

The June 2008 draft DEQ document “Lower Machodoc Creek Total Maximum Daily Load (TMDL) Report for Shellfish Condemnation Areas Listed Due to Bacteria Contamination” purports to identify the source(s) of bacterial contamination so that they can be reduced at some future, unspecified, date. 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.

The technique of BST (Bacterial Source Tracking) used, namely ARA (Antibiotic Resistance Analysis) is not adequate, as I pointed out previously to both DEQ and EPA on 03/16/05 (file “TM2DEQ\_EPA.pdf” posted on the “Impairment of Waterways” page at [www.VaBayBlues.org](http://www.VaBayBlues.org)). No single technique of BST (which is more properly labeled MST, or Microbial Source Tracking) is satisfactory at this stage of our knowledge. Without confirmation using other techniques, the “identifications” that have been made are not believable, and certainly would not survive scrutiny in a court-of-law. 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. No correlation between human and pet contamination exists, which would certainly be expected. 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. Blind replication and analysis of standards as unknowns are always accomplished by competent researchers, especially when an analytical method such as ARA is in such question, but no evidence is presented of any rigorous quality control.

Table 3.1 presents presumed estimated animal populations and failed septic systems for the watershed. Wildlife constitute the most common potential source of bacteria. In contrast, the ARA results (Table 4.6) show bacteria from wildlife to be the smallest contributor to contamination. It is obvious that either the estimates of wildlife contribution are wildly inaccurate, or, more likely, the ARA data are flawed.

	Table 3.1		as a %	Table 4.6 ARA %
Human	39	=	39	22
Wildlife	288 + 122 + 566 + 391	=	1367	10
Pets	190	=	190	31
Livestock	30 + 10 + 45 + 105	=	190	37

Figure 3.1 suggests that, as is typical of these kinds of waterways, most human habitation is nearer the mouth of the waterway than to its headwaters. Yet the concentration of bacteria in the creeks always increases toward the headwaters, where the human population is lowest, where salinity is lowest (minimizing a lethal stress on the bacteria) and where wildlife or contamination from agricultural practices certainly dominate. This is clearly shown in Figures 4.2 through 4.6, where the highest bacterial concentrations are always found the furthest from the mouth of the creeks. Samples 5-24 and 5-22 have the highest bacterial levels of all samples in the area. In Branson Cove, station 8Z is more contaminated than station 8, and in Cabin Point Creek, station 12

exhibits the highest local concentration of bacteria. 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. A map of actual residences would emphasize this point, but is not presented.

As a senior scientist, I conclude that not only should the ARA data "... not be considered precise." (p. 20), they are worthless and do not constitute meaningful or defensible documentation of the source of bacteria.

DEQ is remiss in ignoring a massive source of human bacterial contamination, namely the land application of Class B municipal sewage sludge. "Bio-solids," 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 sewage 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.

Sludge from Blue Plains contains approximately 400 fecal coliforms per dry gram, so a typical truck containing 20 tons of wet sludge (4 tons of dry sludge assuming a moisture content of 80%) disposes of over a billion coliforms/acre, assuming an application rate of one truckload/acre. 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.

Appendix A (Section E) states numerous times that a potential source of bacterial pollution is when "Manure rots in the field." But sewage sludge as a potential source of bacterial contamination is not mentioned. 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, as I have pointed out repeatedly to officials (correspondence posted on the "Harvesting Shellfish" page at [www.VaBayBlues.org](http://www.VaBayBlues.org)). Importing fecal coliform bacteria into Westmoreland County, largely from out-of-state, and simultaneously trying to eliminate contamination from those same bacteria is obviously counter-productive. A ban would "... eliminate 100% of the human derived fecal component ..." from this source.