Excerpted text regarding possible bacteria sources begins below, a little more than halfway down the page.

Potential Sources of Fecal Bacteria

The Freescale Semiconductor plant on Ed Bluestein Boulevard discharges bacteria-free industrial process water into Walnut Creek (1428B_01). The Freescale plant is the only regulated industrial facility that discharges into any of the four streams. The Walnut Creek Wastewater Treatment Facility, operated by the City of Austin, discharges its effluent directly into the Colorado River instead of Walnut Creek. The City of Austin will not build or permit any such discharges into these four streams in the future.

Sources of fecal bacteria in the affected watersheds include sanitary sewer overflows, leaking or illicit discharge from centralized wastewater collection lines, unmanaged wildlife, managed livestock, domestic pets, failing on-site sewage facilities, and direct human contributions. Sanitary sewer overflows (SSOs) are unauthorized discharges from the wastewater collection system. SSOs in dry weather most often result from blockages in the sewer collection lines caused by tree roots, grease, and other debris. Inflow and infiltration of stormwater through leaky sewer collection lines are typical causes of SSOs under conditions of high flow. Blockages in lines may exacerbate the inflow and infiltration problem. Other causes, such as a collapsed sewer lines, may occur under any conditions. Based on City of Austin data on reported SSOs, there were 88 SSOs in the affected watersheds from 1998 to 2011 totaling an estimated 1,126,031 gallons of wastewater.

On-site sewage facilities (OSSFs), or septic systems, may contribute fecal bacteria if they are not properly maintained or fail. Failing OSSFs are not considered a major source of bacteria loading

in the affected watersheds because most of these watersheds are in areas served by centralized wastewater collection systems. There are an estimated 908 in-service OSSFs in the Walnut Creek watershed, of which 894 are estimated to be within City of Austin regulatory jurisdiction.

E. coli bacteria are common inhabitants of the intestines of all warm blooded animals. The TMDL estimates some cattle and feral hogs may inhabit the Walnut Creek watershed although none are assumed to inhabit the other three more urban affected watersheds. Deer and other wildlife including raccoons, rats, and birds are likely to be present in all four of the affected watersheds.

Domestic pets occur in all four of the affected watersheds. The TMDL estimates the number of domestic dogs and cats in the affected watersheds based on the number of households from US Census data (Table 4).

Table 4. Estimated households and pet populations within TMDL watersheds

AU	Estimated Number of Households	Estimated Dog Population	Estimated Cat Population
1403J_01	1,129	714	805
1403K_01	769	486	548
1428B_01	2,129	1,346	1,518
1428B_02	28,887	18,257	20,596
1428B_03	4,406	2,785	3,141
1428B_04	21,314	13,470	15,197
1428B_05	17,429	11,015	12,427
1429C_01	2,608	1,648	1,860
1429C_02	8,042	5,083	5,734
1429C_03	6,151	3,887	4,386

Evidence of direct human defecation near creeks has been observed at multiple monitoring locations in the affected watersheds (Jackson and Herrington 2011). Direct human contributions are likely to be concentrated in intense urban areas with higher densities of homeless residents, but may also occur in parks and greenbelts without restroom facilities regardless of the presence of homeless residents.

TMDL Expression

Load duration curves (LDCs) were used to generate the TMDL for the four affected watersheds. The LDC method allows for estimation of existing loads and TMDL loads by utilizing the cumulative frequency distribution of stream flow and measured pollutant concentration data (Cleland, 2003).

The median loading of the critical very-high flow regime (0-10% exceedance) was used for the TMDL calculations of the impaired AUs in the Austin streams watersheds, because the source

loads are the highest under these flow conditions. Bacteria load contributions from non-regulated stormwater sources are greatest during runoff events. Rainfall runoff, depending upon the severity of the storm, has the capacity to carry indicator bacteria from the land surface into the receiving stream and increases the likelihood of SSOs because of inflow and infiltration into the sanitary sewer system.

LDCs were developed by multiplying the stream flows by the *E. coli* criterion (126 MPN/100 mL). The resulting values were then multiplied by a conversion factor to convert the loading to colonies per day. Continuous daily stream flow was derived for use in the LDC from City of Austin Soil and Water Assessment Tool (SWAT) hydrodynamic models. The TMDL includes the load allocation (LA) from unregulated sources, the wasteload allocation (WLA) for regulated sources, including permitting stormwater runoff (municipal separate storm sewers, or MS4s), an allowance for future growth in the watershed and an additional fixed percentage loading to provide a margin of safety (MOS). The TMDL for the four affected watersheds is presented in Table 5.

Table 5. Final TMDL allocations for all AUs for non-supporting water bodies

Stream	AU	TMDL [a] (Billion MPN/day)	WLA_{SW} [b]	LA_{Total} [c] (Billion MPN/day)	MOS [d] (Billion MPN/day)
Spicewood Tributary to Shoal Creek	1403J_01	11.93	11.33	0.00	0.60
Taylor Slough South	1403K_01	9.93	9.43	0.00	0.50
Walnut Creek	1428B_05	74.91	71.16	0.00	3.75
Waller Creek	1429C_02	90.29	50.72	36.90	2.67
Waller Creek	1429C_03	36.90	35.05	0.00	1.85

[a] Total TMDL allowed from all sources, calculated from median high flow

[b] Permitted loads from MS4 stormwater;

[c] Non-permitted loads from all sources, including non-MS4 stormwater

[d] MOS

The total TMDL reduction for all watersheds combined is 220 billion MPN/day. In total, the proposed management measures included in this I-Plan are estimated to result in a reduction of *E. coli* 370,000 billion MPN/day. Although tracking the progress of the proposed management measures over time in coordination with monitoring the improvement in instream fecal indicator bacteria will be necessary to determine if the I-Plan achieves the stated goal, this I-Plan appears to achieve the load reduction of the TMDL.