Tomales Bay Watershed Council
Summary* of Woodacre Water-Quality Sampling

**Modified from the report to the TBWC from Fall Creek Engineering, Inc. on the analysis of stormwater samples collected in Woodacre during the winter of 2006/2007, with the addition of 2008 sampling results.*

Findings

Table 1 lists the EPA Benchmark Values pertaining to stormwater when these have been promulgated. ***Benchmark values are for guidance; they don't express mandatory limits.*** Persistent exceedance of benchmarks at a particular location probably indicates a problem needing attention. Rare and sporadic exceedances are less urgent.

Total and Fecal Coliform

All the samples presented large numbers of coliform organisms, including *E. coli*. The numbers observed consistently exceeded what would be allowed in water intended for human contact (200 MPN/100 ml).

Bacterial levels in undiluted urban runoff typically exceed public health standards for water contact recreation almost without exception. (…) The Center for Watershed Protection (CWP) (2000) report that the most extreme bacteria concentrations (10^5 -10^6) in stormwater runoff from catchments are commonly associated with inappropriate human discharge (such as failing septic systems).[1]

The levels of fecal coliform (or *E. coli*) in the study under review were highly variable depending on the storm event and location. In many instances the concentration was below 2,400 MPN/100 ml, which could indicate that the sources of the bacteria are nonhuman sources, such as domestic animals or wildlife. [many samples were >2400 (the test limit without dilutions) and results from a large event with dilutions resulted in values ranging from 4,300-13,000 MPN/100mL]. *E. coli* levels measured in Woodacre Creek were generally elevated in the station below the community compared to the two stations above the community. This may indicate that effluent from septic systems is entering the storm sewers. (…) The results suggest, but are not conclusive that there are human sources of bacteria entering the runoff. It is also possible that the major source of bacteria is non human sources, primarily domestic animals and wildlife.

Nitrate

The median of the 85 nitrate measurements is 3.3 mg/l, which is above the EPA benchmark for this parameter (3.0 mg/l as nitrate). Certain stations exceeded the benchmark each time they were sampled. At Woodacre the consistently high nitrate stations are WDR-04, WDR-05, WDR-06, and WDR-07. (…)

Typical nitrate levels in urban runoff can range from 2.1 mg/L in new surburban sites to as high as 39 mg/L in older urban areas.[2] Nitrate levels found in the National Urban Runoff Program research, which includes data from 28 urban sites throughout the U.S. ranged from 2.21 to 4.43 mg/L with an average of 4.25 mg/L.[3]

The nitrate levels measured in storm drains in the central portion of Woodacre, Point Reyes and Tomales are all elevated, which may indicate shallow groundwater with elevated levels of nitrate is entering the stormwater system, and/or that suspended solids in surface runoff are enriched with nitrate. (Given the historical use and density of septic

systems in each of these communities it is likely that shallow groundwater, which would periodically enter the stormdrain system, would contain elevated levels of nitrate.) Excessive nitrate in the stormwater has the potential to stimulate algal growth in the body of water receiving the stormwater discharge.

Ammonia and MBAS

Ammonia, [and] methylene blue active substances (MBAS) (…) are other water quality parameters that typically have high values in domestic wastewater. The study under review presents measurements of these parameters. Ammonia concentrations ranged from non detectable to 8.6 mg/l. Characteristic urban stormwater ammonia concentrations range from 0.26 mg/l for new suburban sites to 1.1 mg/l for older urban areas.[2] In the study under review ammonia was detected in 23 out of the 86 samples analyzed. Five of the samples—all from Woodacre, three from the same location—had measured ammonia concentrations above 1.1 mg/l. The three locations implicated are WDR-1, WDR-2, and WDR-4. If septic tank effluent has contacted the surface in the vicinity of these sample locations it could account for these results.

MBAS components are present in laundry soap and that is why MBAS is thought to be a good surrogate for septic tank effluent. In the study under review this parameter was measured in 85 samples with a median result of <0.01 mg/l. 74 (87 percent) of the samples were reported to contain < 0.02 mg/l.. The other 11 samples had concentrations ranging from 0.06 to 0.36 mg/l. WDR-1, WDR-2, and WDR-4—already noted for ammonia concentration—accounted for six of these samples.

In conclusion

The quality of stormwater runoff from the community is typical of runoff from other urbanized areas in the region. Elevated levels of coliform bacteria, nitrate, ammonia and MBAS in the community of Woodacre is likely attributed to the relatively high density of septic systems.

[1] Center for Watershed Protection. 2000. *The Practice of Watershed Protection*. Ellicott City, Maryland

[2] Schueler, T. 1987. *Controlling Urban Runoff: A practical manual for planning and designing urban BMPs. Metropolian Washington Council of Governments*

[3] USEPA. 1983. *Results of the Nationwide Urban Runoff Program.* Vol. 1-Final Report. Water Planning Division. Washington, D.C.

Table 1

Parameters or Pollutants	EPA Benchmark (units)*	Observed Range
pH 6 to 9	(standard units)	6.17 – 8.24
EC 300 – 500	(µmhos/cm)	58.2 - 595
Temperature	Not specified (º C)	8.2 – 15.2
Dissolved Oxygen	Not specified (mg/l)	4.73 – 12.97
MBAS	Not specified (mg/l)	<0.005 – 0.36
Nitrate	3 (mg/l)	<0.5 – 82
Ammonia	19 (mg/l)	<0.1 – 8.6
Total coliform	Not specified (mpn/100mL)	170 – 160,000
E. coli	Not specified (mpn/100mL)	<1 – 13,000

*****See first paragraph for explanation of EPA Benchmarks