Agricultural Working Group #2 Handout

Chickahominy River and Tributaries – Implementation Plan Development

Henrico, Hanover, New Kent, Charles City Counties and City of Richmond, VA

Our Task

Include all stakeholders in order to develop a plan to install Best Management Plans (BMPs) that will reduce bacteria entering the impaired water bodies.

Primary Roles of Agricultural Working Group

- Assist in determining types and extent of needed BMPs
- Assist in determining cost for each BMP
- Identify economic incentives/hardships with each BMP
- Identify technical and financial resources to carry out implementation plan
- Report findings to Steering Committee

Goals of Meeting

- Discuss revised estimates of implementation measures that will result in reductions in Agricultural bacterial loads.

Discussion

- What are the educational needs? How can they be assembled into a BMP?
- What alternative funding sources are available?
- How can we get residents interested in the project? By what "vehicle" should we convey our message?

Total Maximum Daily Load (TMDL) Study Results

Segments on the Chickahominy River, Collins Run, Beaverdam Creek, Boatswain Creek, and Stony Creek do not meet water quality standards (WQS)for bacteria. These standards are designed to identify waters that are not suitable for "primary contact recreation" (swimming) because of the risk of illness. The TMDL study identified the sources of bacteria and how much each source category needs to be reduced to restore water quality. A watershed approach was followed during allocation in determining the needed reductions in bacteria loads to streams in order to meet the water quality standards. In the watershed approach, the same percentage reduction is applied throughout the entire watershed and the resulting improvement in simulated water quality conditions is assessed at all impaired subwatershed outlets. Additional reductions to sources are modeled until simulated water quality conditions meet the standard at all impaired subwatersheds. Simulated water quality conditions were compared to WQS at 11 locations including impaired subwatersheds, previously developed

TMDLs, and outlet of entire study area. The area of interest in this IP is the entire drainage area of the **non-tidal** Chickahominy River.

The implementation plan will outline a staged approach to meet the reductions to human, pet, and agricultural sources determined in the TMDL study. Wildlife is considered a background condition and reductions to wildlife bacteria loads are not explicitly addressed in the TMDL implementation plan.

Accounting for BMPs Installed

It is recognized that the SWCDs/NRCS have been working in the watershed to establish Best Management Practices (BMPs) that are both cost-effective and beneficial to the farmer and the environment. Table 1 was created from the DCR Ag BMP database website (http://dswcapps.dcr.virginia.gov/htdocs/progs/BMP_query.aspx). Costs listed in Table 1 are obtained by averaging costs per practice from the DCR database. Watershed-wide **streamside fencing** values were accounted for in Table 2.

Table 1. BMPs Already Installed.

	CHARLES CITY, COUNTY			HANOVER, COUNTY			HENRICO, COUNTY			NEW KENT, COUNTY			All		
Row Labels	**Sum Extent**	**Sum Cost**	**Count Extent**	**Sum Extent**	**Sum Cost**	**Count Extent**	**Sum Extent**	**Sum Cost**	**Count Extent**	**Sum Extent**	**Sum Cost**	**Count Extent**	**Sum Extent**	**Sum Cost**	**Count Extent**
Animal waste control facilities				2	37032	2							2	37032	2
Composter Facilities				1	3672	1							1	3672	1
Continuous No-Till System	289.4	28940	10	475.69	47569	36	292.5	29250	23	568.3	56830	21	1625.89	162589	90
Grass filter strips	2.75	613	2										2.75	613	2
Harvestable Cover Crop				109.9	2747.5	3							109.9	2747.5	3
Idle Land/Wildlife Option and Idle Tobacco Land	7	1050	1										7	1050	1
Integrated Pest Management				111.1	858.3	8							111.1	858.3	8
Late Winter Split Application of N on Small Grains	428.1	1878.45	17				200	935.85	5	692.7	2866.2	15	1320.8	5680.5	37
Legume cover crop	379.2	13272	4							143.3	5015.5	3	522.5	18287.5	7
Long Term Continuous No-Till Planting System	1123	28075	31							989.3	24732.5	23	2112.3	52807.5	54
Nutrient Management Plan Implementation and Record Keeping	5598	20548.2	142	3376.7	12726.9	122	1017	4522.8	29	5712.8	21740.7	171	15704.5	59538.6	464
Nutrient Management Plan Writing and Revision	6304.3	12737.3	163	5201.94	12671.5	225	1262.3	2681.2	41	6551.3	13102.6	158	19319.8	41192.7	587
Permanent Vegetative Cover on Cropland	131.3	23171.2	10							91.8	17111.2	8	223.1	40282.5	18
Protective cover for specialty crops				76.2	1022.92	10	79.8	1150	4				156	2172.92	14
Reforestation of erodible crop and pastureland										2.3	402.5	1	2.3	402.5	1
Sediment retention, erosion or water control structures										1	23895	1	1	23895	1
Sidedress Application of Nitrogen on Corn	913.8	5482.8	13	41.5	249	2	218.1	1155.6	2	449.4	1540.4	10	1622.8	8427.8	27
Small Grain cover crop for Nutrient Management	1593.7	36322	33	461.6	15126	36	162.2	4036	7	1620.5	56520.5	51	3838	112004.	127
Soil Test in Support of Nutrient Management Plan				1	1431.9	1							1	1431.9	1
Stream Exclusion With Grazing Land Management				1435	37613.8	1				1800	40761.6	12	3235	78375.4	13
Three Year Small Grain Cover Crop										75.8	3411	3	75.8	3411	3
Grand Total	**16770.**	**172090.**	**426**	**11293.6**	**172720.**	**447**	**3231.9**	**43731.**	**111**	**18698.**	**267929.**	**477**	**49994.5**	**656472.**	**1461**

Streamside Fencing for Cattle

In order to reduce direct bacteria from livestock, some form of livestock stream exclusion is necessary. Streamside fencing eliminates direct livestock bacteria loads, prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from pasture, and establishes (with the growth of streamside vegetation) one of the foundations for clean water. The inclusion of a buffer helps to reduce bacteria, as well as other possible pollutants, in runoff. The incorporation of effective buffers could reduce the need for more costly control measures.

To estimate fencing requirements, the stream network was overlaid with land use. Stream segments that flowed through or adjacent to pasture were identified. If the stream segment flowed through the land-use area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the pasture area; it was assumed that fencing was required on only one side of the stream. Not every land-use area identified as pasture has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. This may result in fencing needs estimated in an area that does not have cattle on it. All streams were used in the analysis including perennial and intermittent streams. Final fencing locations identified by geographic information systems were compared with the aerial photography of the entire watershed which resulted in removal and addition of segments based on what was identified as pasture from the aerial photography. A total of 3,235 ft of fencing is already installed in the watershed (DCR Ag BMP database). A total of 7% per year of the fencing length is assumed to need maintenance during the project. An average length of 840 ft per system was estimated for the districts intersecting the Chickahoming watershed using the DCR database. Also, an average cost of $7,800 per system was estimated using the same database for districts intersecting the Chickahominy watershed.

Table 2 shows a summary of total completed fencing to date and proposed new fencing. Table 3 shows the proposed fencing length by subwatershed, hydrologic unit, and county. A county only summary is given in Table 4.

Table 2. Total watershed Estimated Stream Fencing Installed and Needed.

Method	Estimated Fence Length Needed (ft)	Cost-Share Fence installed (ft)	Total Fence Length Needed (ft)	Fence Maintenance (7% annually) (ft)	Streamside Fencing Systems Needed (LE-1T, LE-2T, SL-6 or WP-2T)
Using all streams intersecting pasture and verifying with aerial photos	**127,695**	**3,235**	**124,460**	**8,712**	**148**

Table 3. Subwatershed, HU, County level estimates for needed fencing length (ft).

TMDL sub	total length (ft)	County	DCR 14 digit HU
1	4926.299	New Kent	JL24
2	516.387	New Kent	JL23
4	4776.195	Charles City	JL23
5	1257.975	Charles City	JL23
6	5269.6	Charles City	JL22
7	3200.917	2782.525 ft in New Kent, 418.392 ft in Henrico	JL20
8	6767.614	2879.032 ft in Hanover, 3868.914 ft in New Kent	5671.053 ft in JL20, 1096.561 ft in JL19
9	1004.829	Henrico	JL19
10	7611.775	6043.441 ft in Henrico, 1555.064 ft in Hanover	JL19
12	3125.983	1910.039 ft in Richmond, 1215.944 ft in Henrico	JL19
13	10.34		
14	383.733	Henrico	JL17
15	6357.025	874.742 ft in Henrico, 5482.283 ft in Hanover	JL17
16	18127.53	5278.094 ft in Henrico, 12839.407 ft in Hanover	JL16
19	9890.129	Charles City	JL24
22	13332.87	13213.806 ft in Henrico, 119.062 ft in Charles City	JL21
23	1812.355	Henrico	JL20
25	4705.322	Hanover	JL19
26	12204.25	2076.526 ft in Richmond, 10127.719 ft in Henrico	JL18
27	22414.07	Hanover	JL17

Table 4. County level estimates for needed fencing length (ft).

County	pasture (acre)	crop (acre)	Horses	Beef	beef calves	fencing length on ALL pasture intersecting any streams (ft)
Charles City	2,181	2,064	162	49	72	21,313
Hanover	8,202	3,438	600	160	123	49,875
Henrico	7,983	3,421	729	214	172	40,383
New Kent	4,737	3,346	325	86	91	12,094
Richmond	145	30	45	15	14	3,987
total	*23,247*	*12,299*	*1,861*	*524*	*472*	*127,695*

Agricultural BMPs Needed

Through modeling, it was concluded that fencing out livestock will not be enough to meet the water quality standard at all impaired segments. In order to meet the water quality standards, additional BMPs are needed that treat or prevent bacteria from traveling to surface waters. Table 5 shows the estimated needs of agricultural BMPs in the watershed.

Table 5. Estimated Agricultural land-based BMPs Needed.

Control Measure	Unit	Units Needed	Cost per Unit ($)	Source of Cost estimate
Conservation Tillage - Cropland	acre	419	$100	James River/Richmond IP
Retention Ponds - Cropland	acre	3,000	$200	Previous IPs (low?)
Vegetated Buffer - Cropland	acre	14.5	$360	James River/Richmond IP
Composting - for waste of 950 horses (assuming 5 horses per system results in 190 systems)	Systems	190	$3,000	James River/Richmond IP
Improved Pasture Management	acre	20,000	$150	James River/Richmond IP
Retention Ponds - pasture	Acre - treated	15,000	$200	Previous IPs (low?)
Stream Exclusion With Grazing Land Management	Foot systems	127,695 148	$7,800	DCR database average
Reforestation of Erodible Cropland	acre	615	$154	James River/Richmond IP
Reforestation of Erodible Pasture	acre	1,160	$154	James River/Richmond IP
Fence Maintenance	Foot/year	8,712	$3.5	James River/Richmond IP

Questions for the group:

- Cost of ponds provided was extremely high. The ponds intended in this practice are simple ponds that utilize available gradient. Similar work is described in the Journal of Soil and Water Conservation. The cost did not exceed $8,000 and the watershed treated was 430 acre coming up to around $20 for each treated acre. We are using 10 times that much in proposing $200 per acre treated. Please discuss.

Steering Committee Representation

So far, we have the following volunteer(s): (Mr. Houston - citizen) houston4@comcast.net; (Christine Beish - citizen) christinebeish@gmail.com, (**Sharon Conner** – Hanover SWCD) slconner@hanovercounty.gov; mark.alling@deq.virginia.gov (DEQ); ram.gupta@dcr.virginia.gov (DCR); Megan.Sommers@dcr.virginia.gov (DCR); Margaret.smigo@deq.virginia.gov (DEQ); (Major Mansfield) jeanandmajor@aol.com; (Jody Bryan – citizen) jmb823@gmail.com; (Olivia Hall – Henrico Co.) hal57@co.henrico.va.us.; james.beckley@scientist.com (participating as a citizen). We greatly appreciate your time and participation!!

Table 7. Estimated livestock populations in areas contributing the Chickahominy River and Tributaries watershed study area.

Sub-watershed	Dairy Repla-cements	Horse	Sheep	Hog	Beef	Beef Calves
1	0	63	0	0	15	22
2	0	26	0	0	6	8
3	0	0	0	0	0	1
4	0	0	0	0	1	2
5	0	36	0	0	12	19
6	0	124	0	0	33	47
7	0	110	5	0	24	25
8	0	101	7	0	43	32
9	0	30	0	0	6	5
10	0	164	6	0	71	52
11	0	8	0	0	3	3
12	0	35	1	0	17	15
13	0	22	2	0	6	4
14	0	63	5	0	30	23
15	0	54	4	0	23	18
16	0	236	9	0	76	56
17	0	0	0	4,440	0	0
18	0	0	0	0	1	1
19	0	0	0	0	2	3
20	0	0	0	0	1	1
21	0	82	0	0	19	25
22	0	231	19	0	49	39
23	0	48	0	0	10	8
24	0	24	2	0	4	3
25	0	116	9	0	19	14
26	0	141	0	0	29	28
27	30	147	11	0	24	18
Total	**30**	**1,861**	**80**	**4,440**	**524**	**472**

Table 9. Application of biosolids within the Chickahominy River study area (2003 – 2010).

Year	Wet Tons (as is)
2003	660
2008	6,223
2009	821
2010	324
Total	8,028