations. This is further validated by the 2004 biosolids application example you cited in Lower Machodoc Creek. DEQ does not promulgate state or local laws regarding biosolids. A ban of biosolids would require legislature by the General Assembly.

Comment 11 addresses the information in your addendum letter, which was received by DEQ on July 13, 2008.

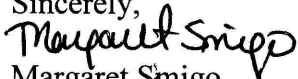
Comment 11) *In addition to taking into account the bacterial pollution caused by the land application of sewage sludge in the Lower Machodoc watershed, DEQ must also consider the land application of poultry litter as a certain additional source of bacteria. ... Additionally, this message is copied to Ms. Betsy Bowles to ensure that DEQ makes the above-cited publication available to the Technical Advisory Committee now convened to address the land application of poultry litter, the vast majority of which is currently unregulated.*

**DEQ Response:** Upon reviewing our poultry litter transfer record data, DEQ staff found no records of poultry litter being transferred into the watershed in question. The Department began collecting the litter transfer information in 2001.

The current permit regulation is under a regulatory action in order to establish requirements for end-users of poultry waste to ensure that poultry waste is being used in a manner in which state waters are being protected and nutrients losses are being reduced and that these reductions can be measured.

A Technical Advisory Committee comprised of stakeholders has been formed and is currently working on draft regulatory language to include requirements of end-users of poultry waste. To date the committee has not finalized their recommendations to the staff and the State Water Control Board regarding this regulatory action. The staff and committee recommendations will be presented to the Board once complete and the draft proposed regulatory language will go through the public comment process.

Again, we appreciate your questions and hope that we have answered them to your satisfaction. Should you have further questions or comments please do not hesitate to contact me at my office (804)527-5124 or via email at [mjsmigo@deq.virginia.gov](mailto:mjsmigo@deq.virginia.gov).

Sincerely,  
  
Margaret Smigo  
DEQ - Piedmont Regional  
TMDL Coordinator  
4949-A Cox Road  
Glen Allen, VA 23060